



FO



2015

**Fertilizer Outlook &
Technology Conference**

John Harpole

**Founder and Owner
Mercator Energy**



Natural Gas Outlook



The
Fertilizer Institute
Nourish, Replenish, Grow



**Fertilizer Industry
Round Table**

The End of Scarcity?

Natural Gas Outlook

Presentation to:

The Fertilizer Outlook and Technology Conference
Jacksonville, FL

By:

John Harpole



Mercator Energy_____

November 11, 2015

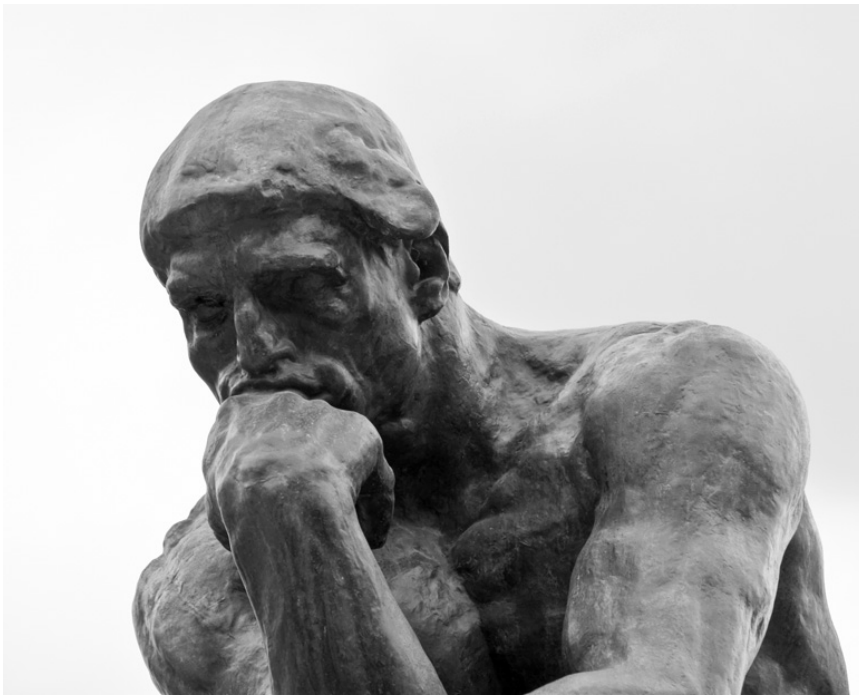
Conclusions from November 20, 2013

- U.S. continues to produce more gas, shale gas revolution was too successful, end-users will benefit
- During the next 3 years, supply will likely exceed demand
- Prices will remain in the \$3.50 to \$4.75 range, with short period above and below that band during adjustments
- Long term prices depend on demand growth. Without demand growth, supply will continue to be long and prices relatively low.
- A significant demand response can't occur for at least 3-5 years



The Big Question

- What issues will have the greatest impact on North American natural gas prices in the next 5 years?



The Big Three Issues to Watch

1. Global Oil Price Recovery
2. Marcellus and Utica Shale Production
3. U.S. LNG Exports

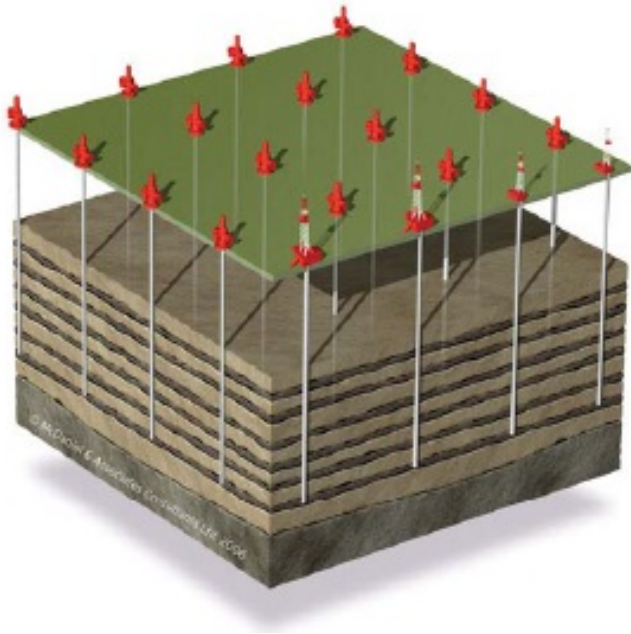
The Big Three Issues to Watch

1. Global Oil Price Recovery

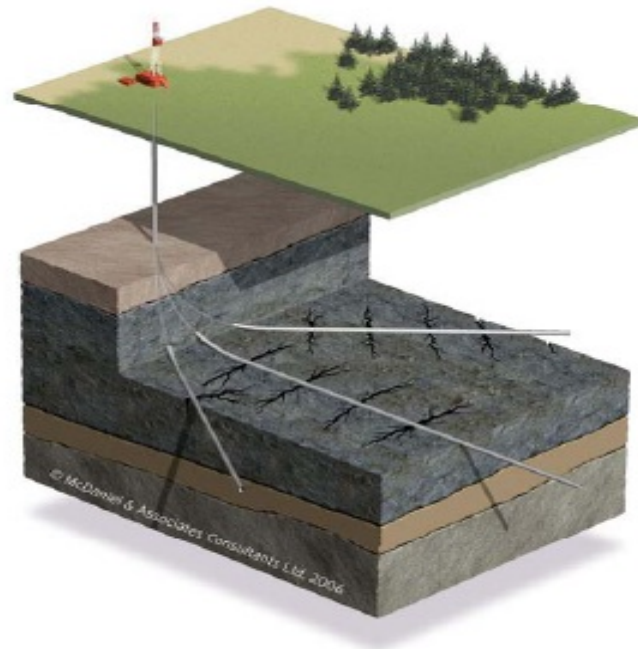
What Happened?

- Thanks to American ingenuity and private property ownership of minerals, the world should/will no longer live under the threat of energy insecurity.
- Energy once scarce, is now super-abundant and that reality will continue to change the world as transportation issues are remedied.

Horizontal Drilling



Traditional Wells

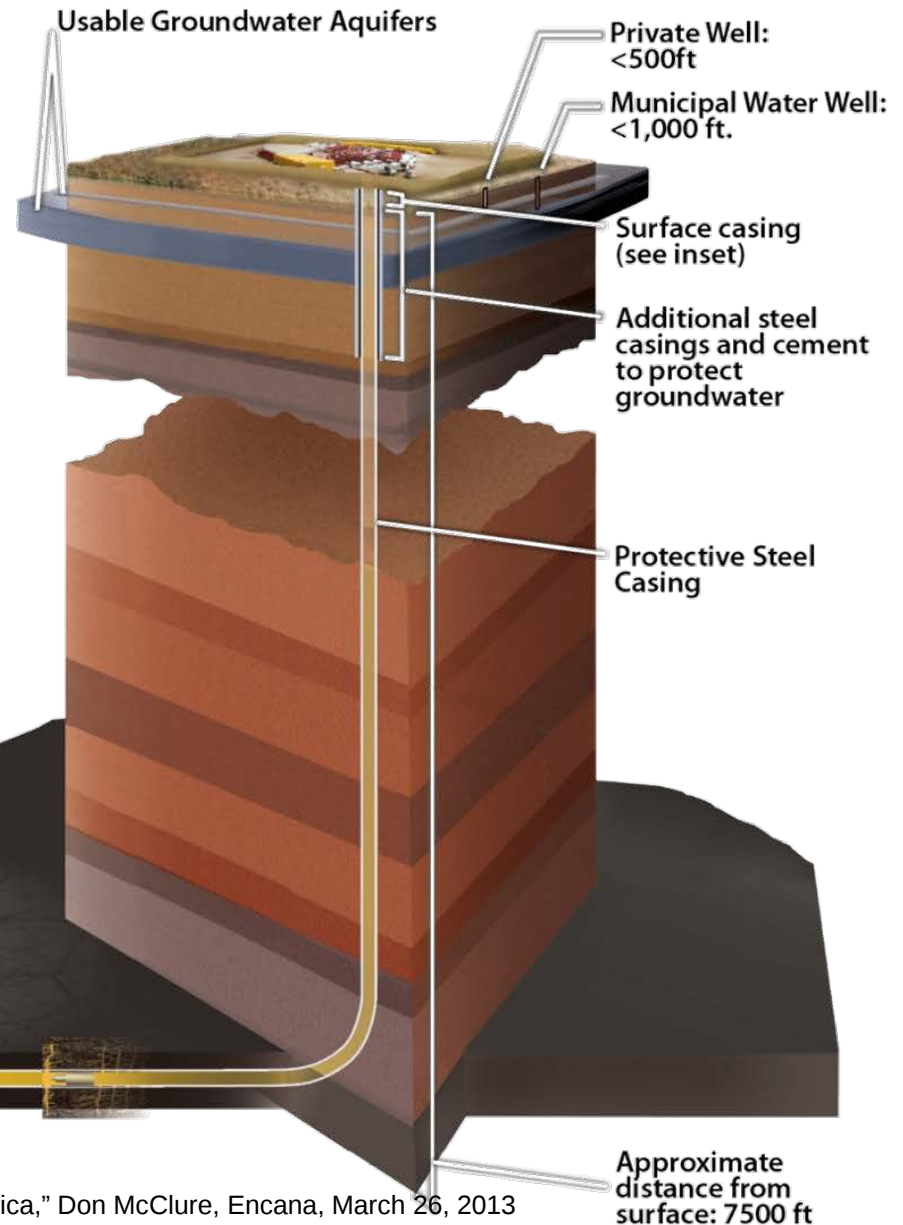
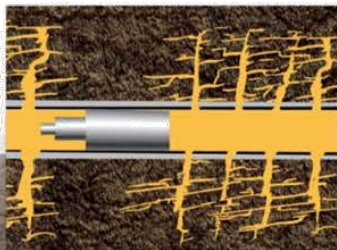


Horizontal Drilling

Source: "The natural gas revolution and energy self-reliance in North America," Don McClure, Encana, March 26, 2013

Pumping fluid under high pressure to fracture formation

- ## Hydraulic Fractures

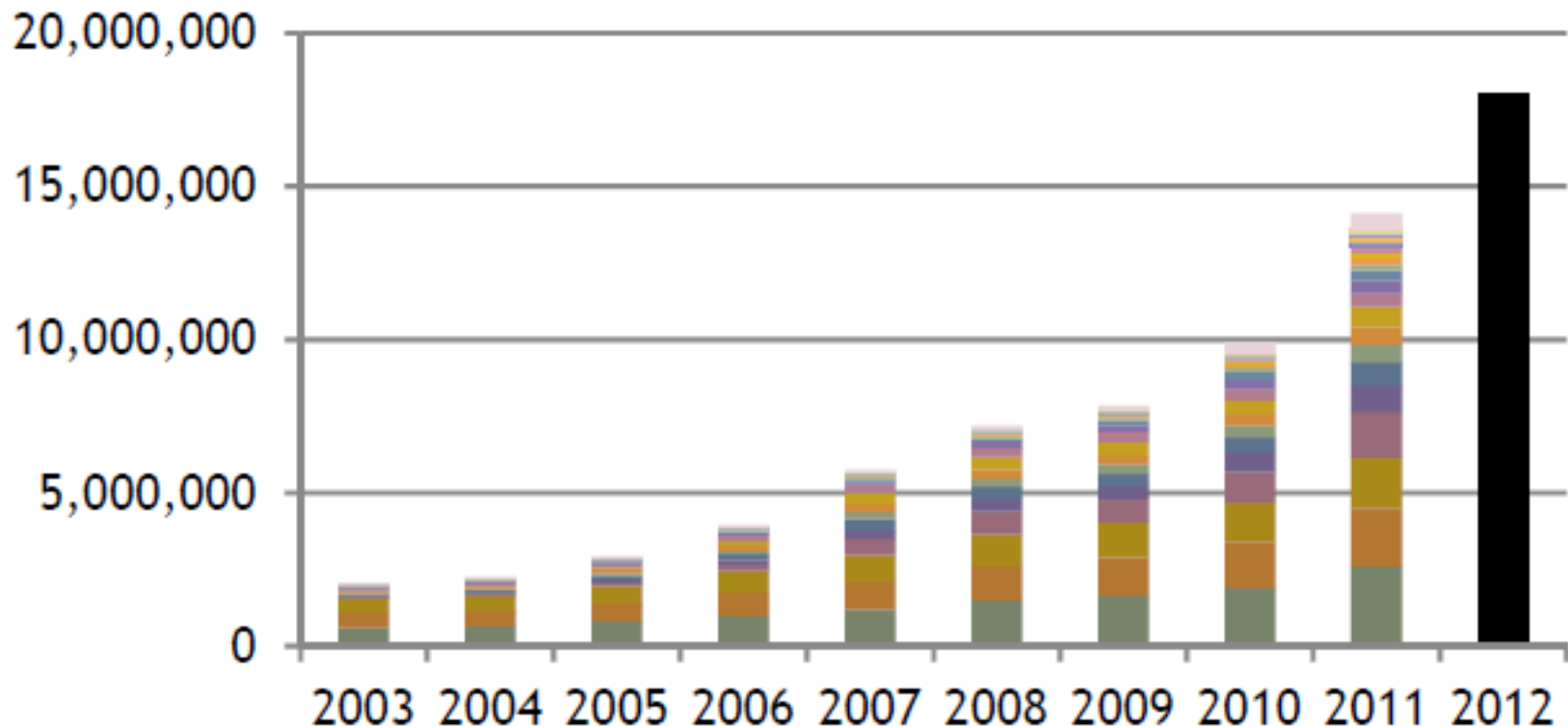


North American shale plays (as of May 2011)



Fracturing Application Exploded

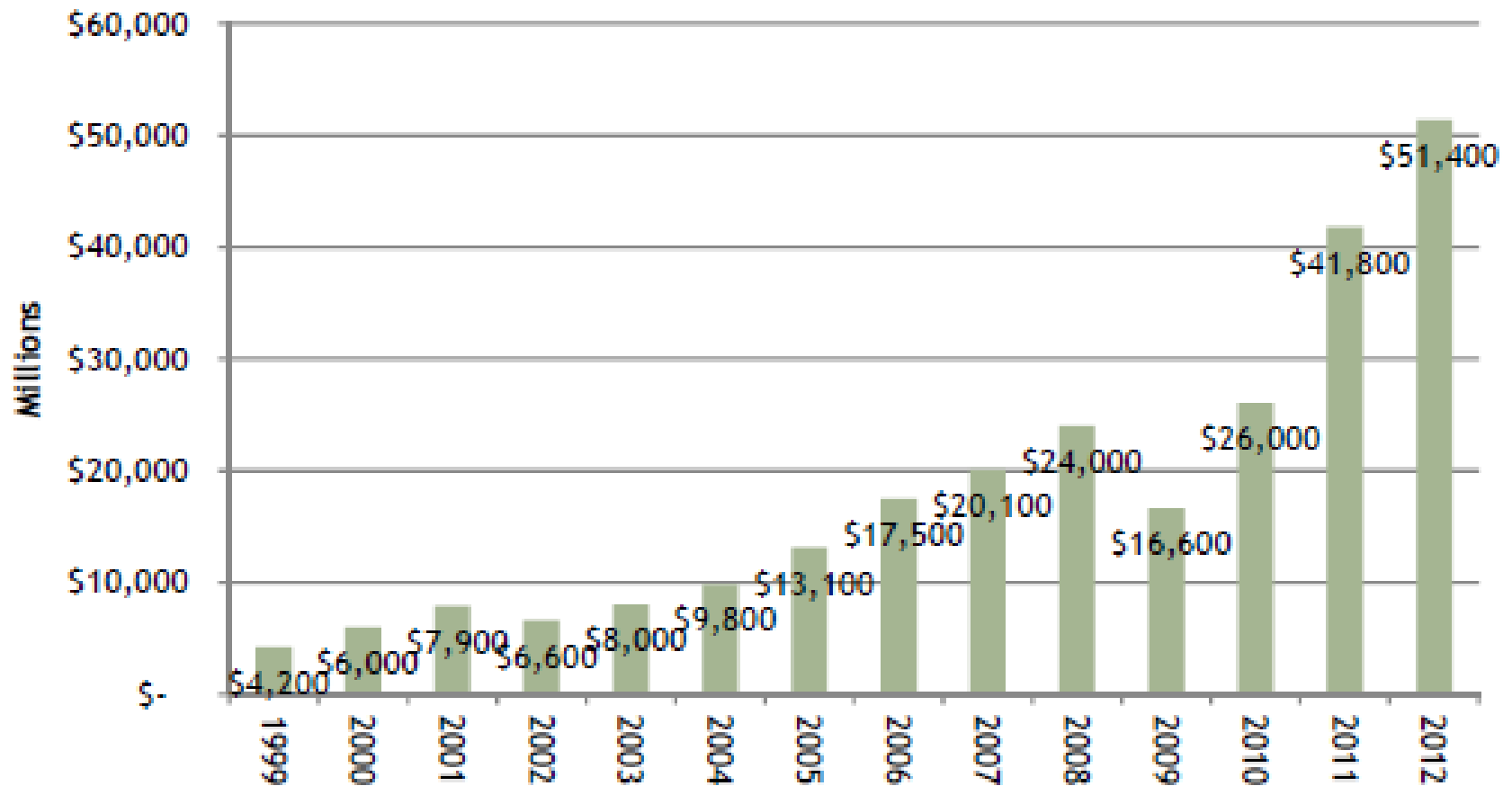
North American Frac Horsepower



Source: Chris Wright, Liberty Resources Tuesday Lunch Club Presentation, 3/5/13

10-fold growth in 10 years

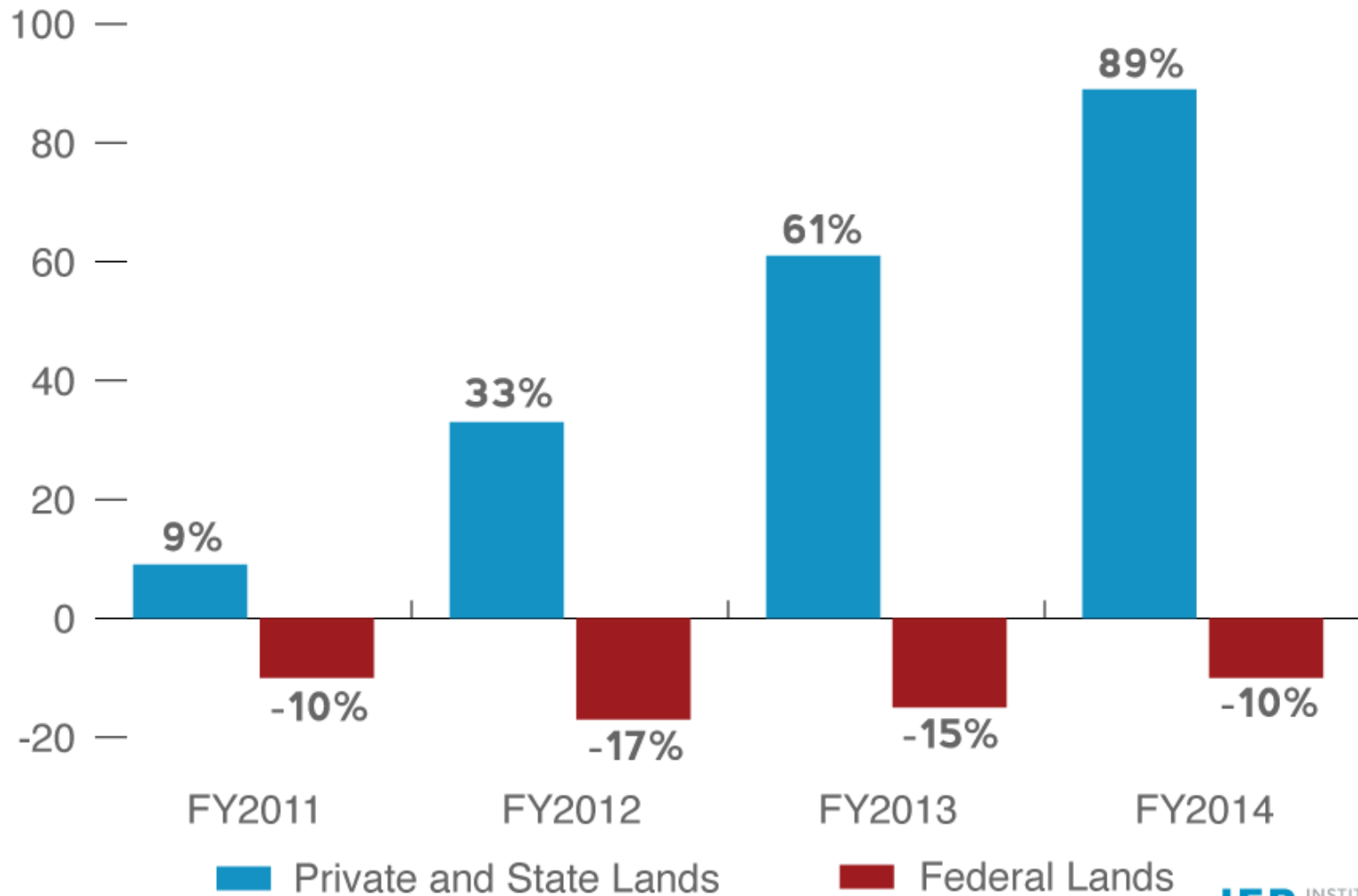
Pressure Pumping Services



Source: Chris Wright, Liberty Resources Tuesday Lunch Club Presentation, 3/5/13

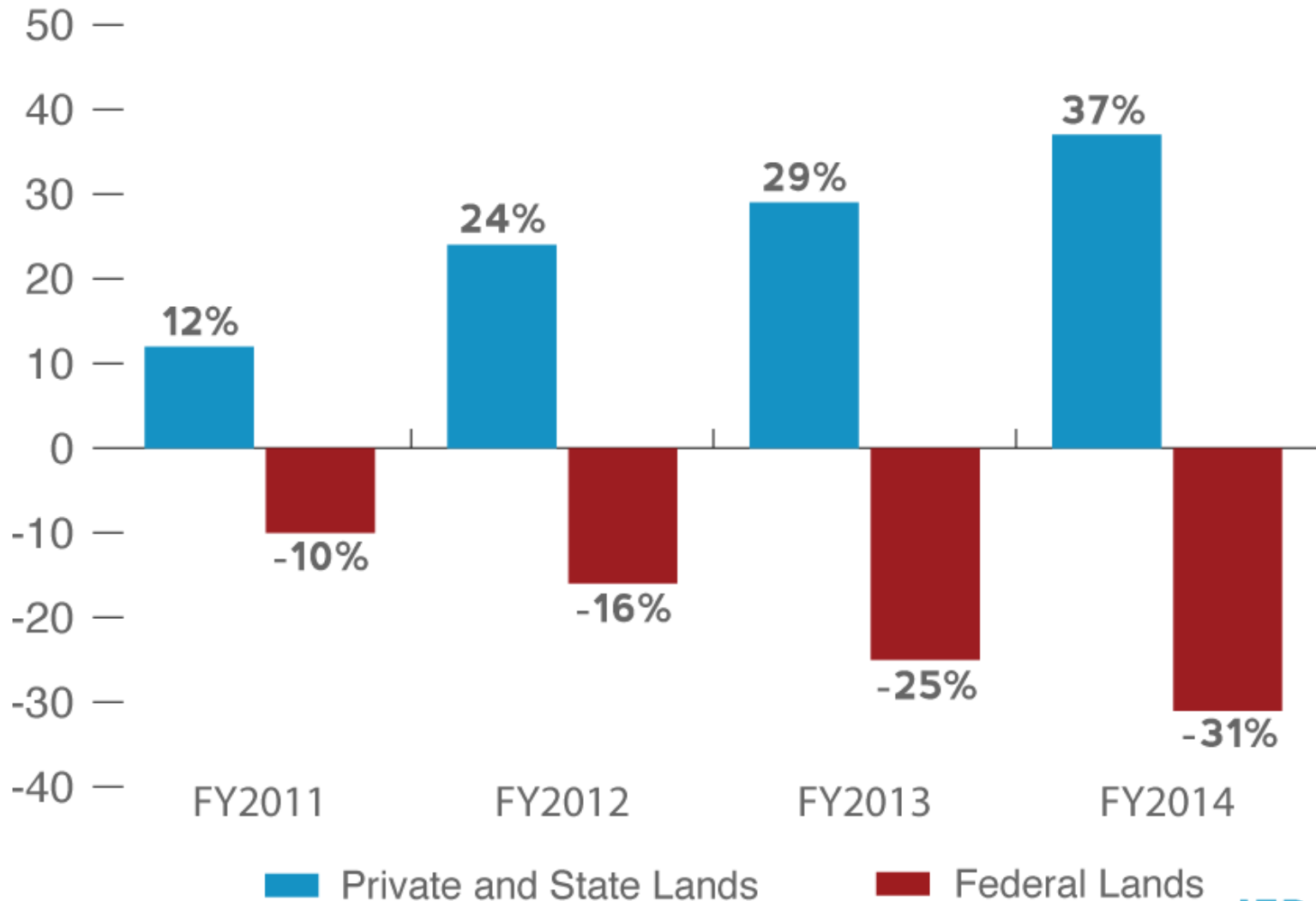
OIL PRODUCTION ON FEDERAL VS. PRIVATE AND STATE LANDS

PERCENT CHANGE FROM FY2010



IER INSTITUTE FOR ENERGY RESEARCH

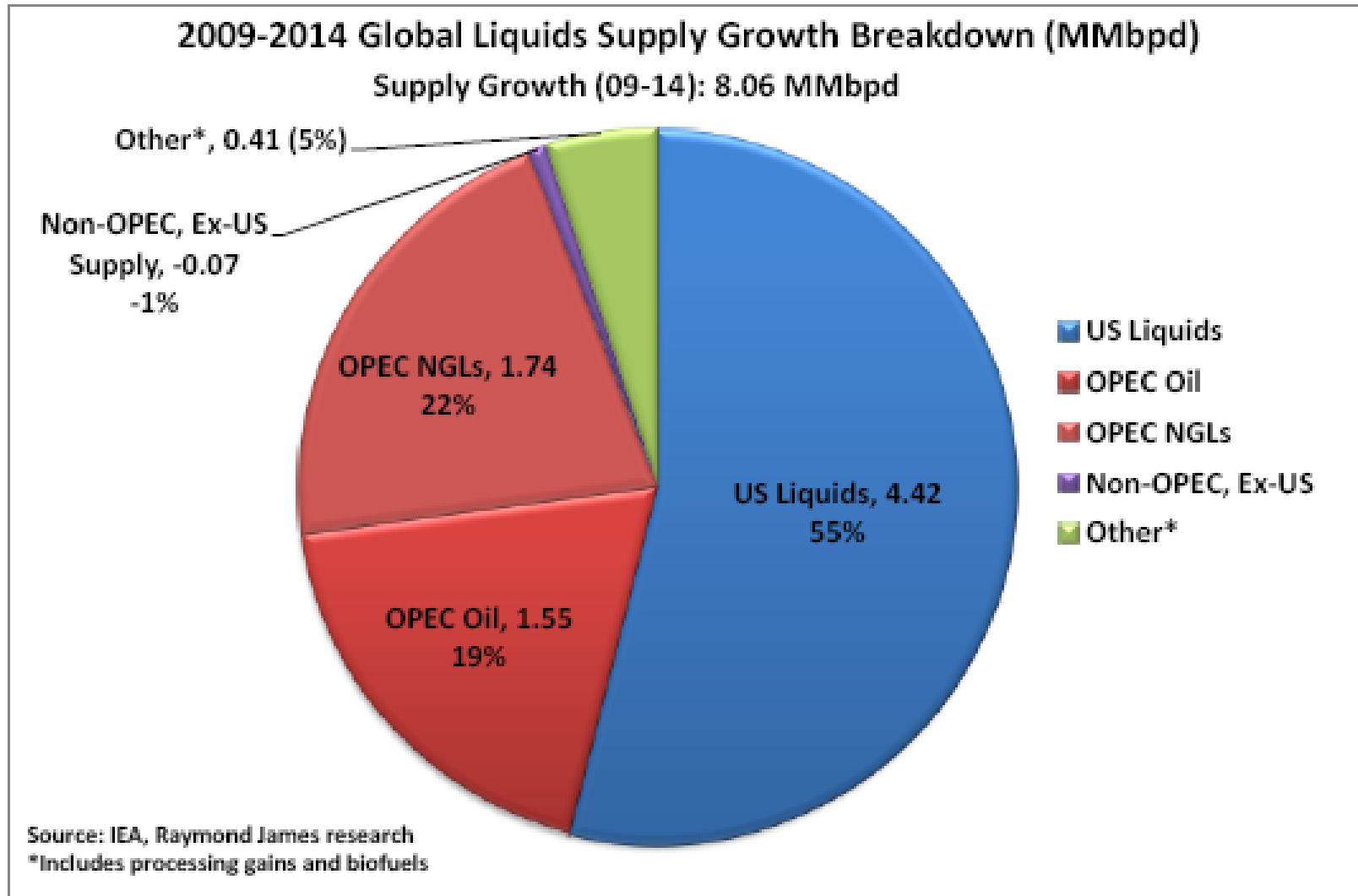
NATURAL GAS PRODUCTION ON FEDERAL VS. PRIVATE AND STATE LANDS, PERCENT CHANGE FROM FY2010



IER INSTITUTE FOR ENERGY RESEARCH

Source: "Oil and Natural Gas Booms on Private and State Lands," Institute for Energy Research, April 14, 2015

The House of Saud's Motivation

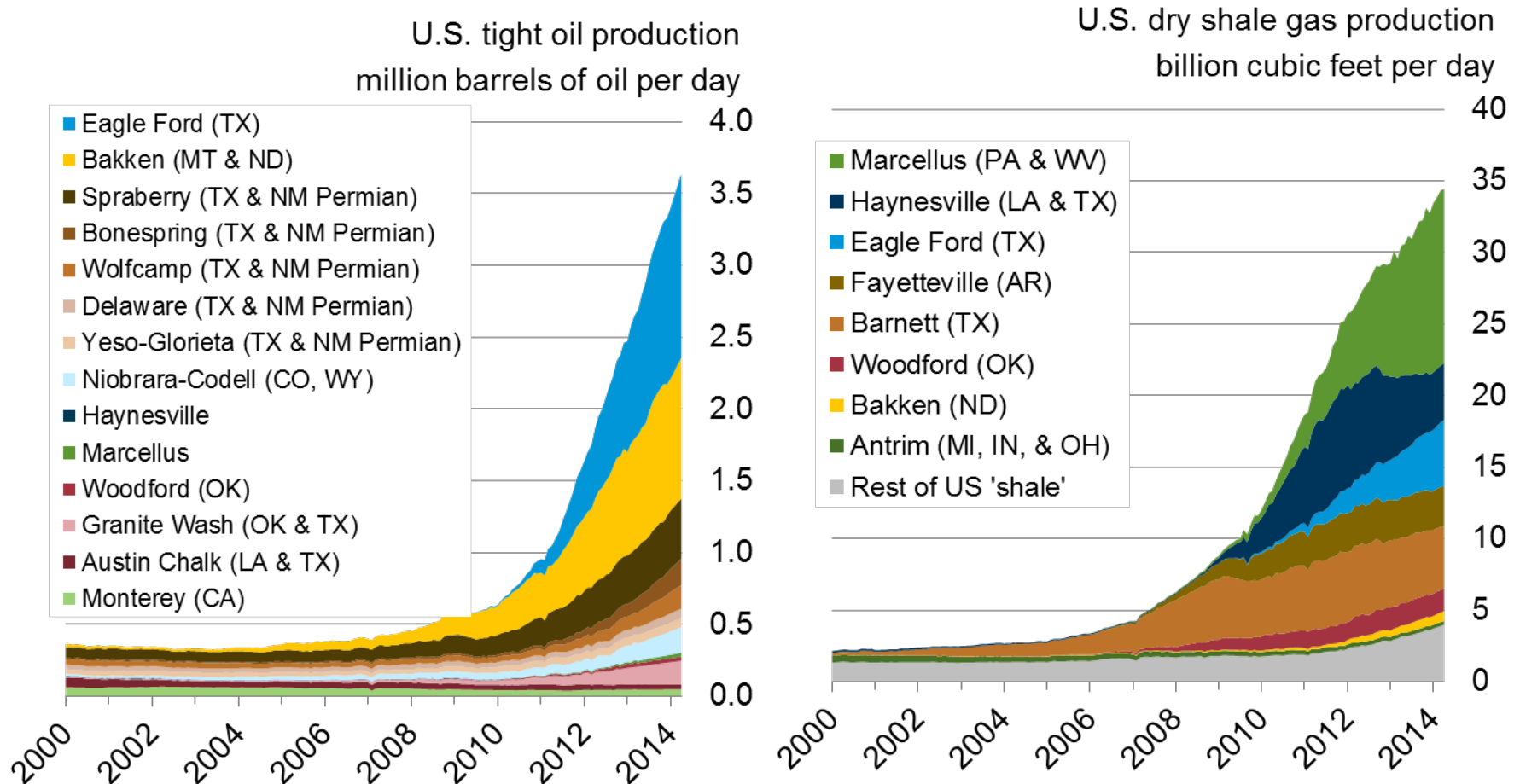


Major Takeaways

- Crude oil prices are depressed due to the current global oversupply.
- The crude oil oversupply will take between 1 to 3 years to correct, unless a major structural event takes supply out (OPEC, etc.)
- Marginally economic areas across the U.S. will be negatively impacted. Geography and crude quality can tip the sales either way.
- Natural gas drilling that was dependent on the value of natural gas liquids has been negatively affected
- North American LNG exports could also be affected.



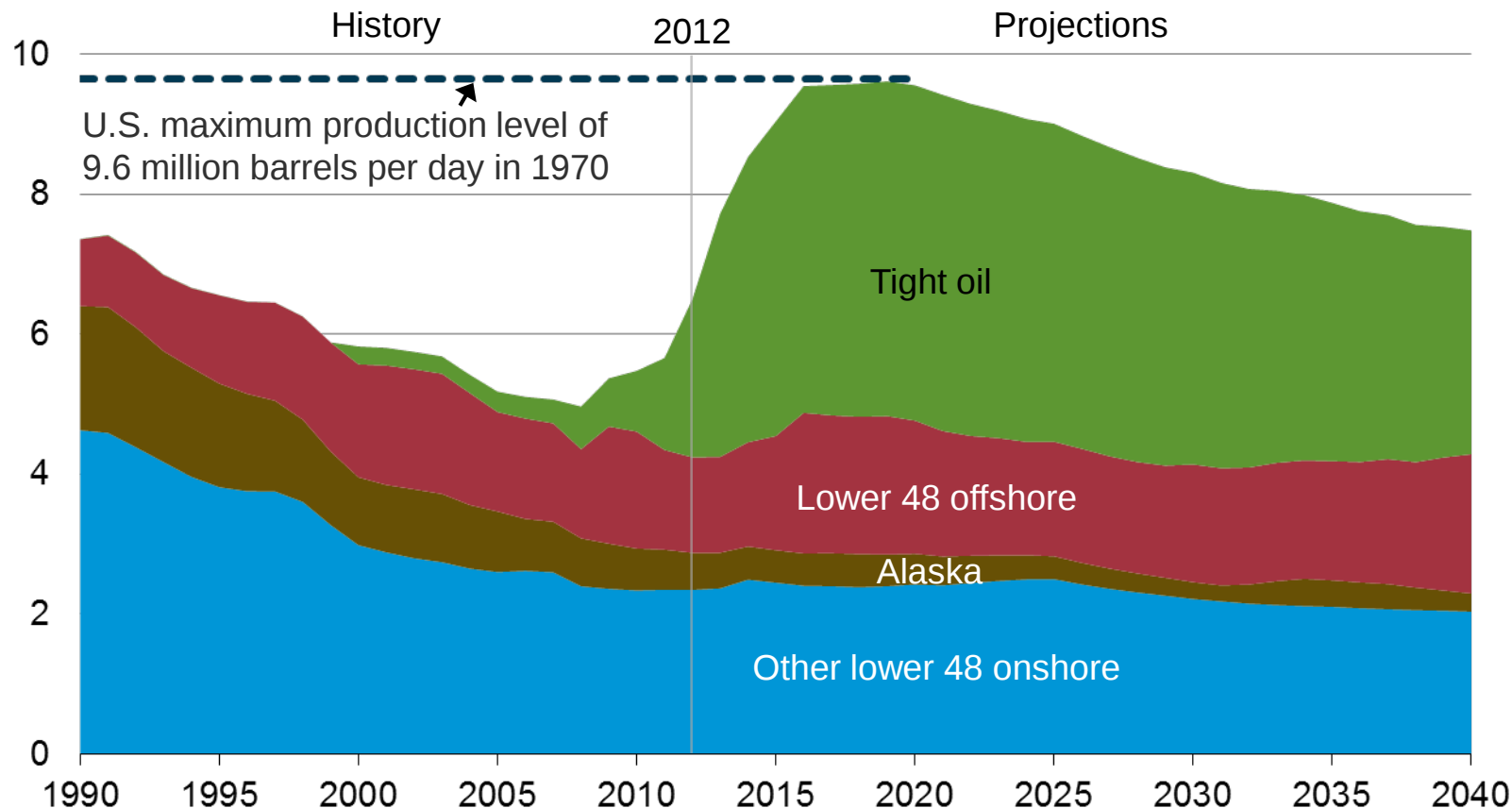
The U.S. has experienced a rapid increase in natural gas and oil production from shale and other tight resources



Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through April 2014 and represent EIA's official tight oil & shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).

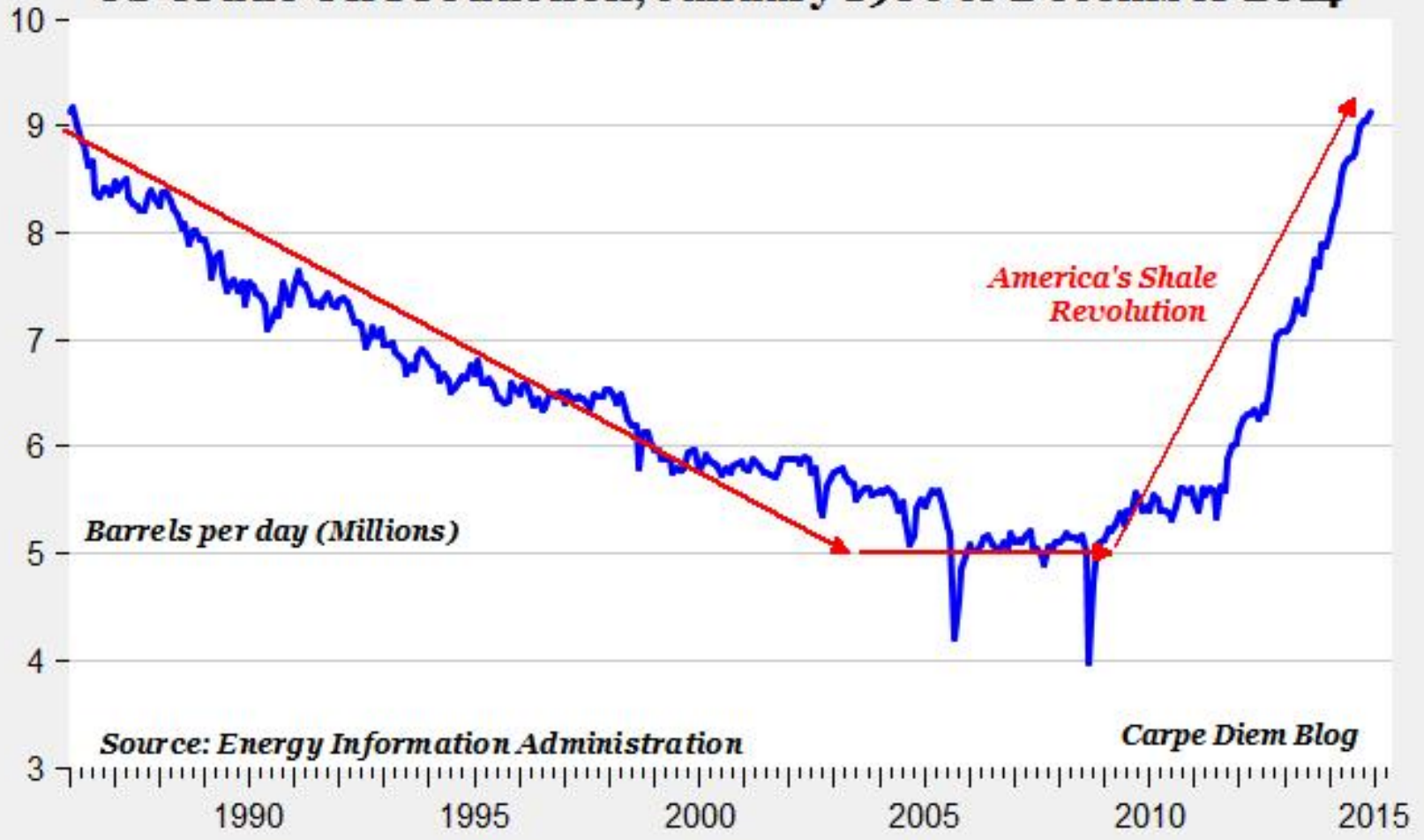
Growing tight oil and offshore crude oil production drive U.S. output close to historical high

U.S. crude oil production
million barrels per day

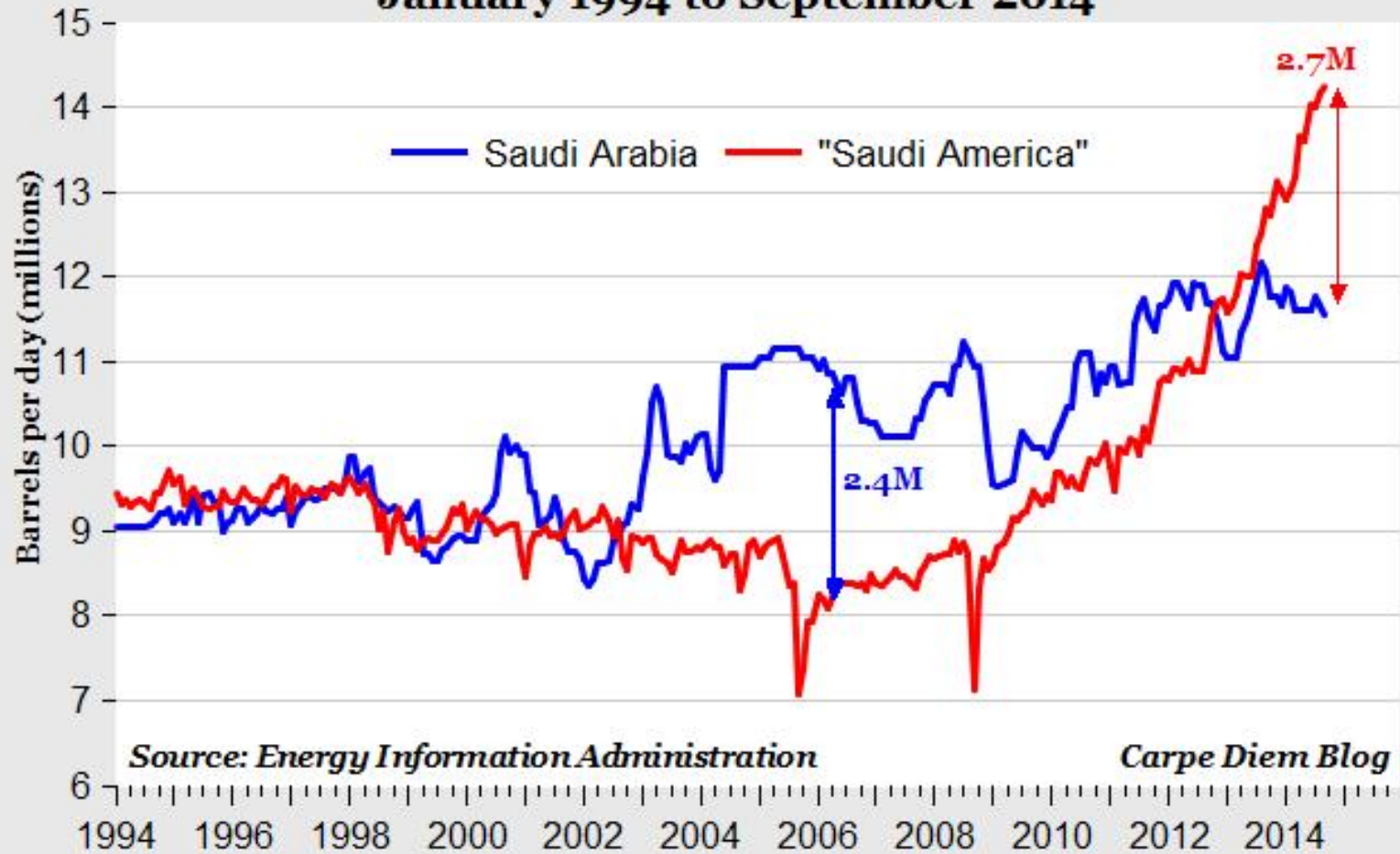


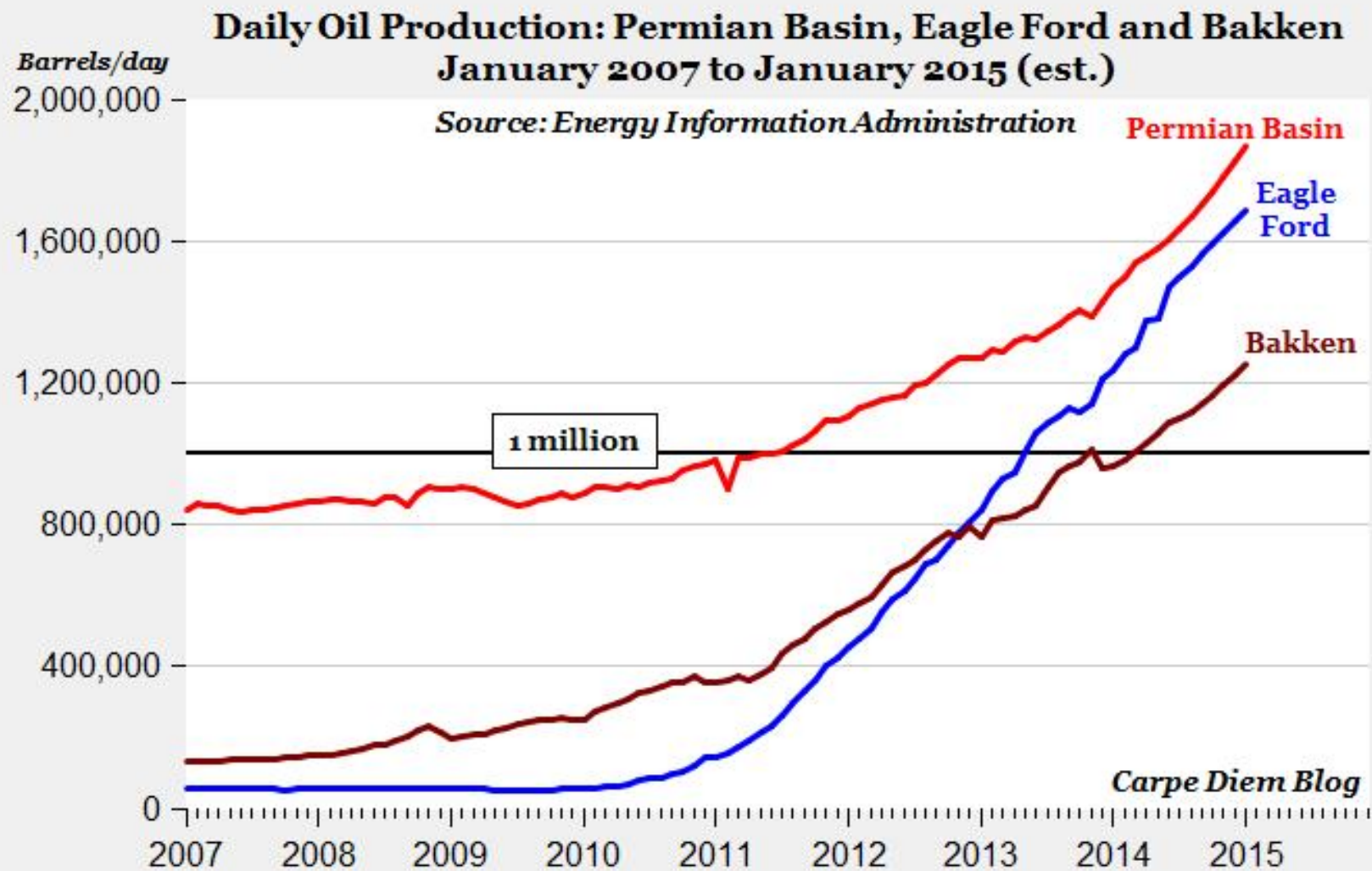
Source: EIA, Annual Energy Outlook 2014 Reference case

US Crude Oil Production, January 1986 to December 2014

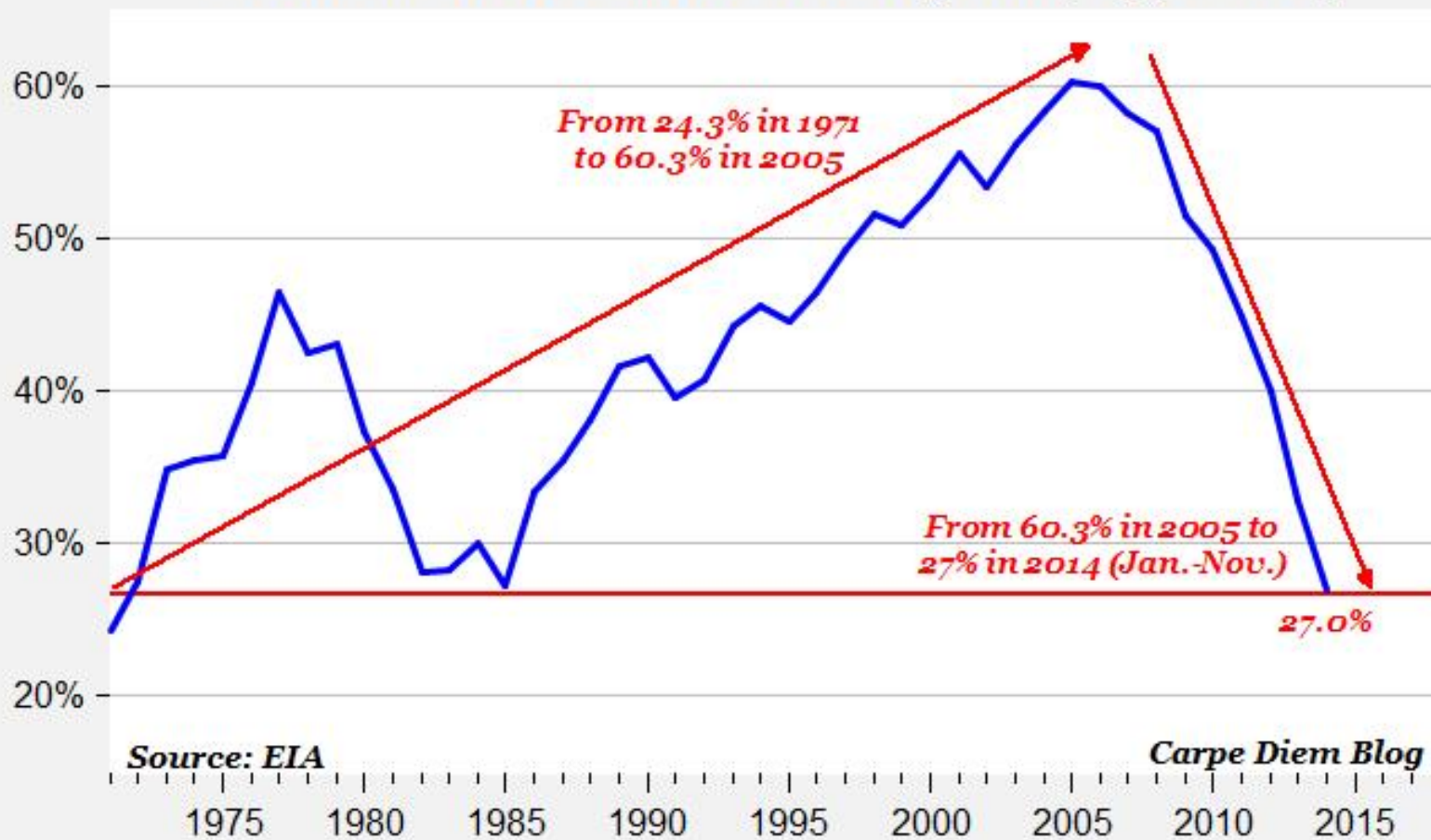


Total Petroleum Production: Saudi Arabia vs. US January 1994 to September 2014





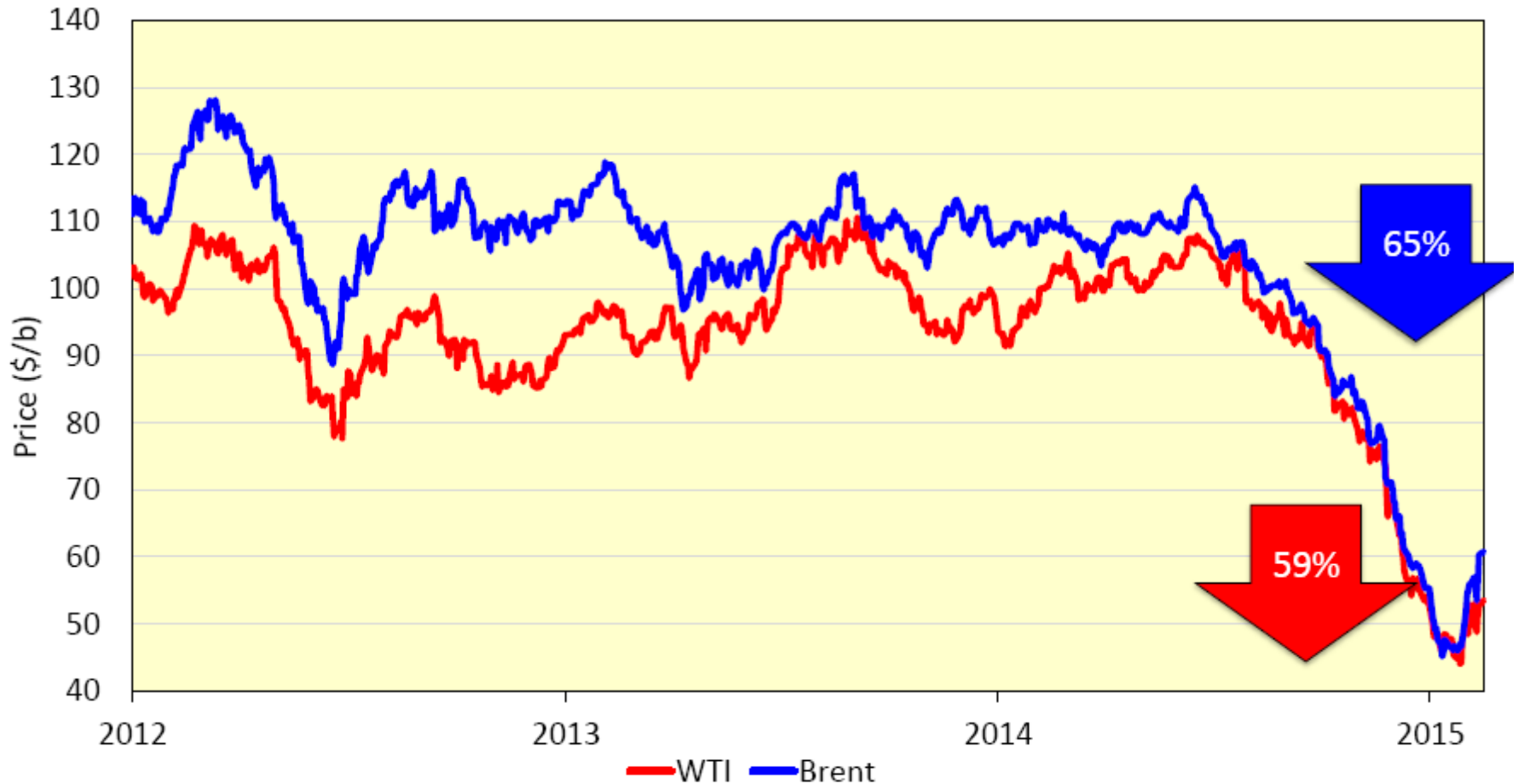
America's Net Petroleum Imports, 1971-2014



Commodity Prices:

Oil Prices Distressed: What Is Happening?

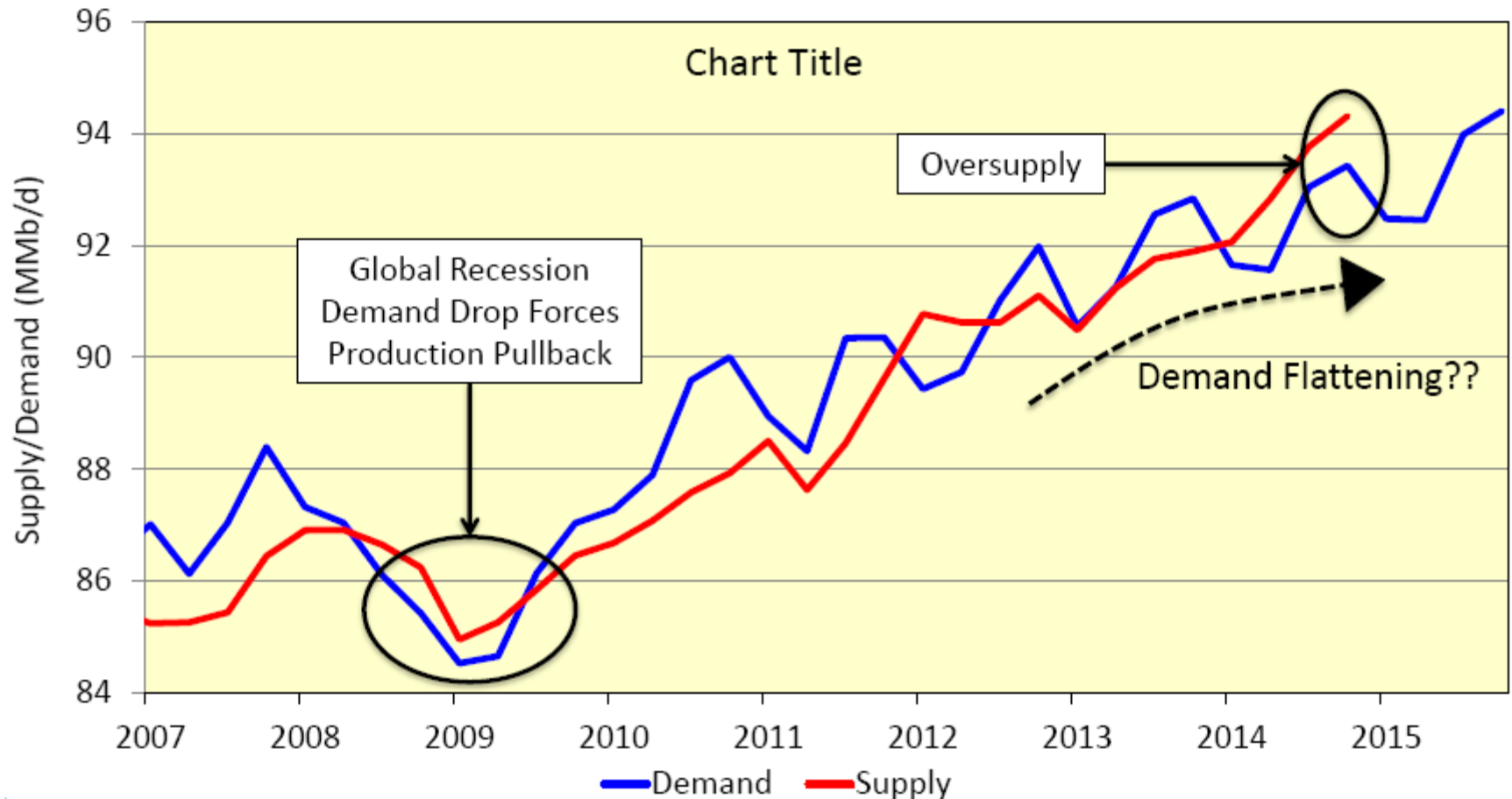
Global crude oil oversupply has pushed prices down both in the U.S. & abroad.



Global Supply/Demand Balance

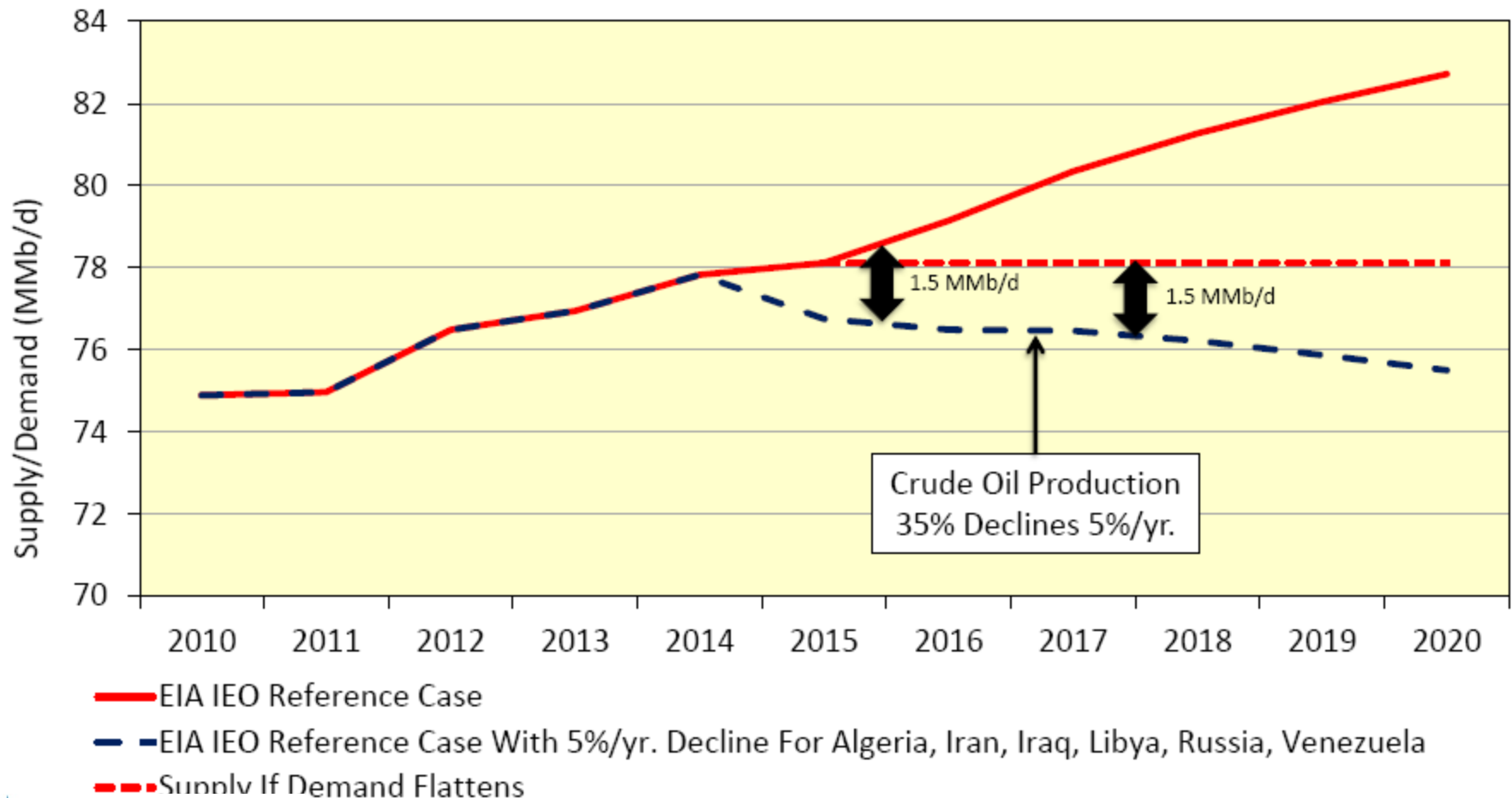
Lower Prices A Function of Global Oversupply

Supply is nearly 1.5 MMb/d over demand. Supply has been higher than demand briefly in the past without price drops (inventory build), however the current oversupply is at a time where demand is also at its peak.



Global Crude Oil Over-Supply 'Pain Period' Will Last 1 to 3 Years

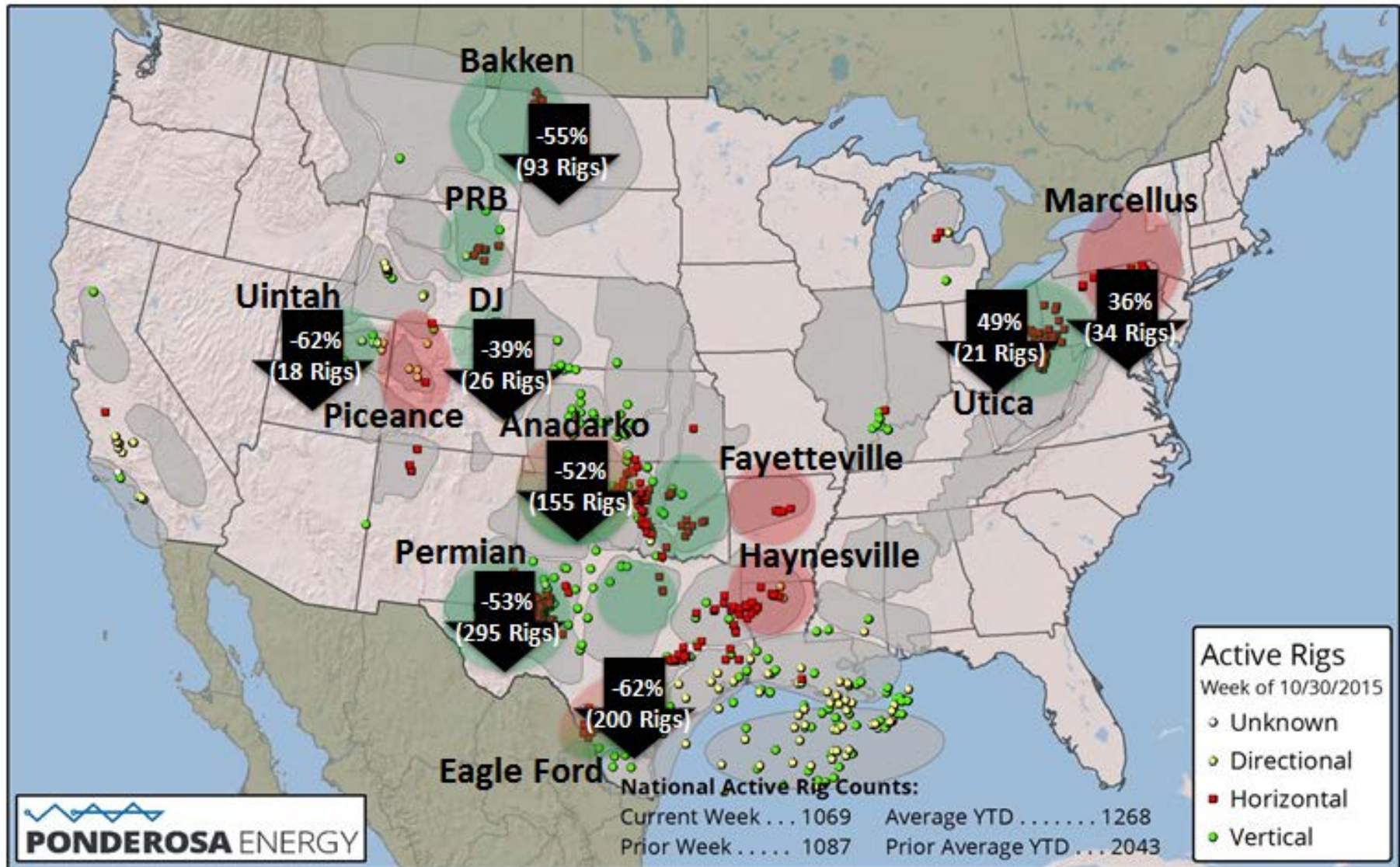
If lower prices force natural declines in high cost producing countries, global production could fall by 1.5 MMb/d by 2016.



Impact of Lower Prices in U.S.

Despite a rig count drop...

The Active Rig Count is Down 51% From the Peak

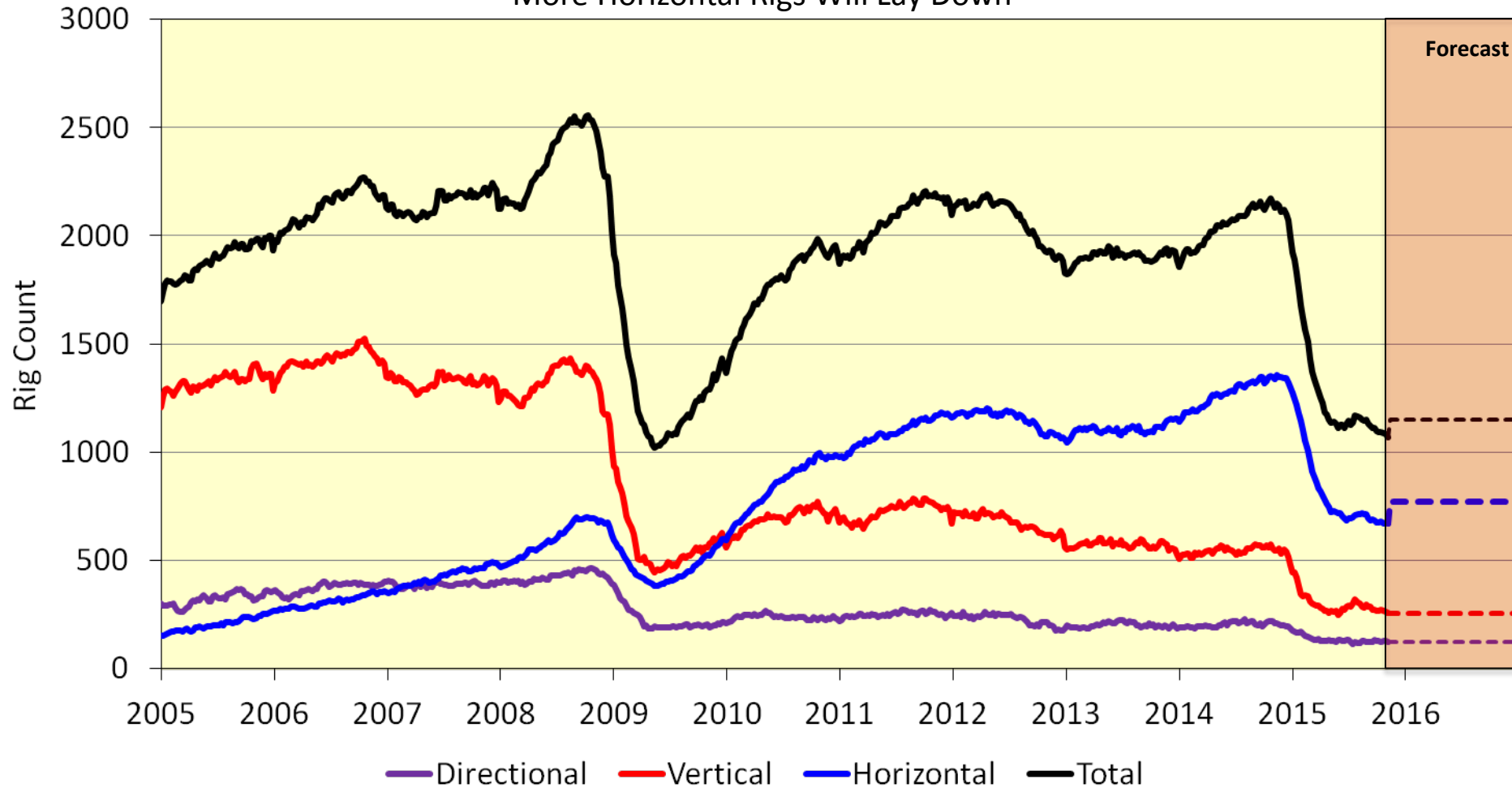


Source: DataWright Rigdata

Source: Bernadette Johnson, Ponderosa Advisors, LLC

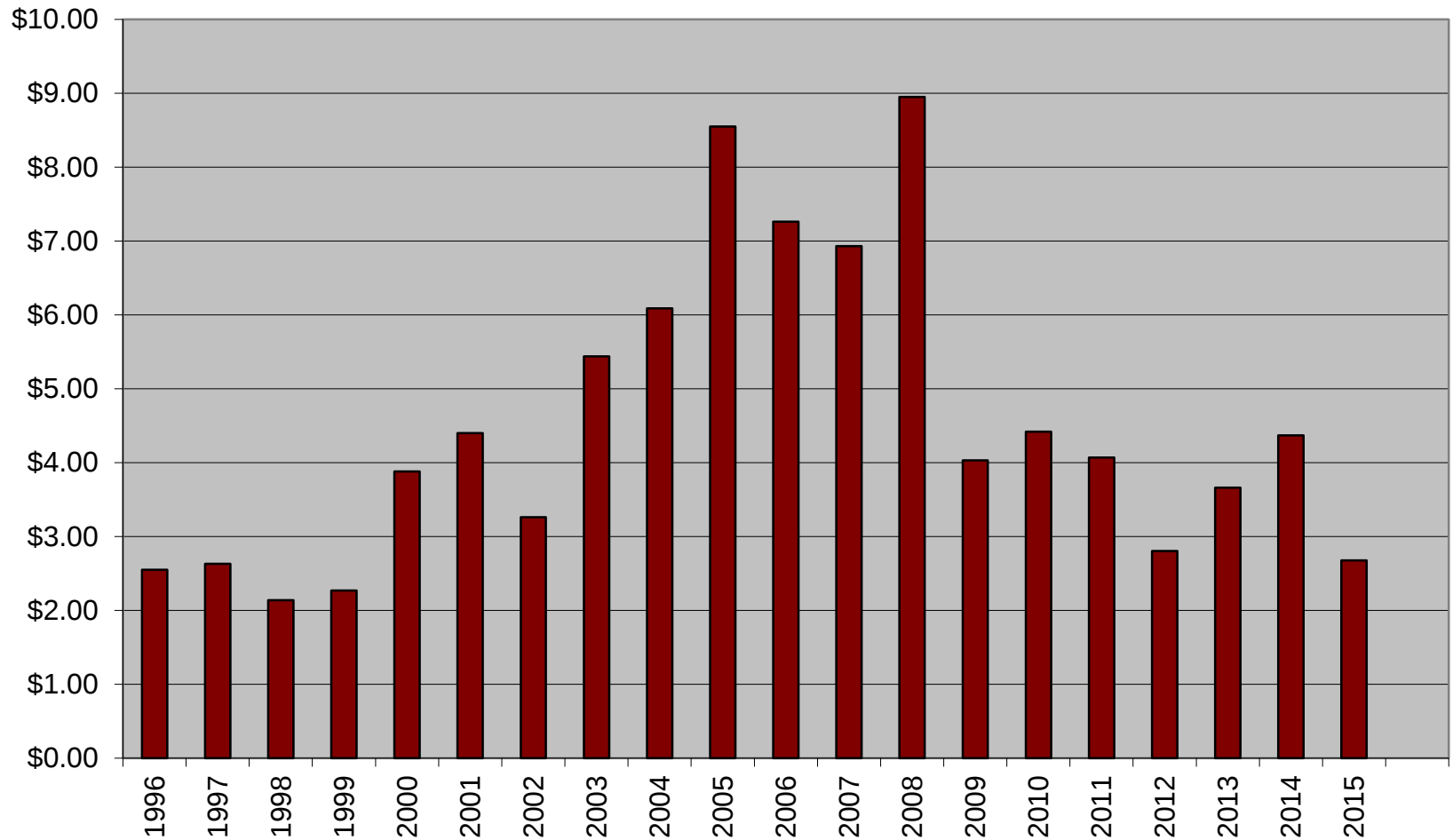
The U.S. Rig Fleet Has Lost At Least 1,076 Rigs Since Oct 2014

This Rig Drop Is Different Than 08/09 Because Rigs Are More Productive
More Horizontal Rigs Will Lay Down

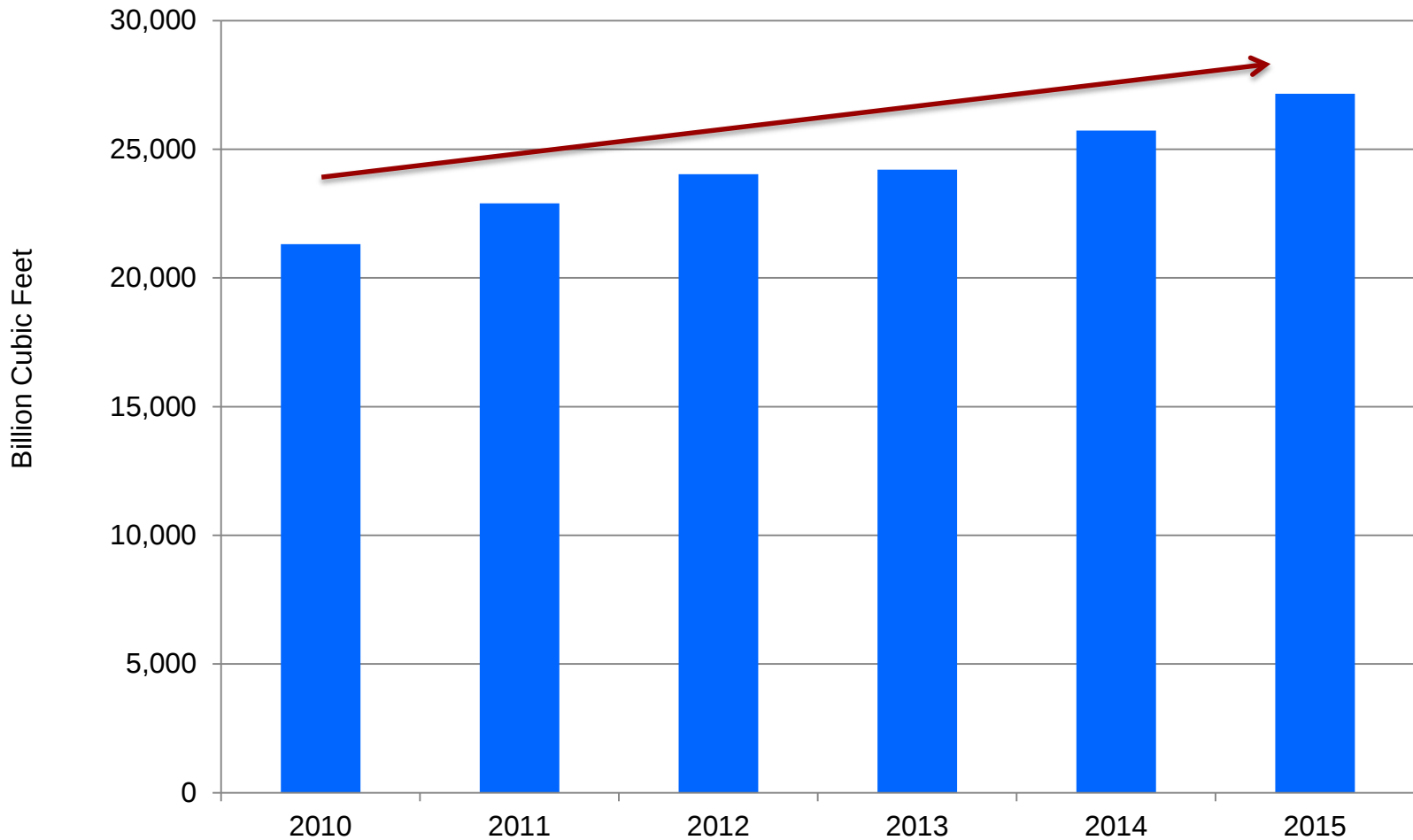


Despite a price drop

Historical Henry Hub Index Prices (1996-Current)



Summary of Dry Natural Gas Production in the United States, 2010-2015

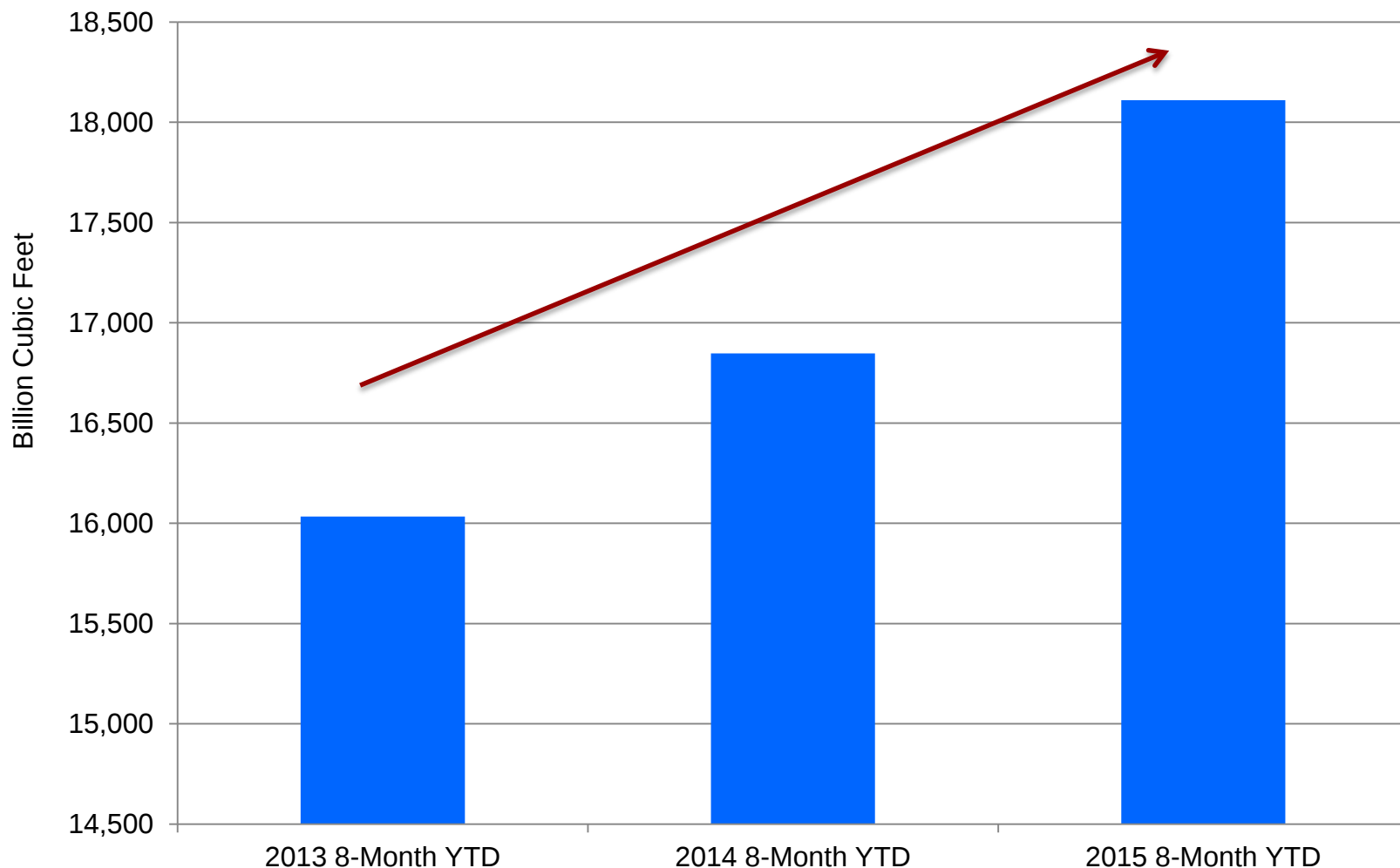


Equal to marketed production minus NGPL production.

Note: actual data through August 2015 and estimated for September-December 2015

Source: Natural Gas Monthly, U.S. Energy Information Administration, October 2015

Summary of Dry Natural Gas Production in the United States, 8-Month YTD



Equal to marketed production minus NGPL production.

Source: Natural Gas Monthly, U.S. Energy Information Administration, October 2015

China Gambles

- From 2005 – June 2013, \$430.4 billion invested world wide “with energy as the focus”
- Those investments were predicated on the scarcity of energy.
- It was the wrong bet.



Source: “China’s Steady Global Investment: American Choices,” Derek Scissors, Ph.D., Heritage Foundation, July 16, 2013

China Sleeps?

That miscalculation may impact the hoped for growth in oil demand that the world expected China/Asia to realize over the next 5 years



China

- Without significant demand in China, it is doubtful that world oil prices will strengthen in the near term (2015-2020)
- Combined with an aging population, China's GDP growth will slow
- That will obviously affect world/U.S. oil prices and natural gas liquid values



Four Grandparents, Two Parents, One child. 4-2-1



China Abandons One-Child Policy

Will future historians consider the elimination of the “one-child-only” policy in China as the end of the Malthusian inspired “era of perceived scarcity”?



The Lesson for China, Free Markets?

“Consider for a moment that any one person can only know a fraction of what is going on around him. Much of what that person believes will be false rather than true...”

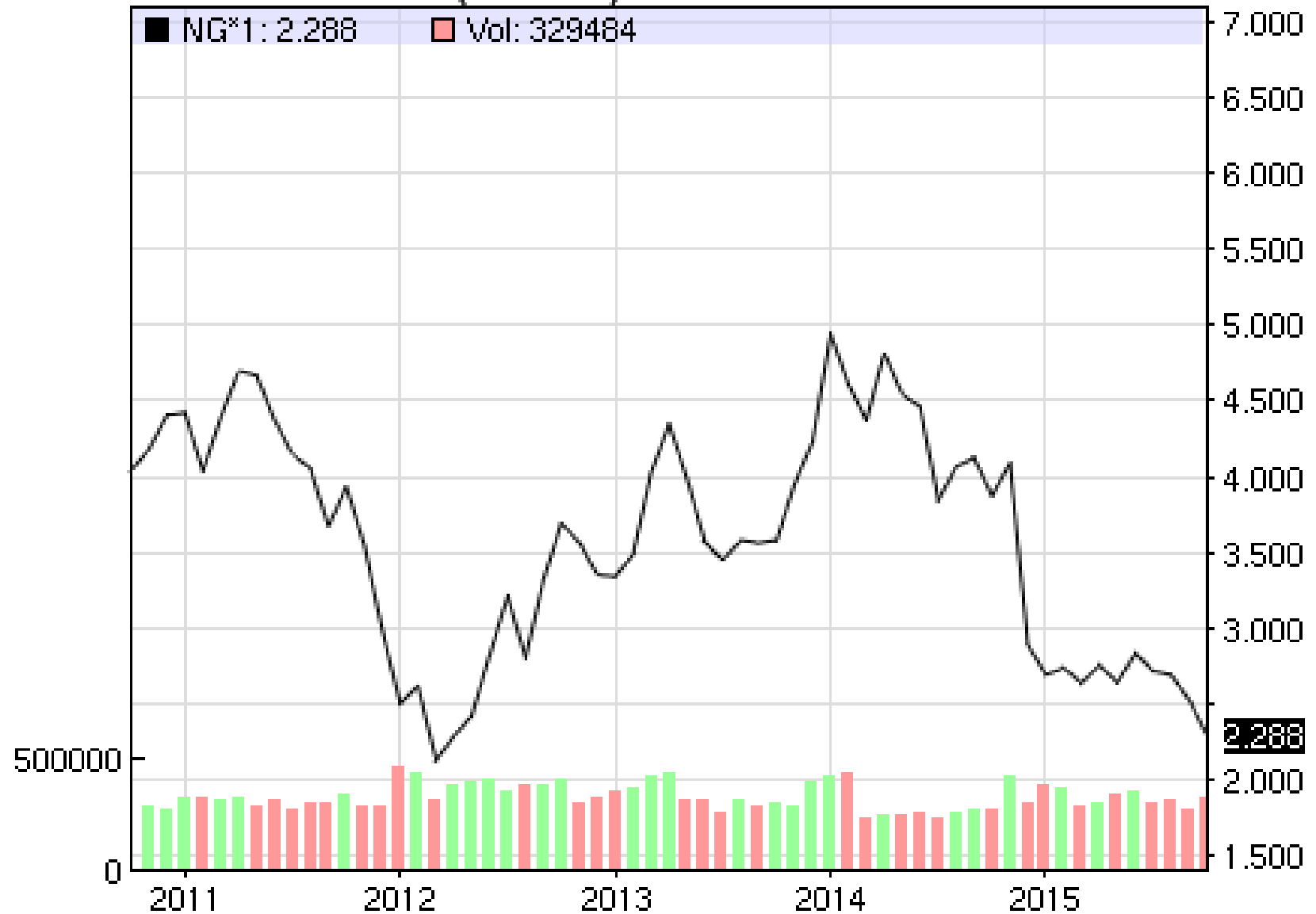
- F.A. Hayek in his “The Constitution of Liberty”

Free Markets

“It is because every individual knows so little and, in particular, because we rarely know which of us knows best that we trust the independent and competitive efforts of many to induce the emergence of what we shall want when we see it.”

- F.A. Hayek in his “The Constitution of Liberty”

NGX10 - Natural Gas (NYMEX)



Source: Nasdaq.com, End of day Commodity Futures Price Quotes for Natural Gas (NYMEX)

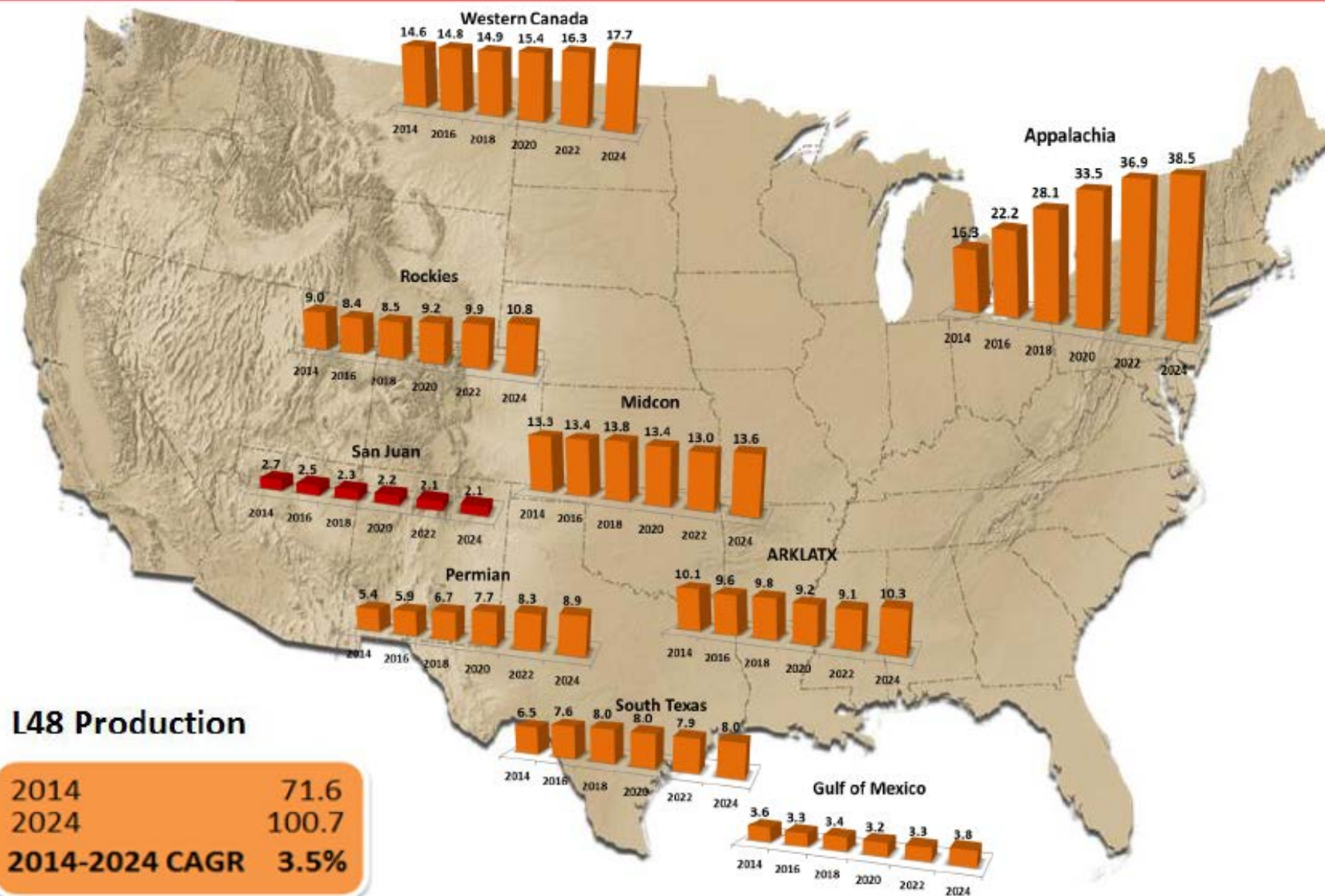
Regional prices for November 2015

All prices in \$/MMBtu

- Tennessee Gas Pipeline Zone 4 300-Leg: \$0.90
- Eastern Penn Transco Gas Pipeline Leidy Line : \$0.98
- West TX/Permian Basin El Paso Natural Gas Co: \$1.99
- Colorado Interstate Gas: \$1.94
- Appalachia Dominion Transmission: \$1.24
- Millennium Pipeline East Receipts: \$1.00

Source: Platts McGraw Hill Inside FERC's First of the Month Gas Market Report, November 2015

Supply



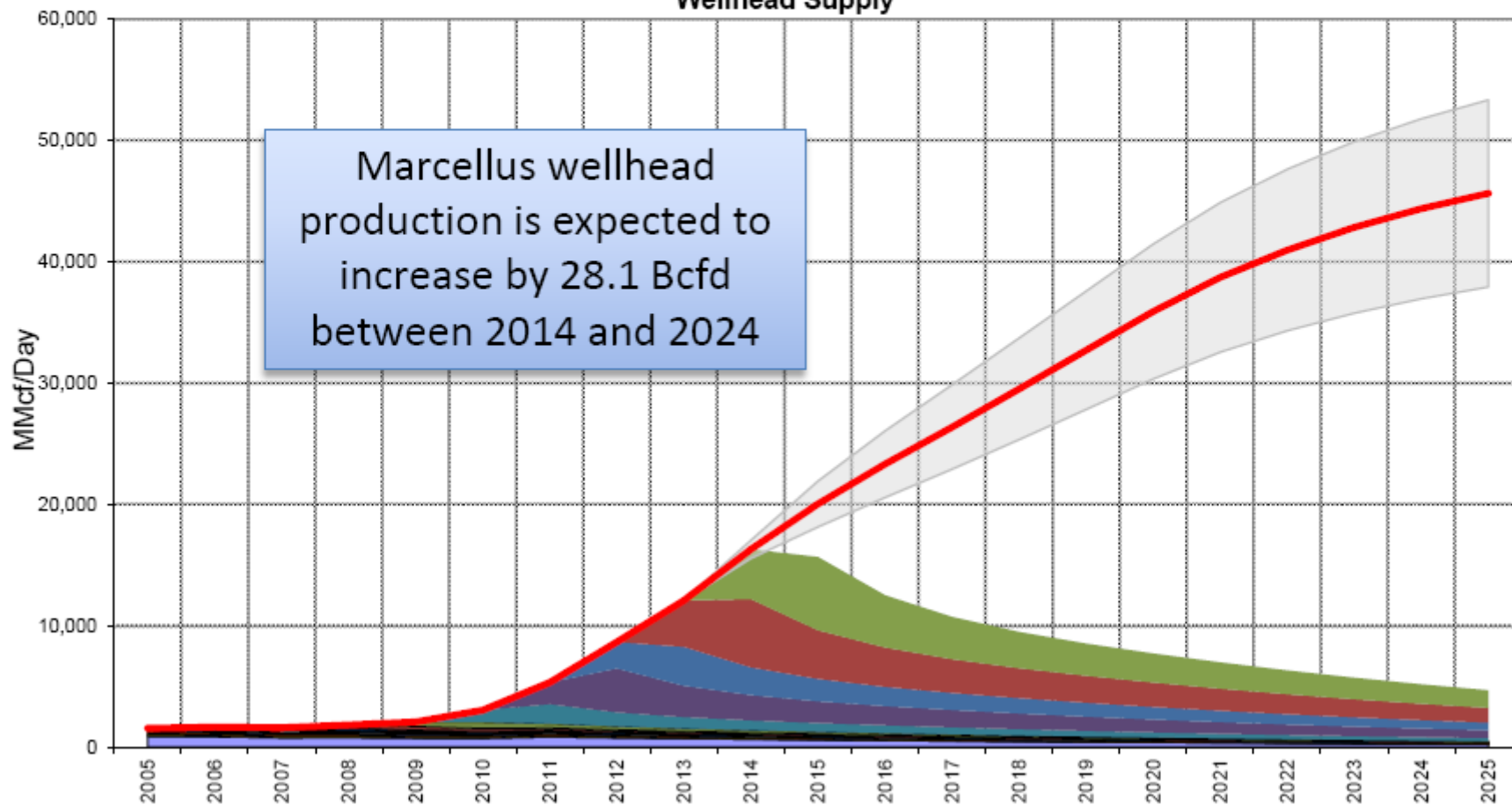
The Big Three Issues to Watch

2. Marcellus and Utica Shale Production

Marcellus

Marcellus/Utica Area

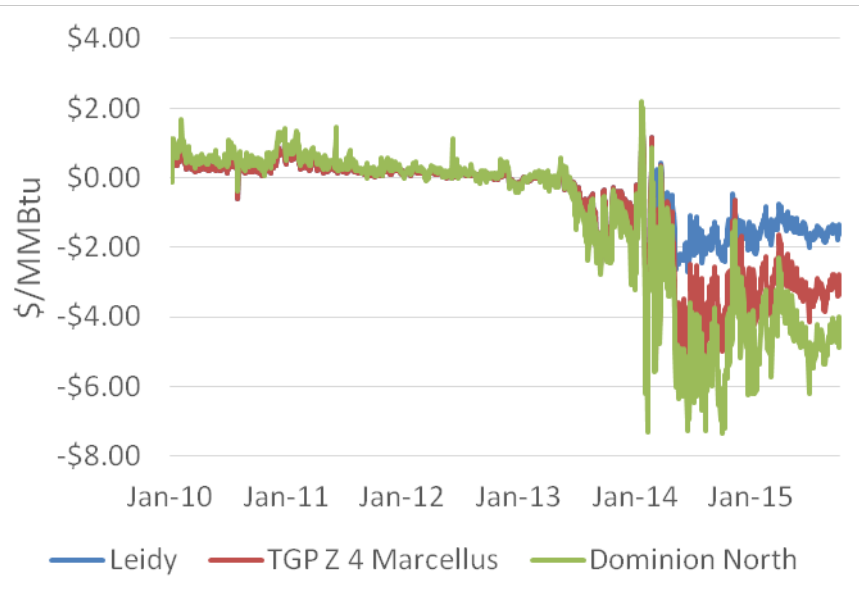
Wellhead Supply



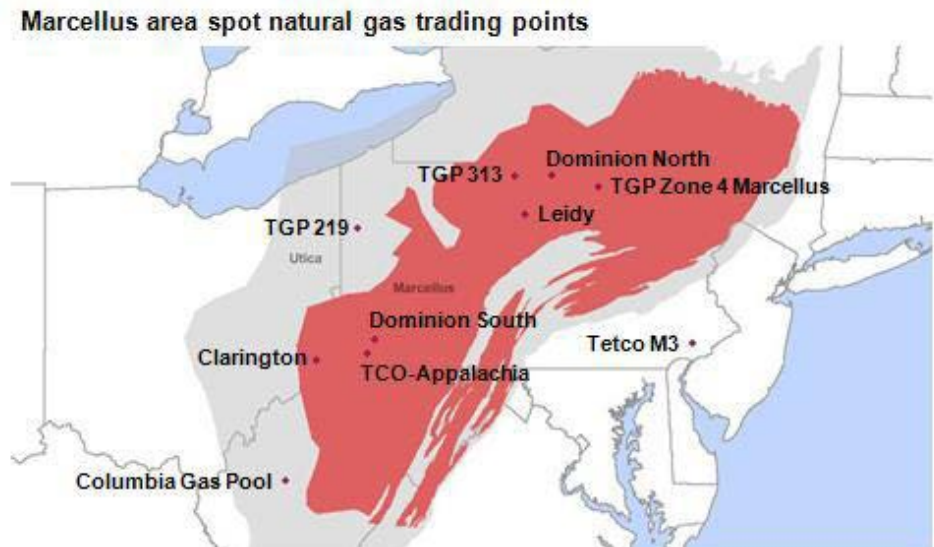
1990-2013: Wellhead total data from DI Desktop

2014-2025: Kinder Morgan forecast

PA North - From Premium to Discount Market



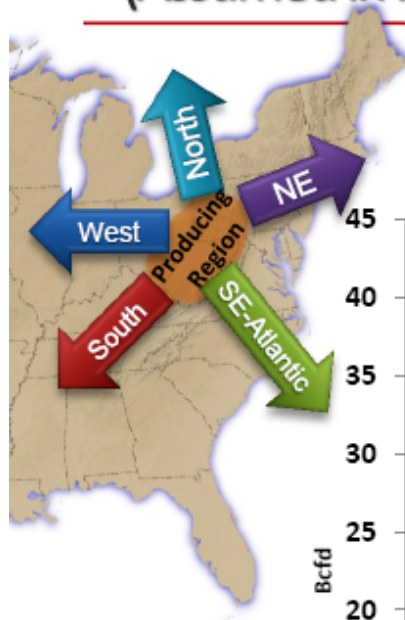
- ❖ Production growth limited by takeaway capacity.
- ❖ Oversupply market sent basis to negative territory starting in Summer 2014.



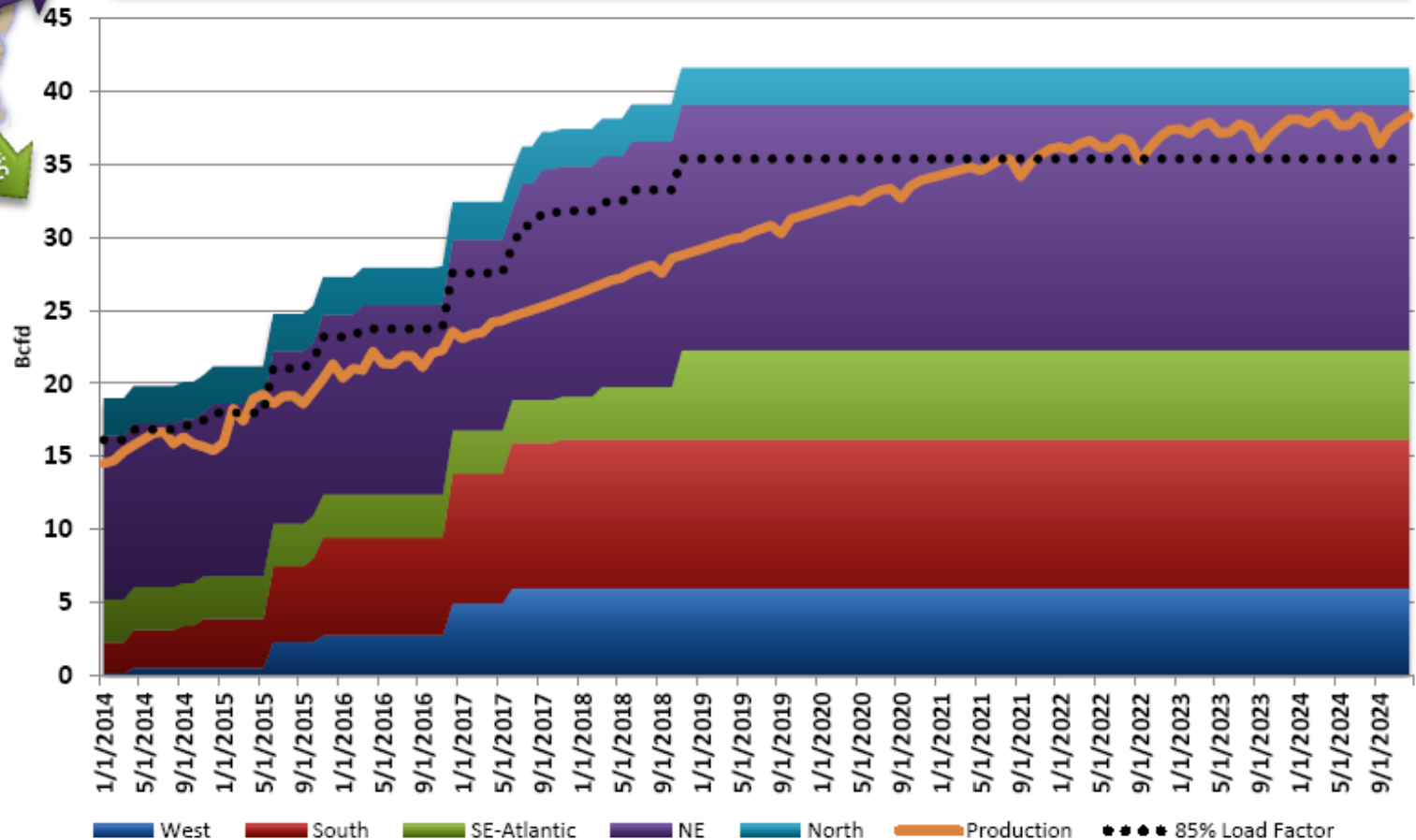
Source: Ponderosa Energy

Source: SNL cash prices. EIA Map

Pipe Capacity out of Producing Region (Assumed in Model)



Roughly 20.9 Bcfd of Pipeline capacity is added from 2015 to 2019;
however, capacity is again constrained against supply by 2021



Note: Production based on ICF July, 2015 Forecast

Source: Kinder Morgan, 2015 Business Meeting: West Region Gas Pipelines, November 2, 2015

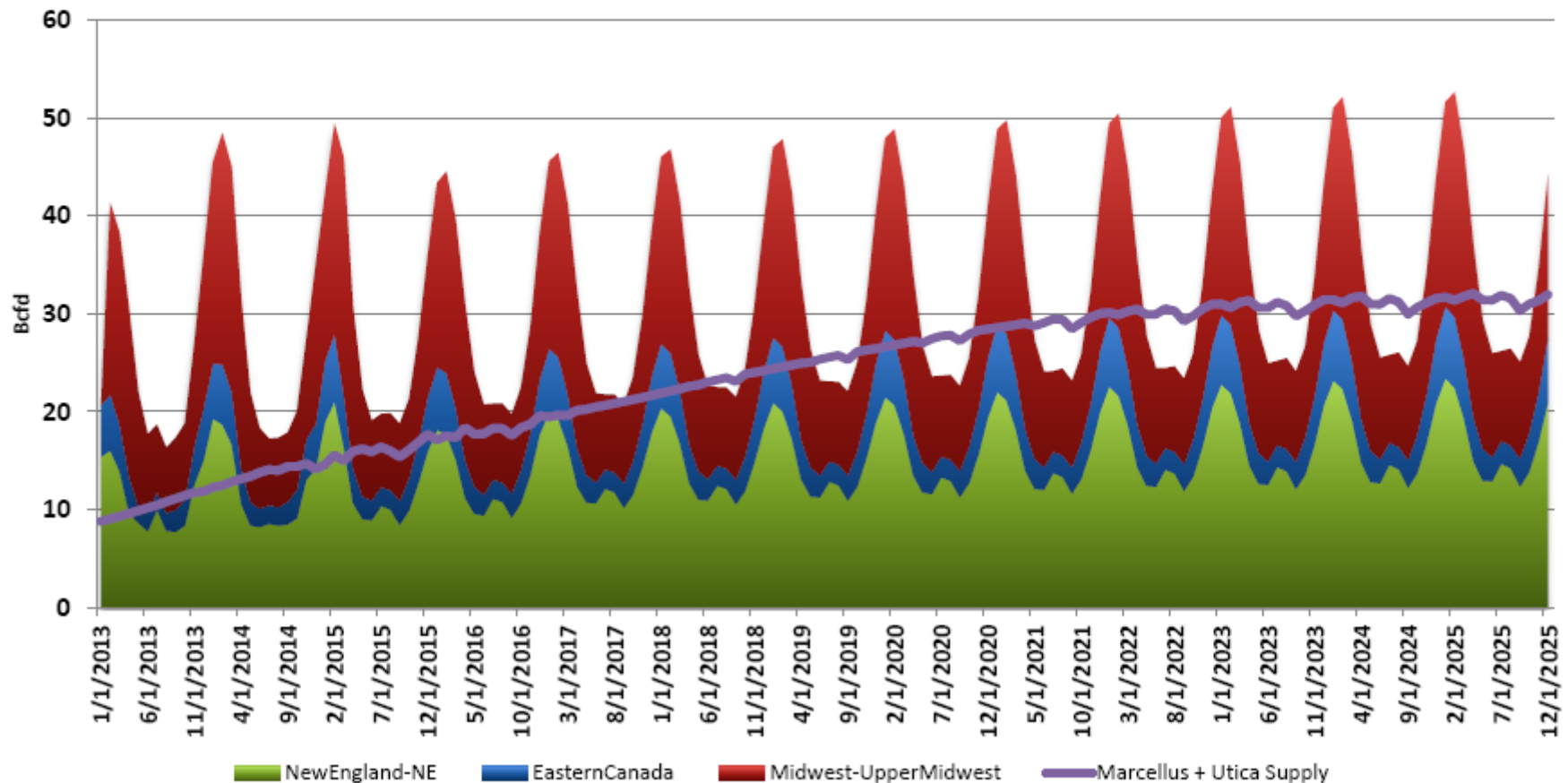
Additional Takeaway Capacity to Provide Limited Basis Strength

- ❖ Potential production growth in north PA higher than proposed takeaway capacity.
- ❖ Basis to remain in negative territory although stronger than current levels.

Q/YEAR	Pipeline	Project Name	Capacity (Bcf/d)
4Q15	Transco	Leidy Southeast	0.525
4Q15	Nat Fuel	Northern Access 2015	0.140
3Q16	Constitution	Constitution Pipeline	0.650
4Q16	Nat Fuel/Empire	Northern Access 2016	0.497
3Q17	Transco	Atlantic Sunrise	1.700
3Q17	TGP	SW Louisiana Supply	0.600
4Q17	PennEast	PennEast Pipeline	1.000
4Q18	Transco	Diamond East Project	1.000
4Q18	TGP	Northeast Energy Direct (NED)	2.000
2015 4Q – 2018 TOTAL			8.312

Northeast Supply vs. Regional Demand

Northeast Supply and Demand Balance



Source: ICF International, KM analysis

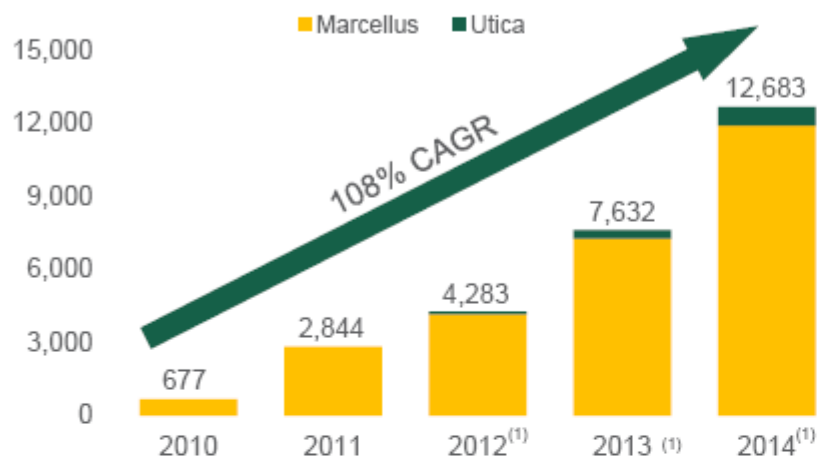


A Marcellus and Utica Case Study

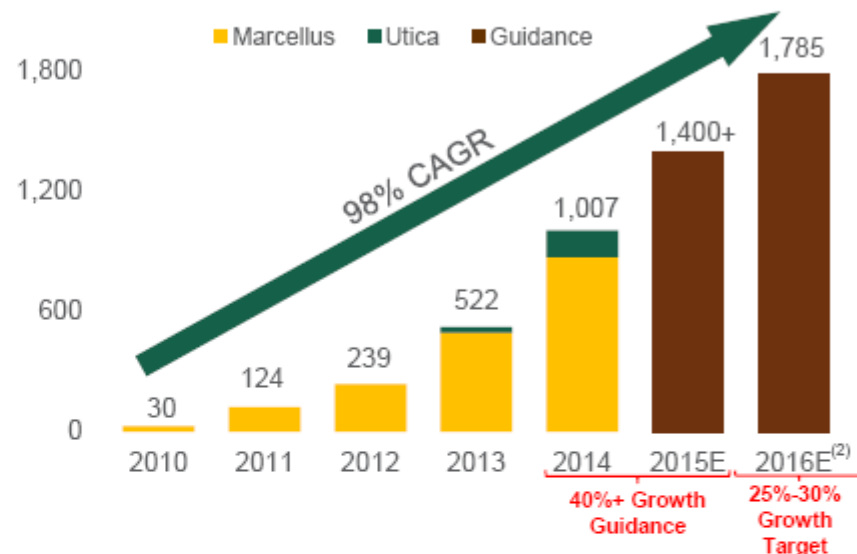
GROWTH – STRONG TRACK RECORD



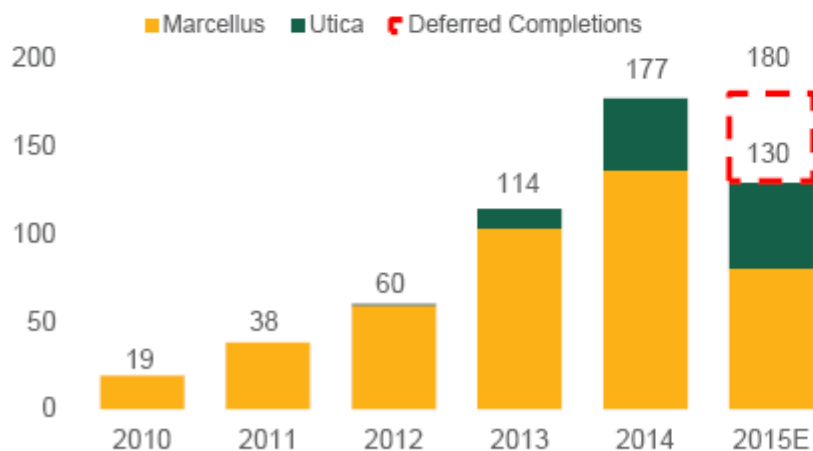
NET PROVED RESERVES (Bcfe)



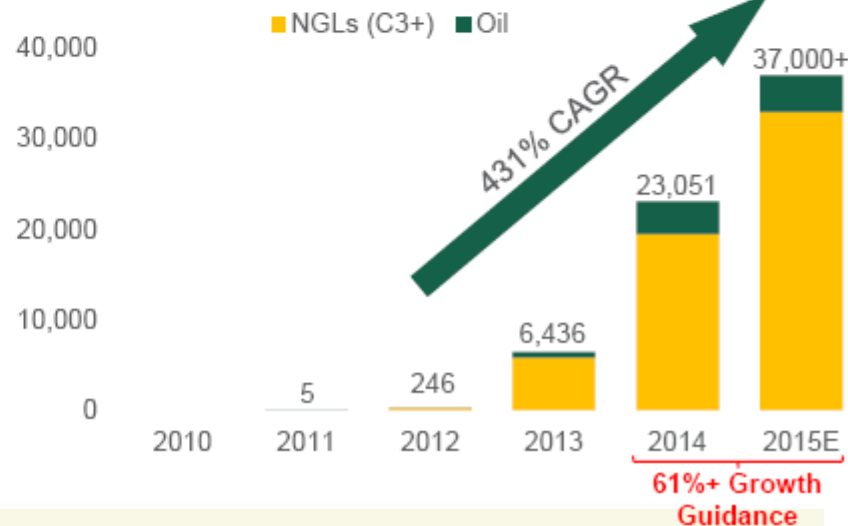
AVERAGE NET DAILY PRODUCTION (MMcfe/d)



OPERATED GROSS WELLS COMPLETED



AVERAGE NET DAILY LIQUIDS PRODUCTION (Bbl/d)



1. Assumes ethane rejection.

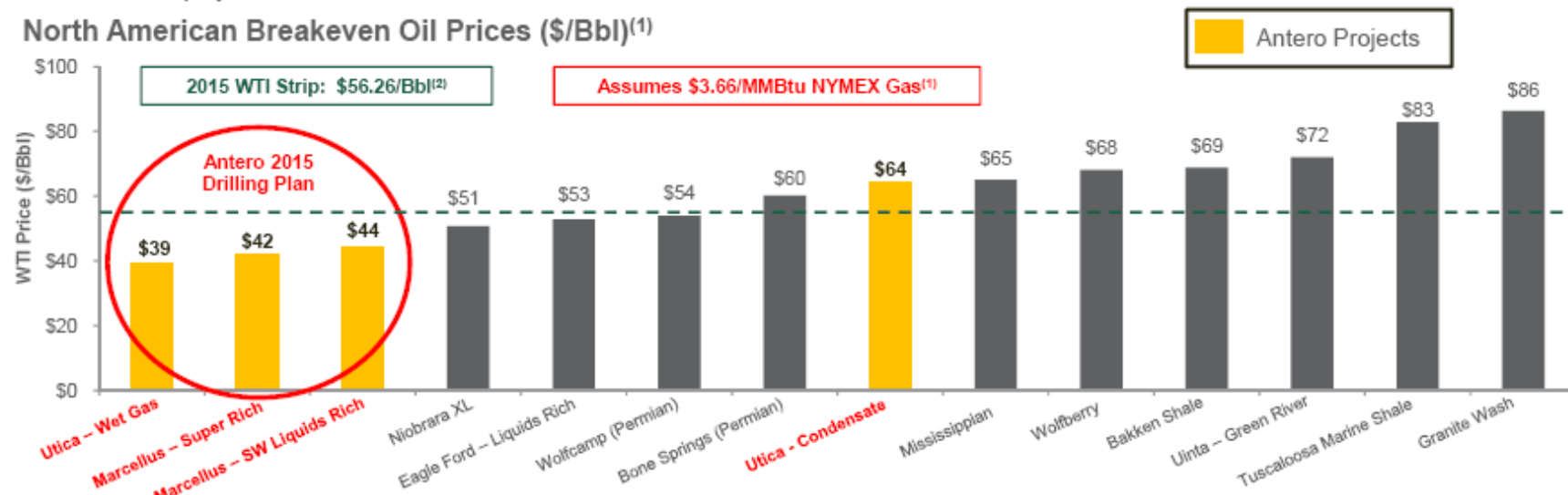
2. Reflects midpoint of 2016 production growth target of 25%-30%.

WELL ECONOMICS – LOW BREAK-EVEN PRICE ECONOMICS

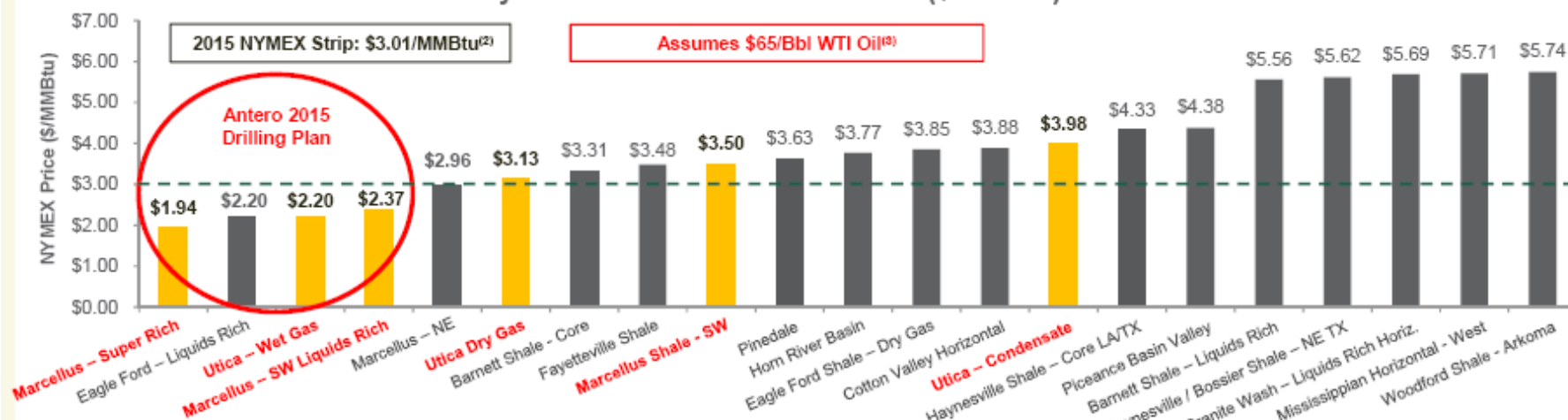


- Marcellus and Utica undeveloped 3P rich-gas locations have the lowest breakeven prices for both oil and natural gas compared to other U.S. shale plays

North American Breakeven Oil Prices (\$/Bbl)⁽¹⁾



North American Gas Resource Play Breakeven Natural Gas Prices (\$/MMBtu)⁽³⁾



1. Source: Credit Suisse report dated December 2014 – Break-even WTI oil price to generate 15% after-tax rate of return. Assumes NYMEX gas price of \$3.66/MMBtu for 2015-2019; \$4.23/MMBtu thereafter.

2. 2015 one year WTI crude oil strip price as of 12/31/2014; NYMEX one year natural gas strip price as of 12/31/2014.

3. Source: Credit Suisse report dated December 2014 – Break-even NYMEX gas price to generate 15% after-tax rate of return. Assumes WTI oil price of \$64.74/Bbl for 2015-2019; \$70.50/Bbl thereafter; NGLs at 35% of WTI vs. Antero guidance of 30%-35% of WTI for 2015-2016 and 50% of WTI for 2017 and thereafter, driven by completion of Mariner East II project expected by year-end 2016.

REALIZATIONS – A LEADER IN REALIZATIONS & MARGINS AMONG LARGE-CAP APPALACHIAN PEERS



- Antero continues to be a leader in its peer group in price realizations and EBITDAX unit margins

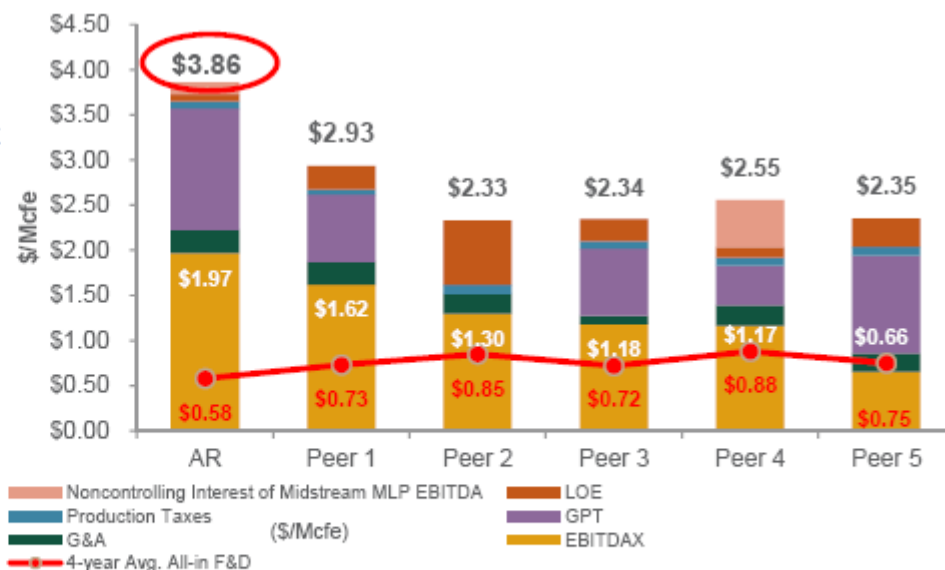
3Q 2015 Natural Gas Realizations (\$/Mcf)

Region	3Q 2015 % Sales	Average NYMEX Price	Average Differential ⁽²⁾	Average BTU Upgrade	Hedge Effect	Average 3Q 2015 Realized Gas Price ⁽³⁾	NYMEX Premium/Discount
TCO	41%	\$2.77	\$(0.30)	\$0.22	\$0.14	\$2.83	\$0.06
Dom South/TETCO	32%	\$2.77	\$(1.63)	\$0.10	\$0.77	\$2.01	\$(0.76)
Gulf Coast ⁽¹⁾	7%	\$2.77	\$(0.27)	\$0.22	\$0.68	\$3.40	\$0.63
Chicago/Michigan	20%	\$2.77	\$0.20	\$0.18	\$0.04	\$3.19	\$0.42
Total Wtd. Avg.	100%	\$2.77	\$(0.62)	\$0.17	\$1.67	\$3.99	\$1.22

3Q 2015 Natural Gas Realizations⁽³⁾⁽⁴⁾



3Q 2015 Price Realization & EBITDAX Margin vs F&D⁽⁴⁾⁽⁵⁾



1. Gulf Coast differential includes contractual deduct to NYMEX-based sales.

2. Includes firm sales.

3. Includes natural gas hedges.

4. Source: Public data from 3Q 2015 10-Qs. Peers include Cabot Oil & Gas, CONSOL Energy, EQT Corp. and Southwestern.

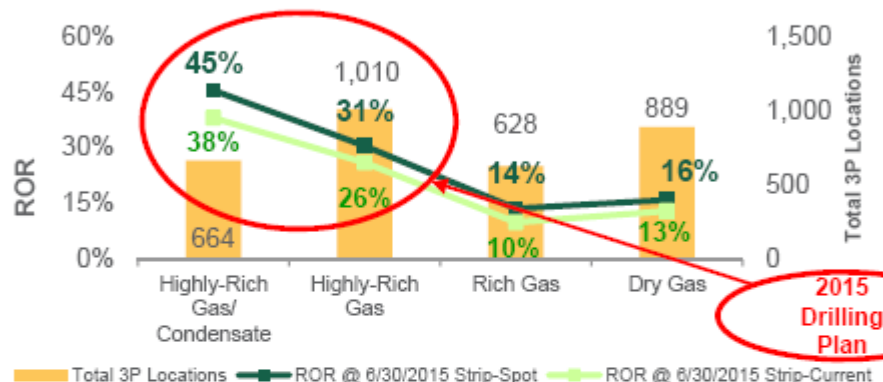
5. Includes realized hedge gains and losses. Operating costs include lease operating expenses, production taxes, gathering, processing and firm transport costs and general and administrative costs. 4-year proved reserve average all-in F&D from 2011-2014. Calculation = (Development costs + exploration costs + leasehold costs) / Total reserves added (2014 ending reserves - 2011 beginning reserves + 4-year reserve sales - 4-year reserve purchases + 4-year accumulated production). AR price realization includes \$0.03 of midstream revenues; EBITDAX excludes AR's midstream EBITDA not attributable to AR's ownership.

WELL COST REDUCTIONS SUPPORT SUSTAINABLE BUSINESS MODEL

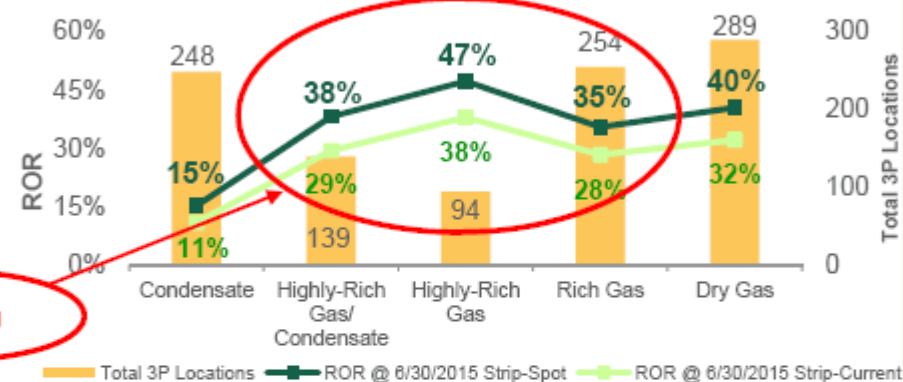


- Antero has reduced average well costs for a 9,000' lateral by 16% in the Marcellus and 18% in the Utica as compared to 2014 well costs, through a combination of service cost reductions and drilling and completion efficiencies
 - Well economics on some wells expected to improve further starting in early 2016 as the Company utilizes incremental market based contracts for drilling and completion operations which is expected to reduce well costs by another 10 to 12% over time

MARCELLUS WELL ECONOMICS⁽¹⁾



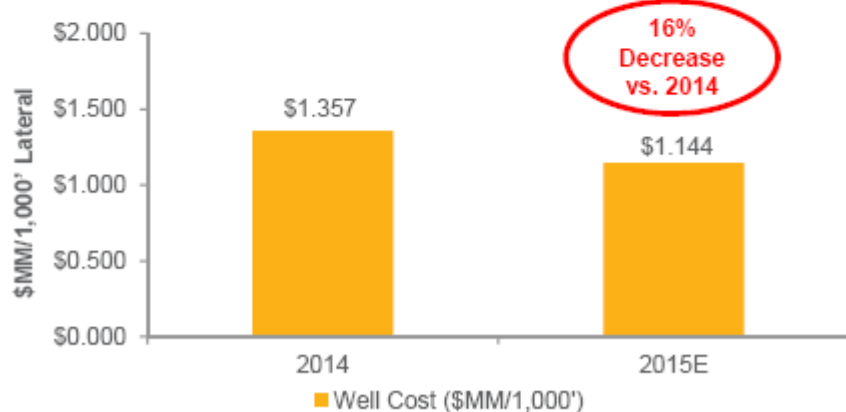
UTICA WELL ECONOMICS⁽¹⁾



- 72% of Marcellus locations are processable (1100-plus Btu)

- 72% of Utica locations are processable (1100-plus Btu)

Marcellus Well Cost Improvement⁽²⁾



Utica Well Cost Improvement⁽²⁾



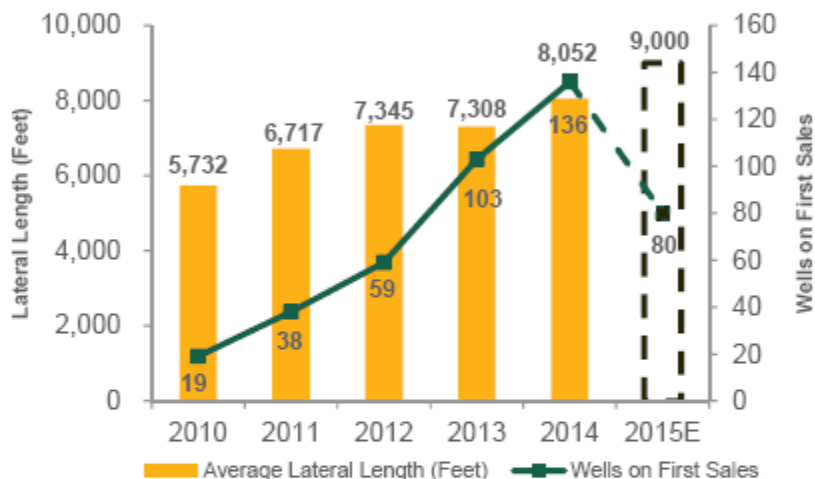
- 6/30/2015 pre-tax well economics based on a 9,000' lateral, 6/30/2015 natural gas and WTI strip pricing for 2015-2024, flat thereafter, NGLs at 32.5% of WTI for 2015-2016 and 50% of WTI thereafter, and applicable firm transportation and operating costs. Well cost estimates include \$1.2 million assumed for road, pad and production facilities. Current well costs include legacy contracts. Spot well costs are adjusted for current market drilling and completion rates resulting in a \$1.2 million cost saving vs. current well costs. Antero will begin to realize spot well costs as the company utilizes incremental completion crews for deferred completions beginning at year end 2015 and as existing drilling rig contracts begin to roll off during 2016.
- 2015E well costs based on \$10.3 million for a 9,000' lateral Marcellus well and \$11.6 million for a 9,000' lateral Utica well.

MARCELLUS WELL PERFORMANCE IMPROVEMENTS

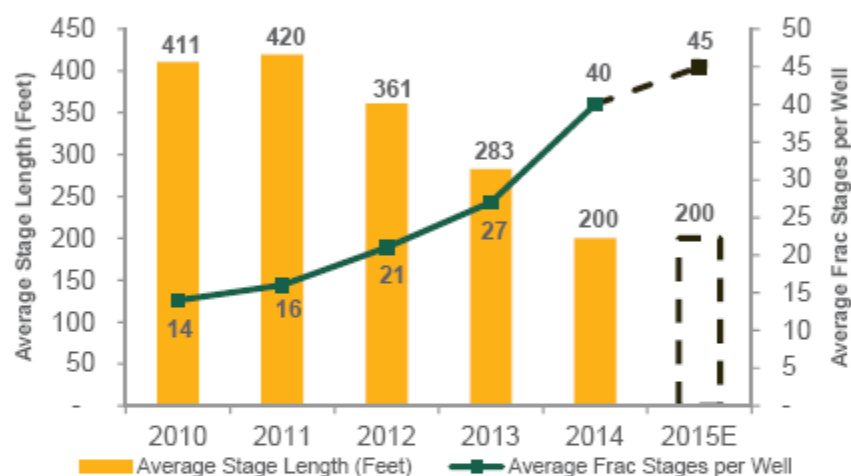


- Increasing recoveries and efficiencies, through longer laterals, shorter stage lengths and faster drilling
- SSL completions drove a 21% decline in development costs in 2014 while lower service costs and efficiencies are driving further development cost reductions in 2015

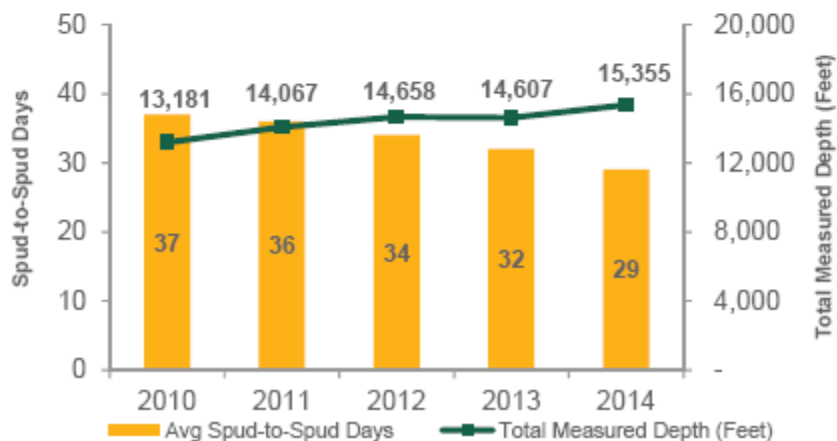
Increasing Lateral Lengths⁽¹⁾



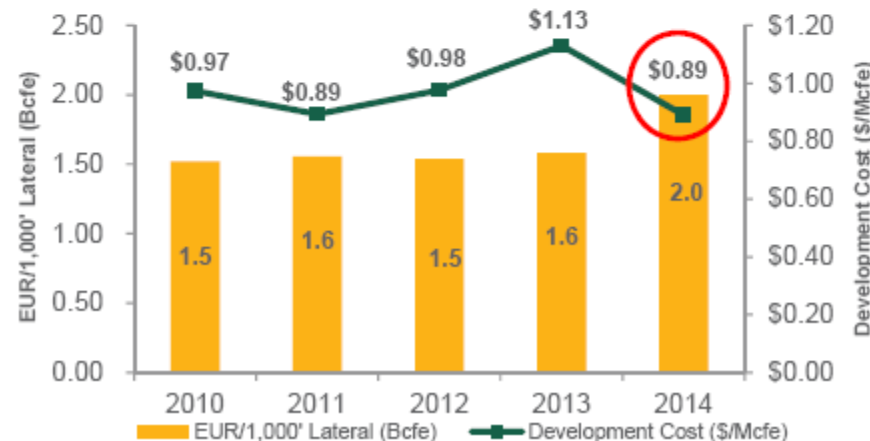
Increasing Frac Stages per Well⁽¹⁾



Increasing Drilling Efficiency



EUR vs. Development Cost per Unit



1. 2015 reflects Antero guidance per 1/20/2015 press release.

OHIO UTICA WELL PERFORMANCE IMPROVEMENTS

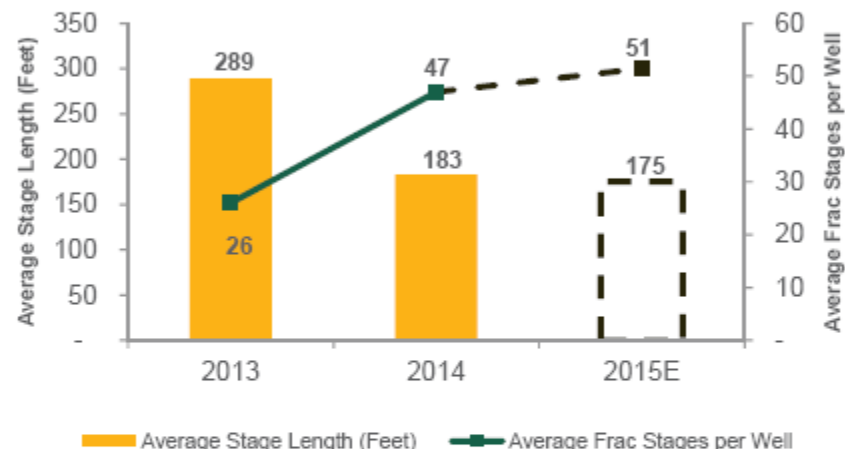


- Increasing recoveries and efficiencies through longer laterals, shorter stage lengths and faster drilling
- Lower service costs and efficiencies, and focus on liquids-rich locations, driving development cost reductions in 2015

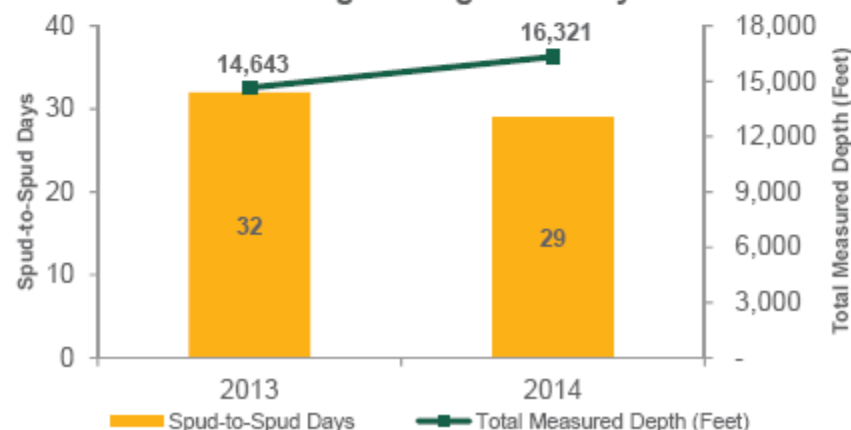
Increasing Lateral Lengths⁽¹⁾



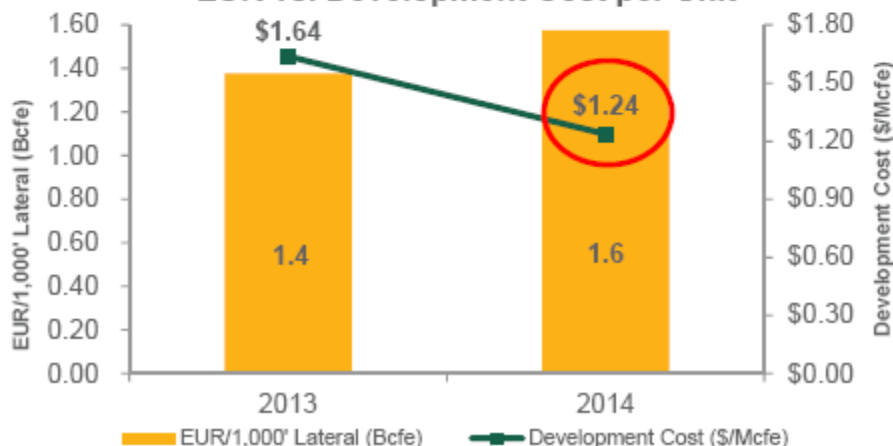
Increasing Frac Stages per Well⁽¹⁾



Increasing Drilling Efficiency

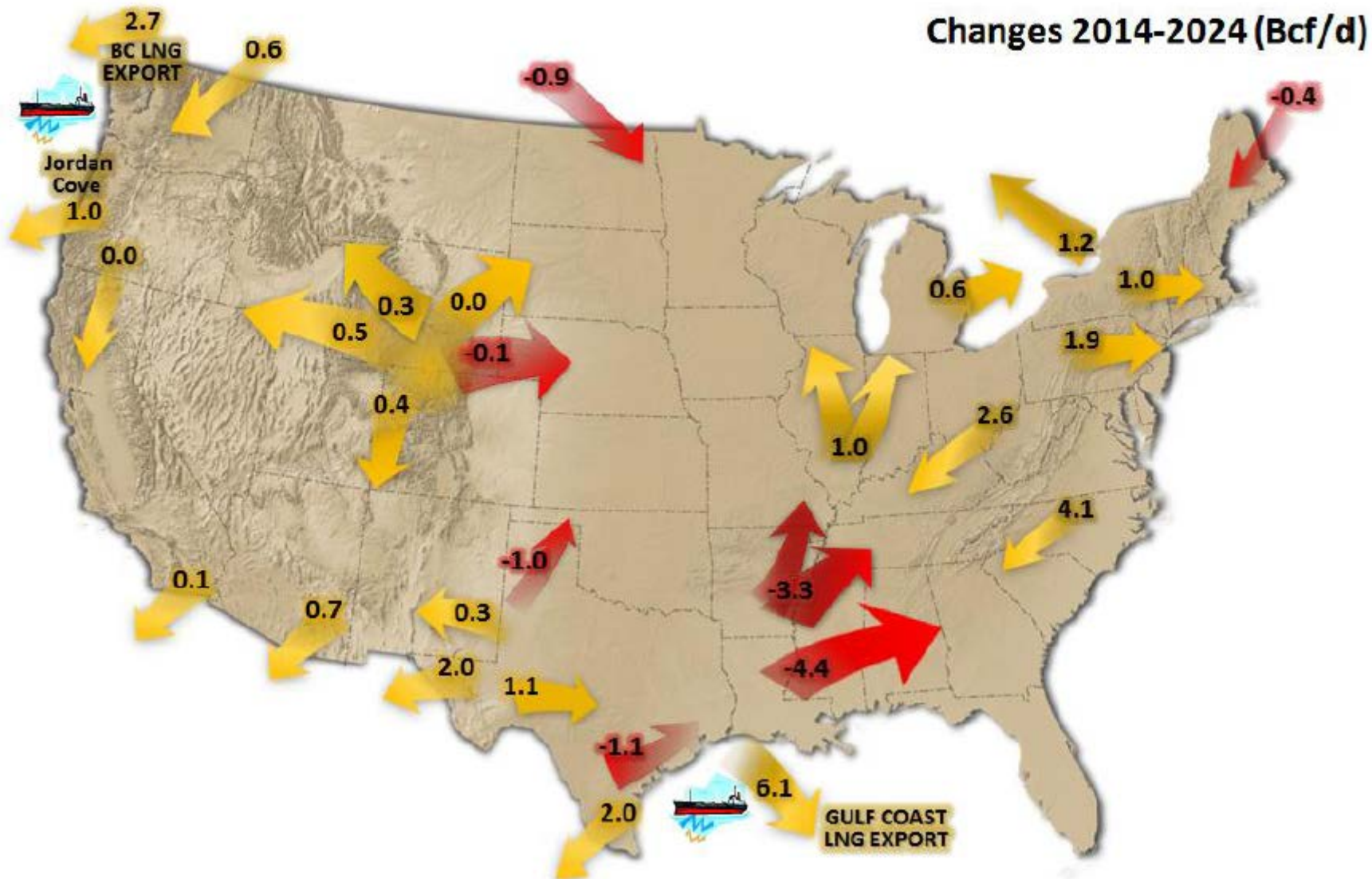


EUR vs. Development Cost per Unit

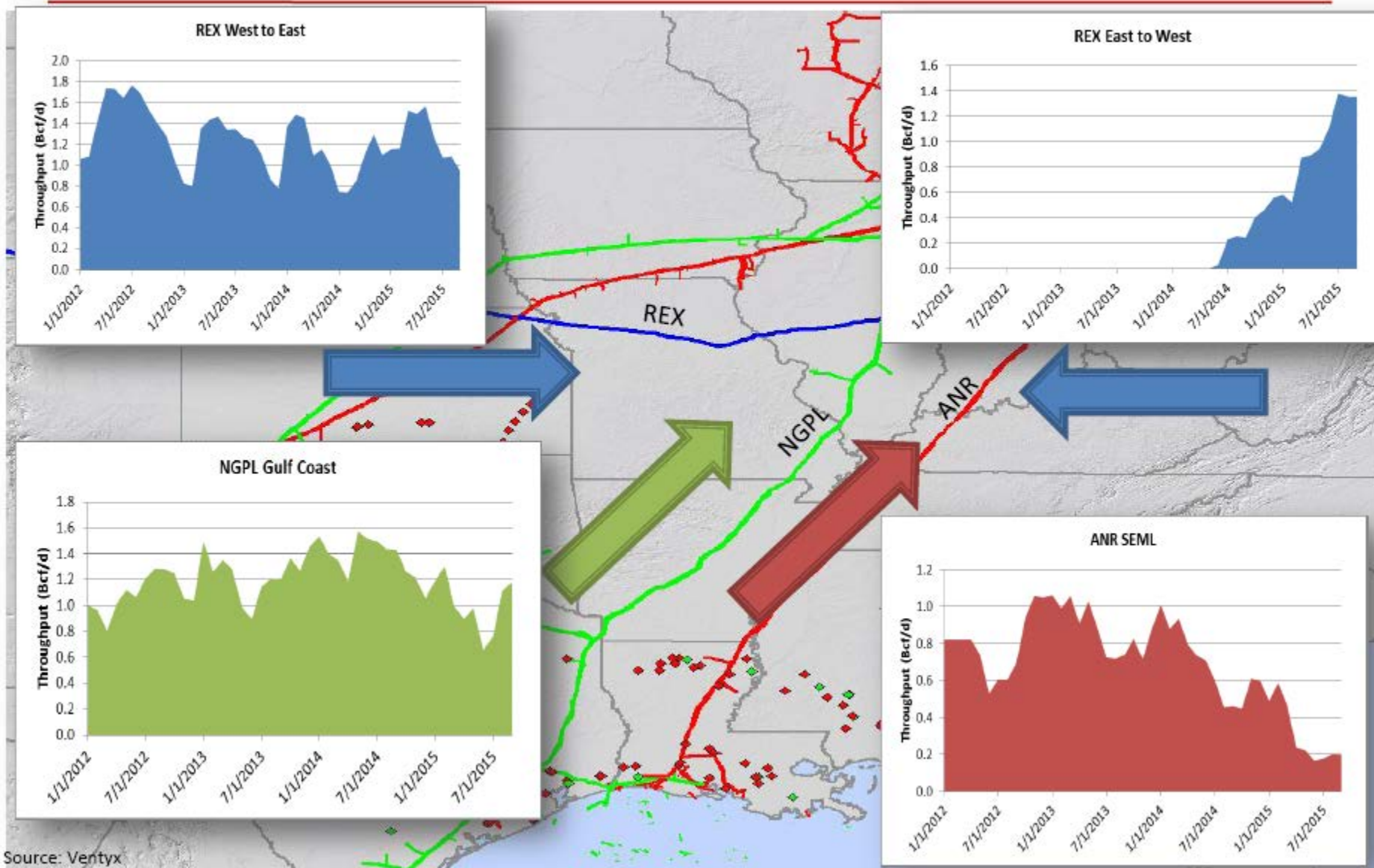


1. 2015 reflects Antero guidance per 1/20/2015 press release.

Flows Change



Southeast Feels Brunt of Pushback

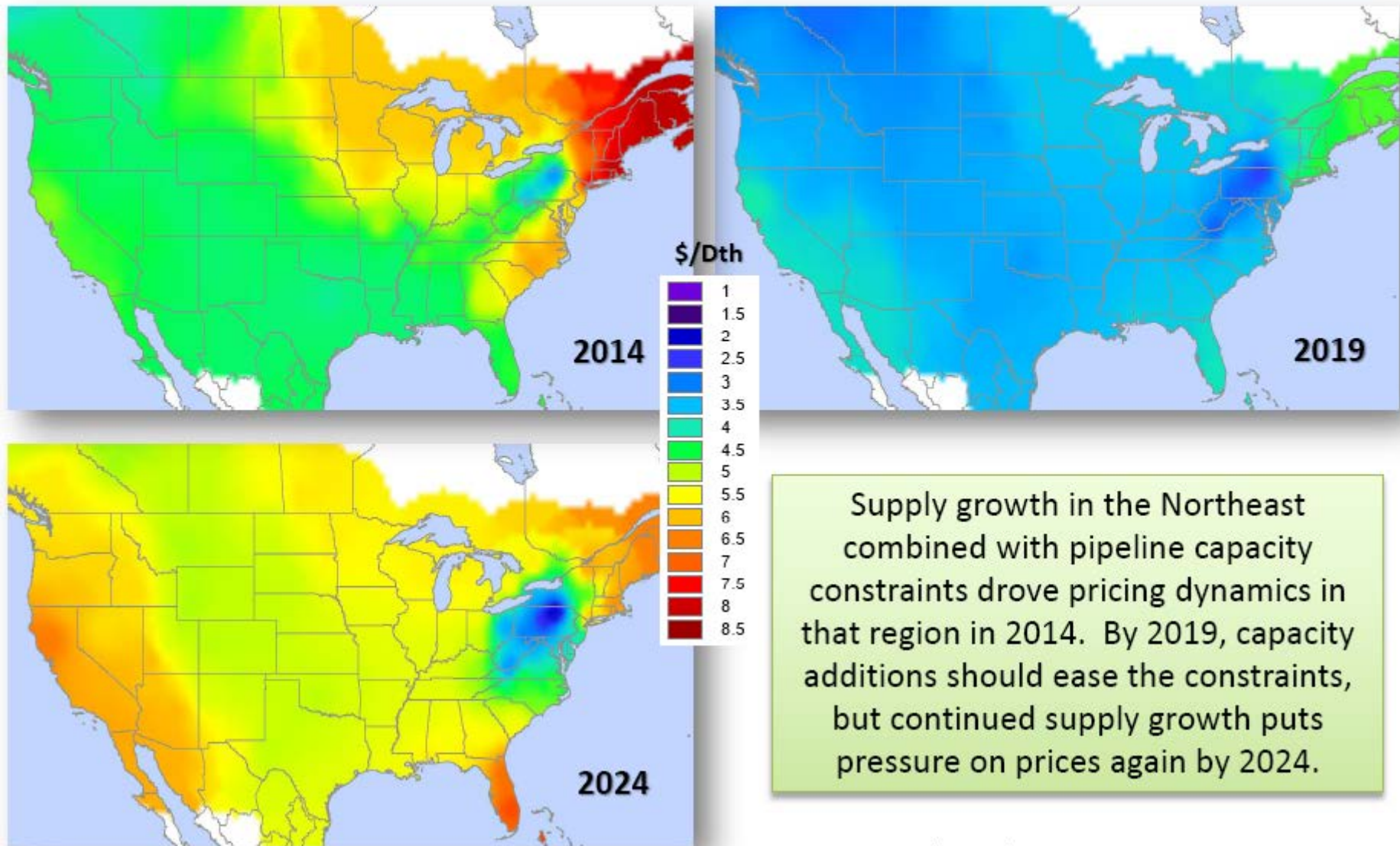


Source: Ventyx

Source: Kinder Morgan, 2015 Business Meeting: West Region Gas Pipelines, November 2, 2015

North American Price Expectations

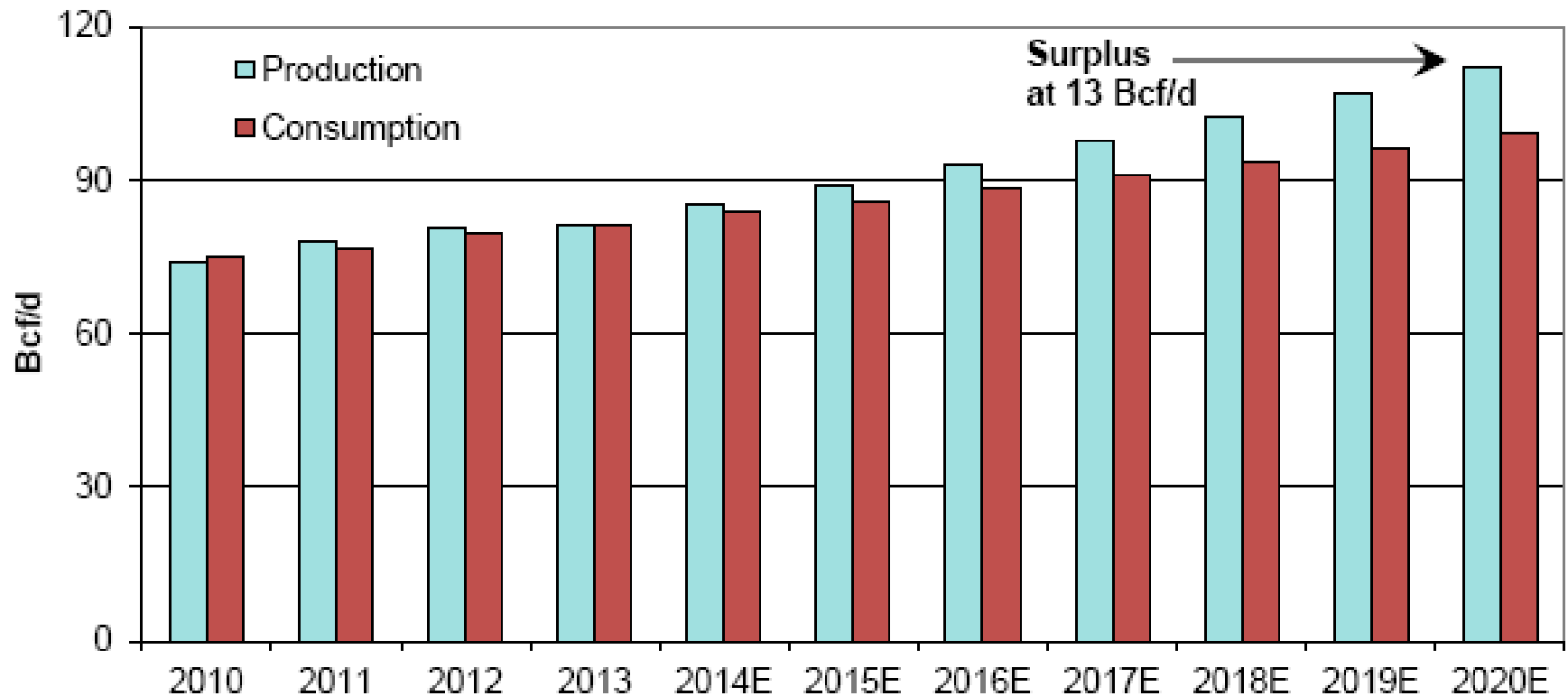
Supply and Pipeline Constraint Impacts



Supply growth in the Northeast combined with pipeline capacity constraints drove pricing dynamics in that region in 2014. By 2019, capacity additions should ease the constraints, but continued supply growth puts pressure on prices again by 2024.

Source: ICF International, KM analysis

U.S. and Canada: Natural Gas Production vs. Consumption



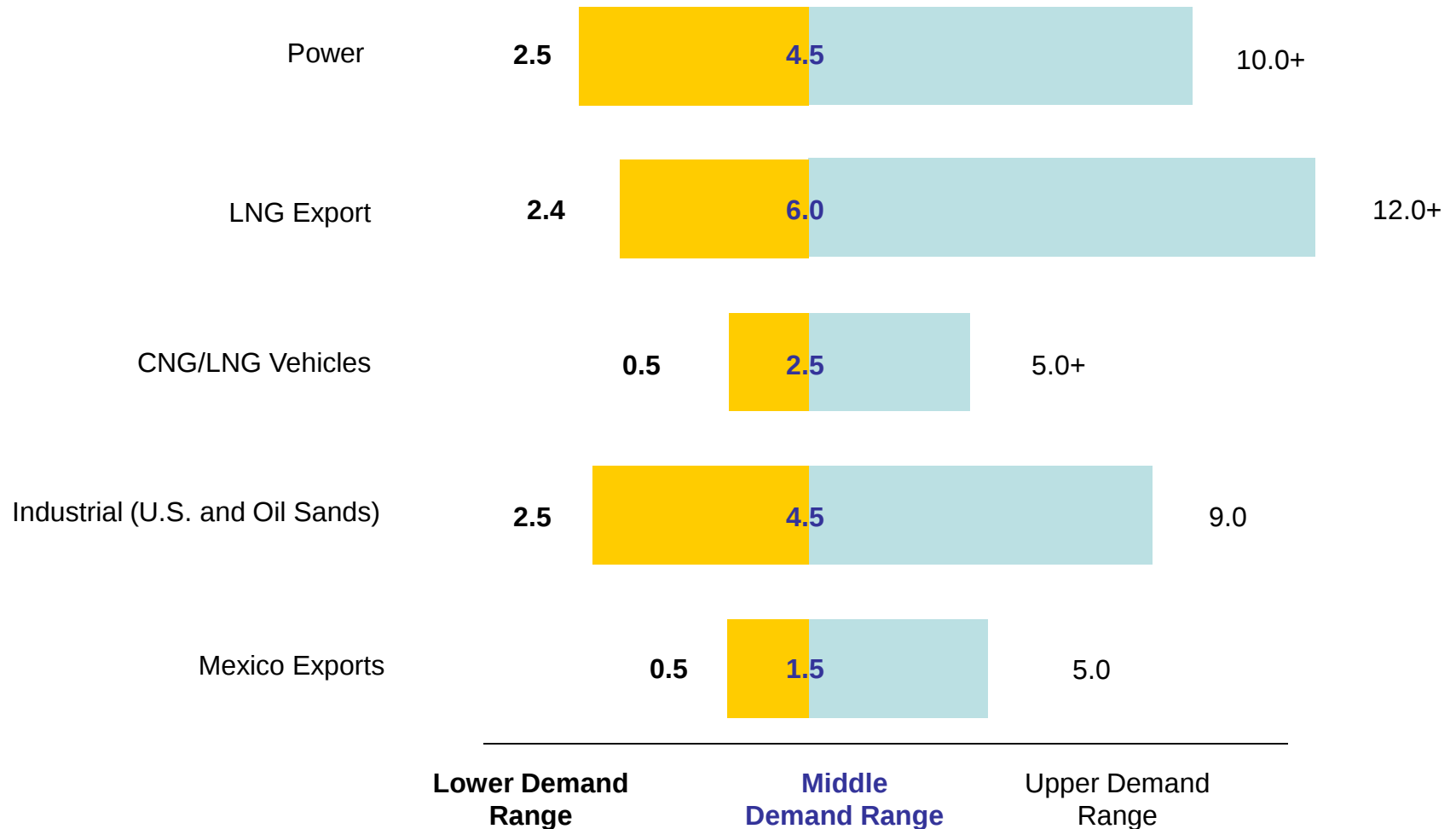
Source: BP Statistical Review, Raymond James research

The Big Three Issues to Watch

3. U.S. LNG Exports

North American Natural Gas Demand Ranges by Selected Sector

Significant demand growth is possible in the LNG, transportation/HHP and power sectors through 2020 in Bcf per day.



Summary / Conclusions

- We believe **7-8BCF/d and up to 8.2BCF/d of US LNG is likely to be exported from the US Gulf Coast by 2020** given 5 LNG projects comprising 8.4BCF/d in total nameplate capacity are currently under construction. **Spot US LNG volumes are also likely to find a home as the economics make sense for the exporter and importer.**
- Why would a buyer take US LNG for ~\$7.50-\$9.00/MMBtu (depending on transport and US natural gas price) vs. \$6.00-\$7.00/MMBtu for spot LNG?
 - **>90% of US LNG export capacity under construction is contracted** on a take or pay basis with the purchaser typically paying a ~\$3/MMBtu liquefaction charge. So, the buyer would pay a \$3/MMBtu penalty for “cancelling their order” (ie pay \$3/MMBtu and receive nothing in return).
 - **Diversity of supply is important to both Asian and European buyers** as Asian buyers seek an alternative to volatile crude linked prices and many European nations look to diversify away from Russian as a main or sometimes essentially sole supplier
 - **Off-takers for US LNG projects are high quality**, investment grade companies (e.g. BG Group, KOGAS, Tokyo Gas, Chubu Electric, Total, Centrica) and are unlikely to balk on their contracts.
- The **US is the lowest incremental source of supply today** for large scale LNG facilities with the projected **ability to build LNG trains for ~\$500-\$800/tonne vs. global competitors at \$1,000-\$2,500/tonne).**
- **Will any spot volumes flow from the US at current prices? Yes, Cheniere has signed up two spot price based LNG contracts** since oil prices fell from \$100 to \$40-\$50/bbl. Why? Customers desire that diversity of supply, variable costs of US LNG supply are below spot LNG prices in certain instances.

US LNG Export Projects Under Construction

US LNG Projects Under Construction

<u>Projects</u>	Uncontracted Capacity (bcf/d)	Contracted Capacity (bcf/d)	Nameplate Capacity (bcf/d)	Percent Contracted	Online Date
Sabine Pass T1-4	0.3	2.1	2.4	89%	Feb-16 – Sept 17
Cameron LNG T1-3	0.0	1.7	1.7	100%	Early/Mid/Late -18
Freeport LNG T1-3	0.1	1.7	1.8	97%	Sept-18 – Aug-19
Cove Point T1	0.1	0.7	0.8	92%	Dec-17
Corpus Christi T1-2	0.2	1.0	1.2	86%	Jun-19, Apr-20
Sabine Pass T5	0.1	0.5	0.6	83%	19-Jan
Total	0.7	7.8	8.4	92%	NA

- Nameplate US export capacity to total 8.4 bcf/d by YE 2020 with just over 8bcf/d exportable 2020.
- >90% or 7.8bcf/d of the capacity is contracted.
 - What does this mean? The off-takers pay ~\$3/MMBtu for any contracted LNG volumes they defer/cancel. Buyers could then buy LNG on the spot market for ~\$7.00/MMBtu or all in cost of ~\$10.00/MMBtu (including the cancellation fee).
 - All in US LNG landed in Asia likely runs \$7.50-\$9.50 depending on US gas price and transports costs.
- There are 5 major US LNG export projects under construction (assumes Sabine Pass is one project).
- There are another >4bcf/d of LNG export projects that are ~fully contracted, which we would consider close to FID (e.g. Lake Charles, Golden Pass).

LNG Export Economics...and its effects

- US LNG to Asia: \$2.50 Henry Hub + \$3 liquefaction charge + \$2.25 shipping = \$7.75/MMBtu
- US LNG to Europe: \$2.50 + \$3 liquefaction charge + \$1 shipping = \$6.50/MMBtu
- The liquefaction charge is how Cheniere earns a return on capital for the contracted portions of its facilities, but the actual liquefaction cost is much cheaper than \$3/MMBtu. We estimate the actual cost to liquefy the gas is ~\$0.50.
- Thus, at today's pricing and transport costs, a facility owner could ship US gas to Europe for a variable cost of ~\$4/MMBtu, sell it for ~\$6/MMBtu and net \$2/MMBtu in gross profit.

World LNG Estimated October 2014 Landed Prices



World LNG Estimated October 2015 Landed Prices (\$U.S./MMBtu)



Source: Waterborne Energy, Inc. Data in \$US/MMBtu, updated October 2015

Note: Includes information and Data supplied by IHS Global Inc. and its affiliates ("IHS")

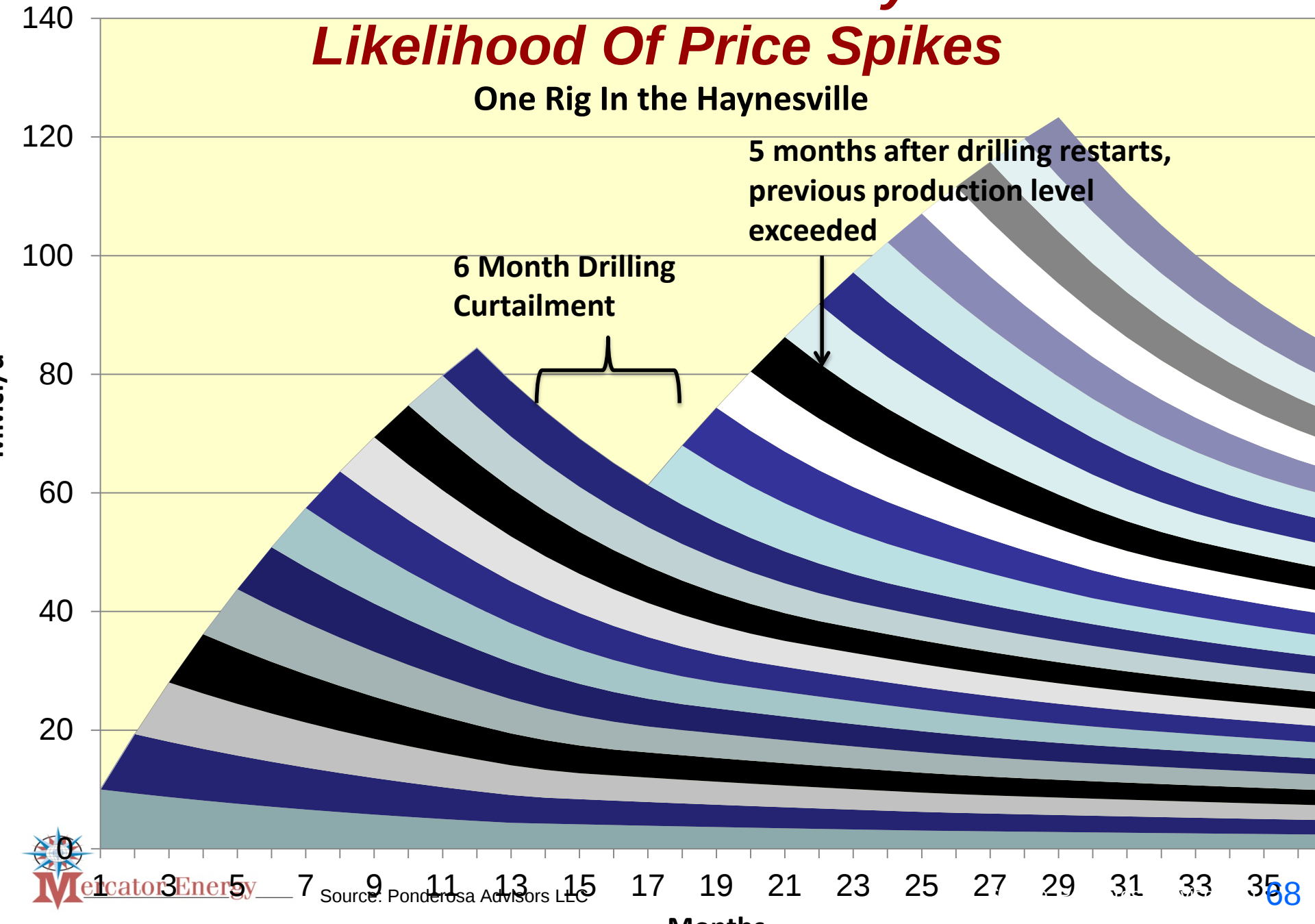
It's a buyers market

“The 7-8 BCF of U.S. LNG exports that is expected by 2020 is equal to 20% of the total world LNG import market of 32.1 BCF.”



The “Ferrari” Affect Substantially Reduces The Likelihood Of Price Spikes

One Rig In the Haynesville



Conclusions

- Don't expect the additional 4 BCF of LNG projects (Lake Charles and Golden Pass) to be built before 2022.
- World oil prices (Brent) will be range-bound for at least 5 years in the \$45-\$55 per barrel.
- China (Asian) demand will not rebound – expect slow GDP growth in Asia
- Dry natural gas production in the U.S. will more than replace any associated gas volume decline (as a result of lower oil prices)
- The next 5 years will remain a buyers market in North America and worldwide for natural gas

Citations for Report

All of the information utilized for this report is a compilation of information pulled from the following data sources:

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LNG World News
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Waterborne Energy, Inc.
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Kinder Morgan

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