Natural Gas Outlook

Presentation to:
2013 Fertilizer Outlook
& Technology Conference
Tampa, Florida

By:
John Harpole

Mercator Energy

November 20, 2013

Fertilizer Industry vs. Natural Gas Industry

Source: http://www.search.com/reference/Lucy_van_Pelt

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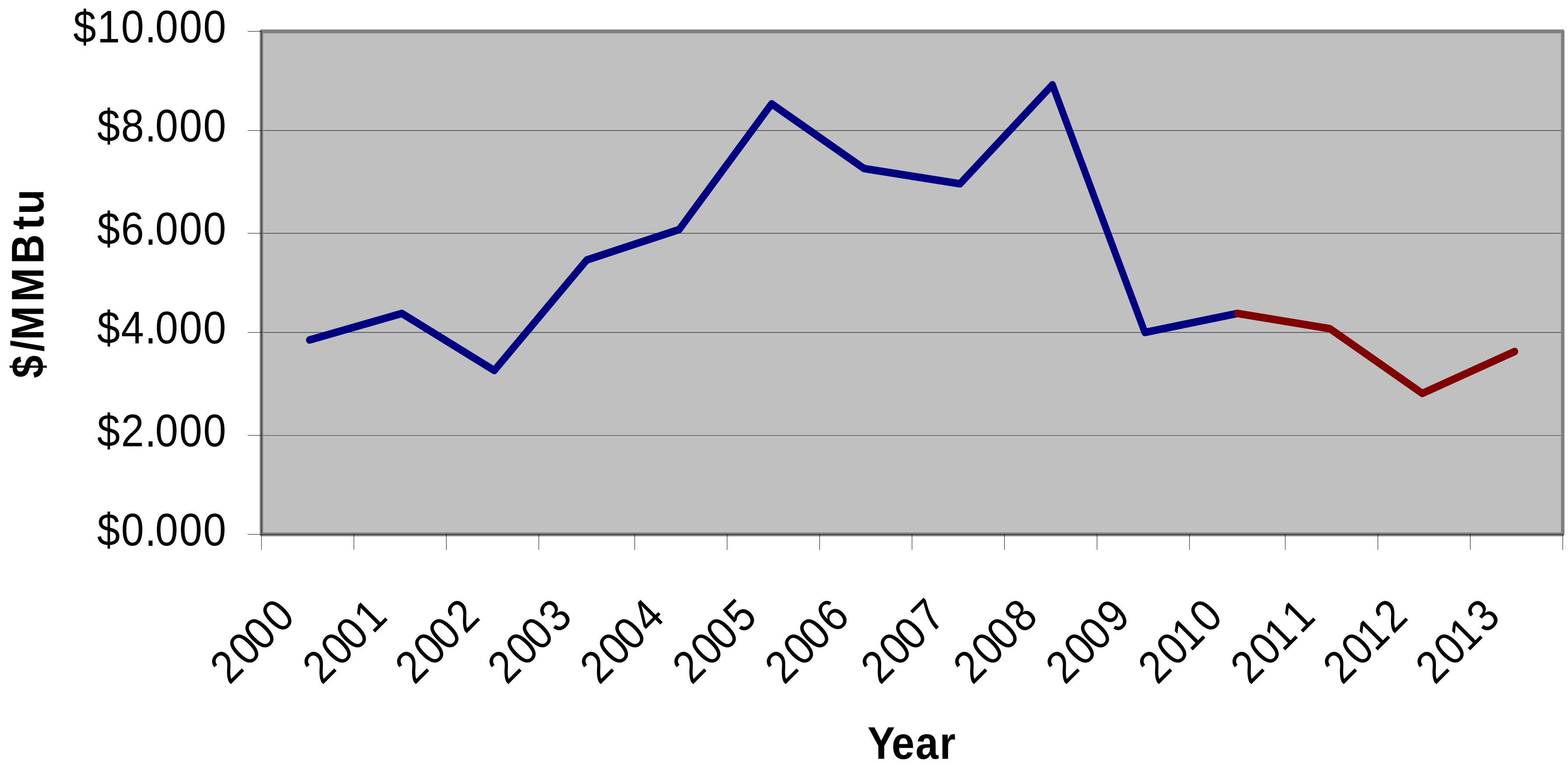
Historical NYMEX Prices



NYMEX - Average last 3 days of close as reported in Platts Gas Daily Report, A McGraw Hill Publication

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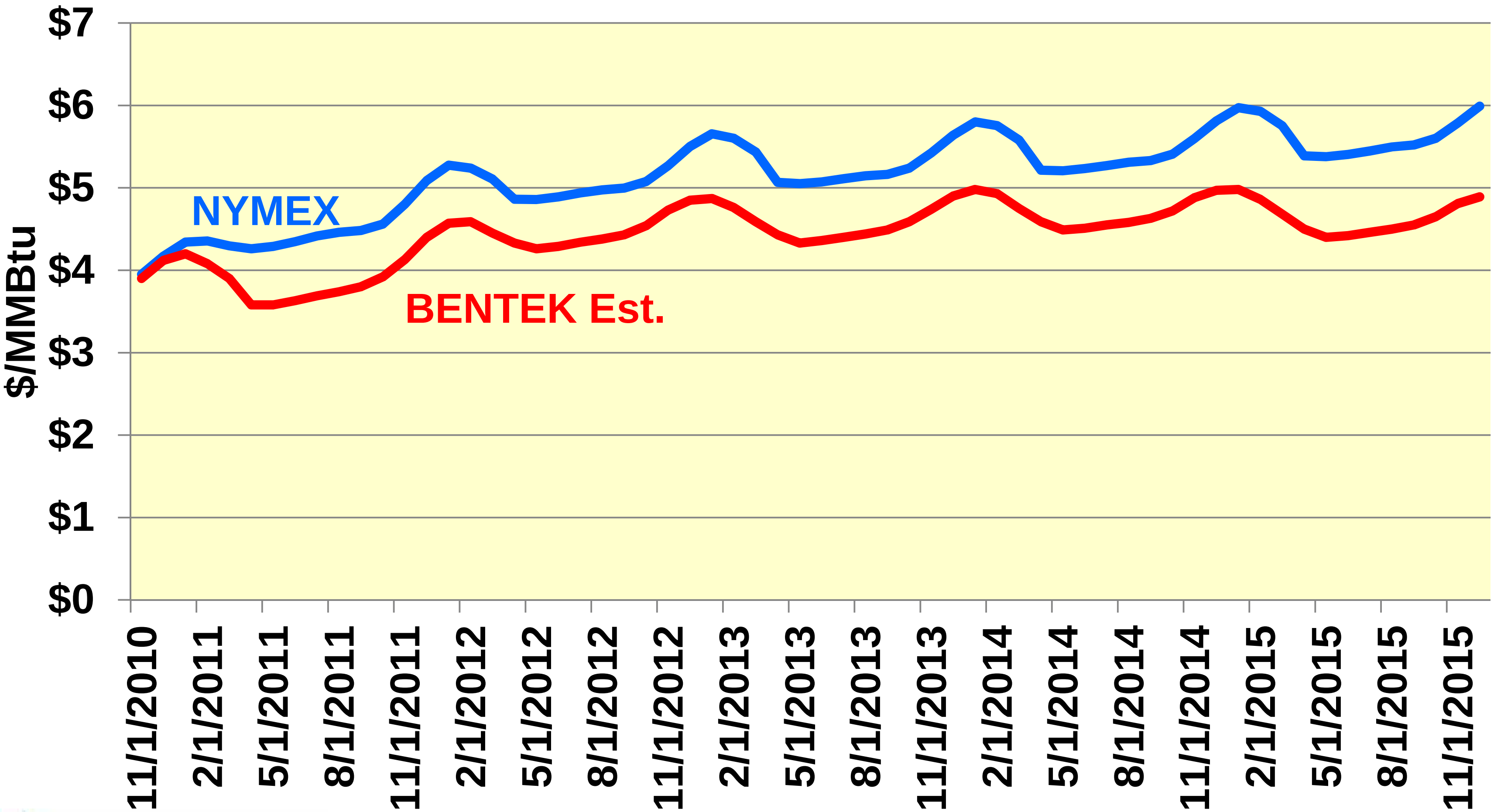
*Forecast from my 2010 speech:
BENTEK Expects The Forward Curve To Fall Further



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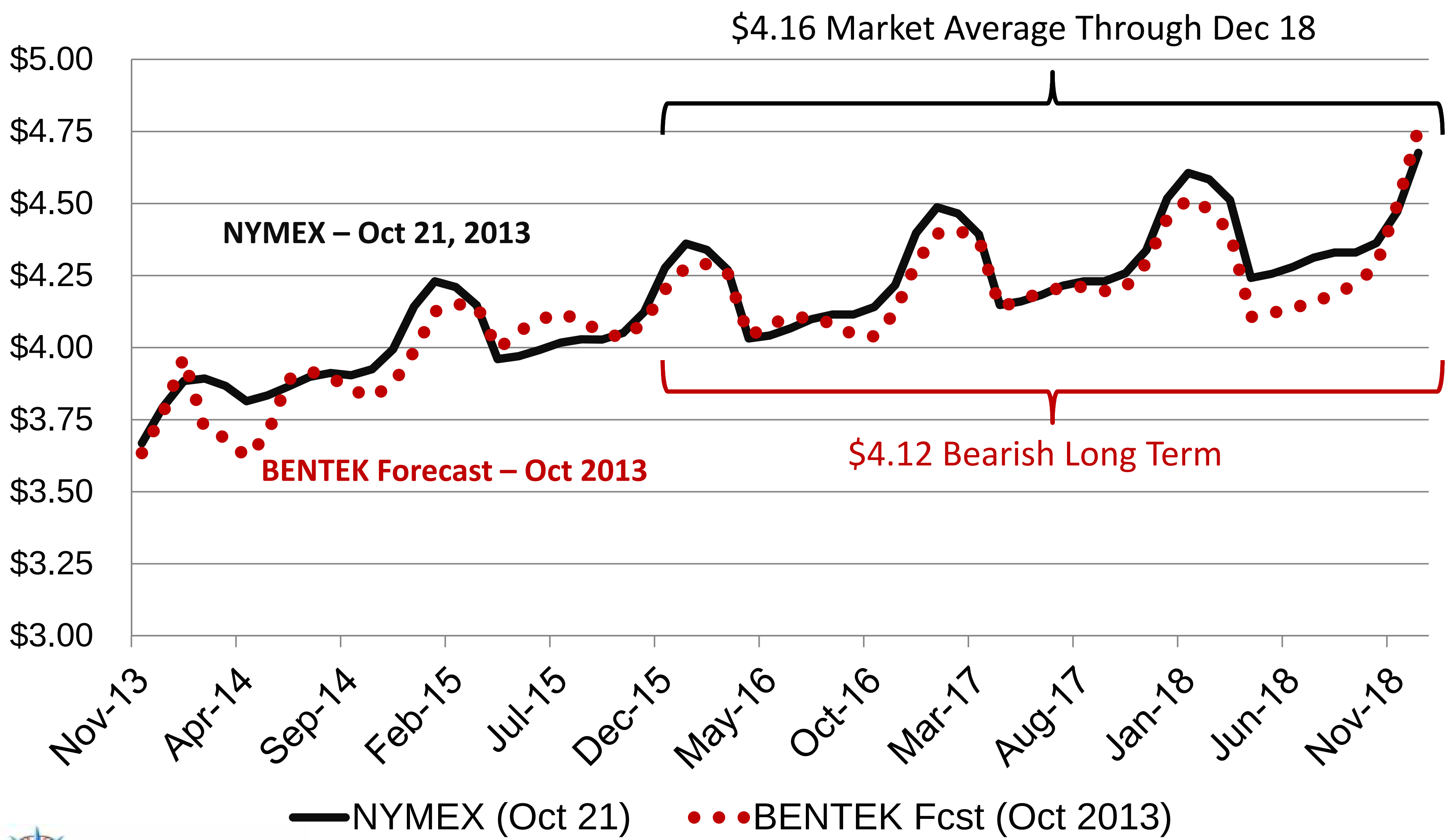
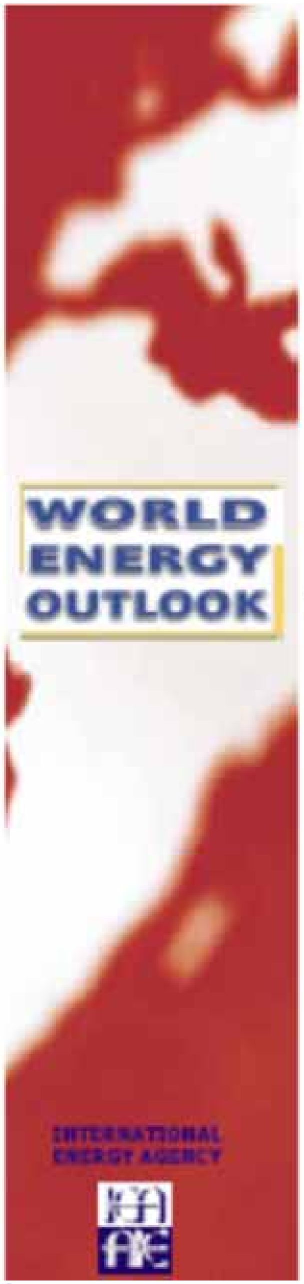
Source: BENTEK

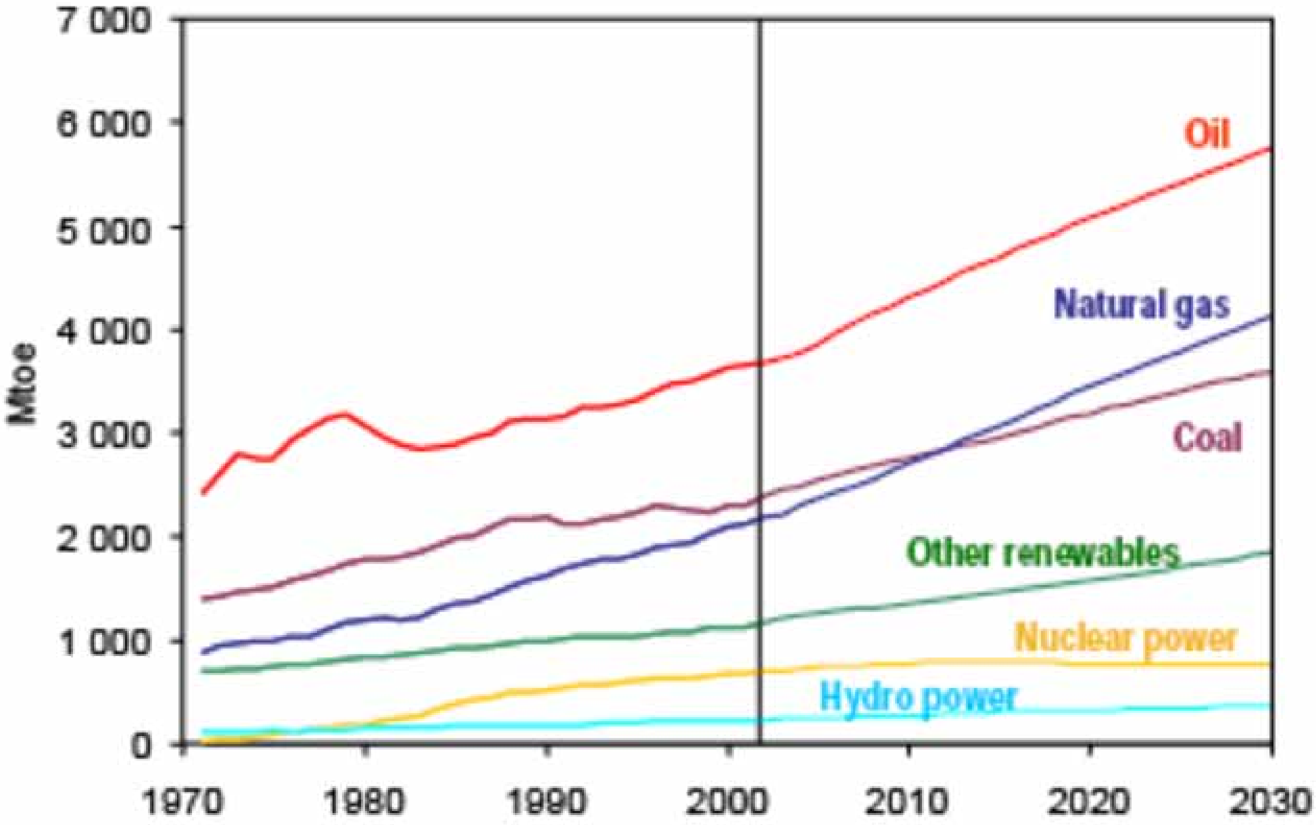
NYMEX Forward Curve Expectations



Source: BENTEK Market Call Long Term, NYMEX

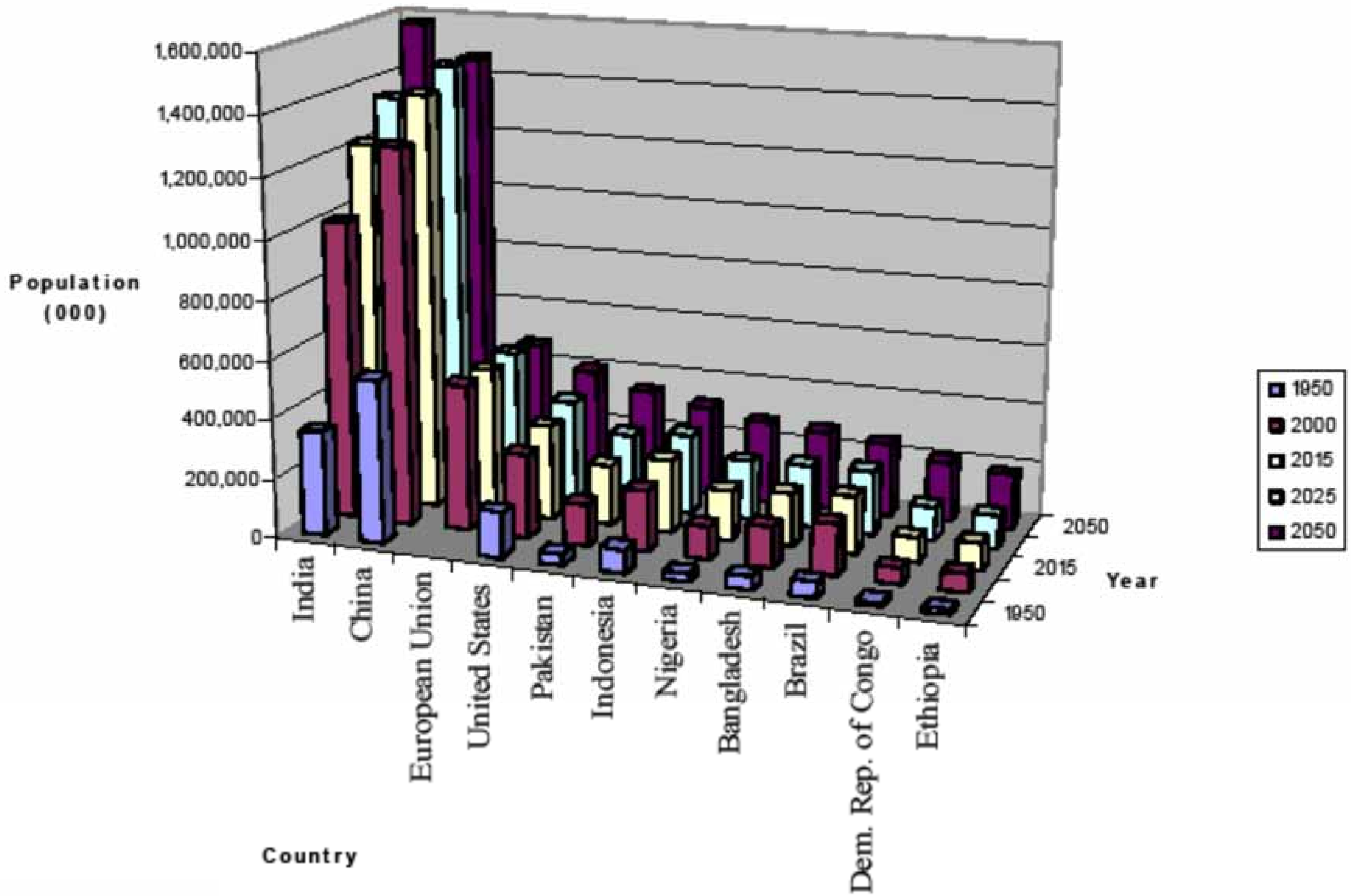
World Primary Energy Demand



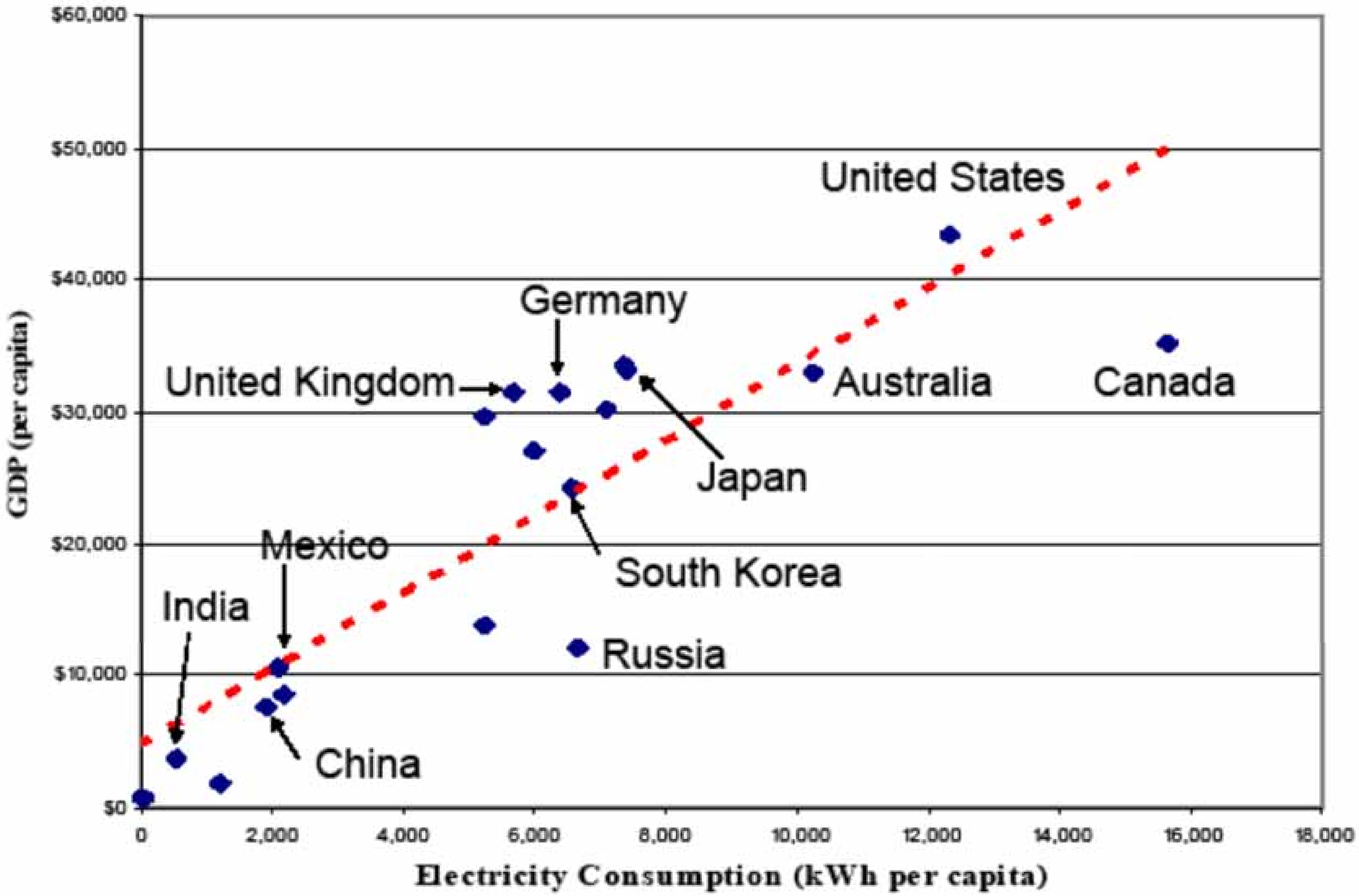


Fossil fuels account for almost 90% of the growth in energy demand between now and 2030

Population Growth from 1950-2050



Quality of Life is Strongly Correlated with Electricity Consumption



Source: CIA World Factbook, 2007

Russia, Iran and Qatar Form Natural Gas Cartel

10/21/2008 in Tehran, Iran

Qatar's Deputy Premier and Minister of Energy and Industry, Abdullah bin Hamad Al-Attiya

Iranian Oil Minister, Gholam Hossein Nozari

Alexei Miller, Chief of Russia's state gas monopoly - Gazprom

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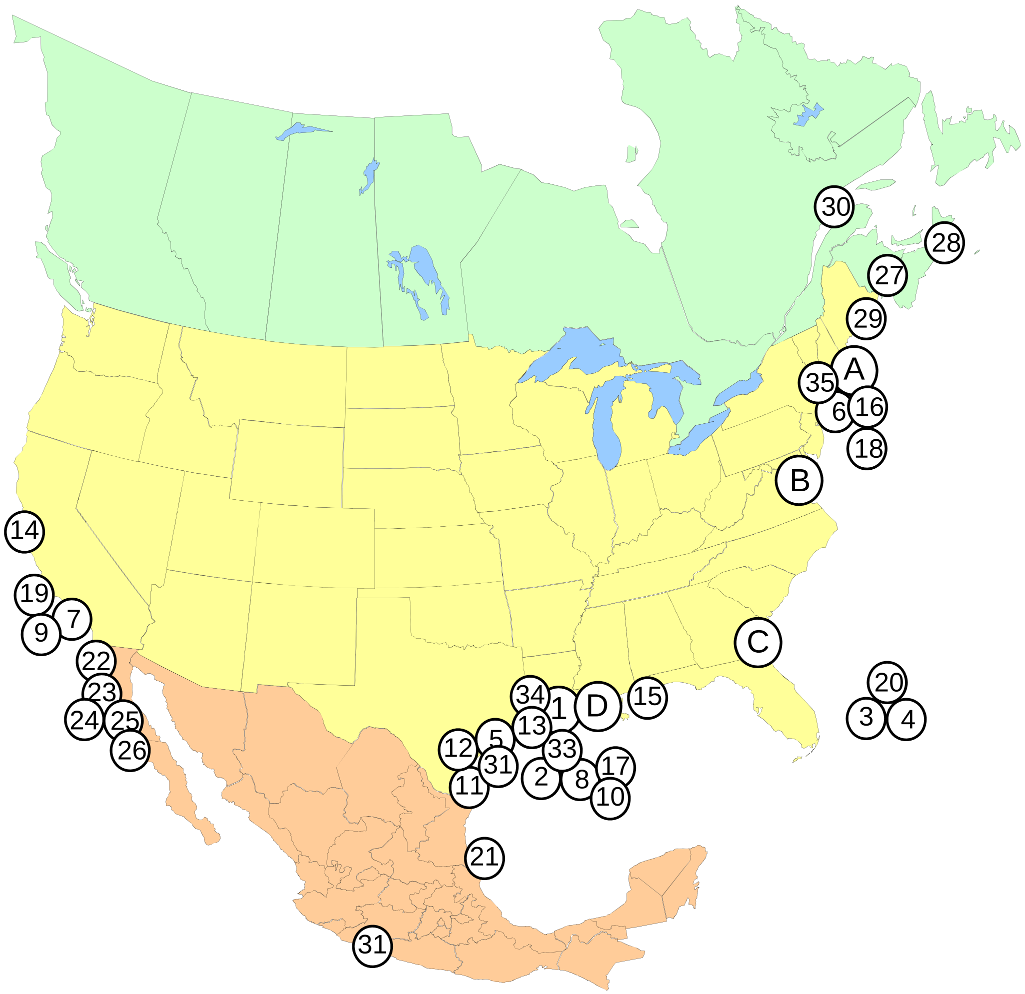
FERC

Existing and Proposed Lower-48 LNG Terminals



December 2003

Source: Pat Wood, Federal Energy Regulatory Commission, LNG Ministerial Conference Presentation

Existing Terminals with Expansions

A. Everett, MA : 1.035 Bcfd (Tractebel)
B. Cove Point, MD : 1.0 Bcfd (Dominion)
C. Elba Island, GA : 1.2 Bcfd (El Paso)
D. Lake Charles, LA : 1.2 Bcfd (Southern Union)

Approved Terminals

1. Hackberry, LA : 1.5 Bcfd, (Sempra Energy)
2. Port Pelican: 1.0 Bcfd, (Chevron Texaco)

Proposed Terminals – FERC

3. Bahamas : 0.84 Bcfd, (AES Ocean Express)
4. Bahamas : 0.83 Bcfd, (Calypso Tractebel)
5. Freeport, TX : 1.5 Bcfd, (Cheniere / Freeport LNG Dev.)
6. Fall River, MA : 0.4 Bcfd, (Weaver's Cove Energy)
7. Long Beach, CA : 0.7 Bcfd, (SES/Mitsubishi)

Proposed Terminals – Coast Guard

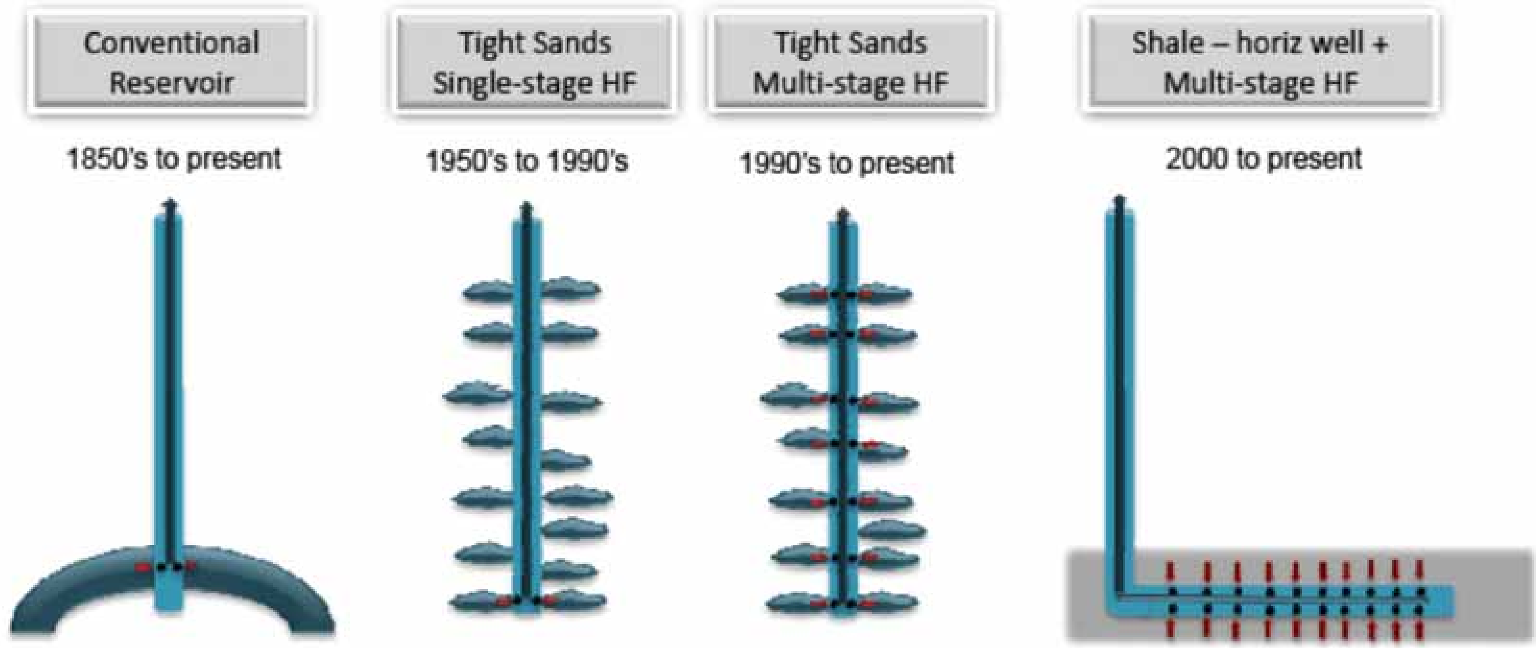
8. Gulf of Mexico: 0.5 Bcfd, (El Paso Global)
9. California Offshore: 1.5 Bcfd, (BHP Billiton)
10. Louisiana Offshore : 1.0 Bcfd (Gulf Landing – Shell)

Planned Terminals

11. Brownsville, TX : n/a, (Cheniere LNG Partners)
12. Corpus Christi, TX : 2.7 Bcfd, (Cheniere LNG Partners)
13. Sabine, LA : 2.7 Bcfd (Cheniere LNG)
14. Humboldt Bay, CA : 0.5 Bcfd, (Calpine)
15. Mobile Bay, AL: 1.0 Bcfd, (ExxonMobil)
16. Somerset, MA : 0.65 Bcfd (Somerset LNG)
17. Louisiana Offshore : 1.0 Bcfd (McMoRan Exp.)
18. Belmar, NJ Offshore : n/a (El Paso Global)
19. So. California Offshore : 0.5 Bcfd, (Crystal Energy)
20. Bahamas : 0.5 Bcfd, (El Paso Sea Fare)
21. Altamira, Tamulipas : 1.12 Bcfd, (Shell)
22. Baja California, MX : 1.3 Bcfd, (Sempra)
23. Baja California : 0.6 Bcfd (Conoco-Phillips)
24. Baja California - Offshore : 1.4 Bcfd, (Chevron Texaco)
25. Baja California : 0.85 Bcfd, (Marathon)
26. Baja California : 1.3 Bcfd, (Shell)
27. St. John, NB : 0.75 Bcfd, (Irving Oil & Chevron Canada)
28. Point Tupper, NS 0.75 Bcf/d (Access Northeast Energy)
29. Harpswell, ME : 0.5 Bcf/d (Fairwinds LNG – CP & TCPL)
30. St. Lawrence, QC : n/a (TCPL and/or Gaz Met)
31. Lázaro Cárdenas, MX : 0.5 Bcfd (Tractebel)
32. Corpus Christi, TX : 1.0 Bcfd (ExxonMobil)
33. Gulf of Mexico : 1.0 Bcfd (ExxonMobil)
34. Sabine, LA : 1.0 Bcfd (ExxonMobil)
35. Providence, RI ; 0.5 Bcfd (Keyspan & BG LNG)

AMERICA'S NATURAL GAS ALLIANCE

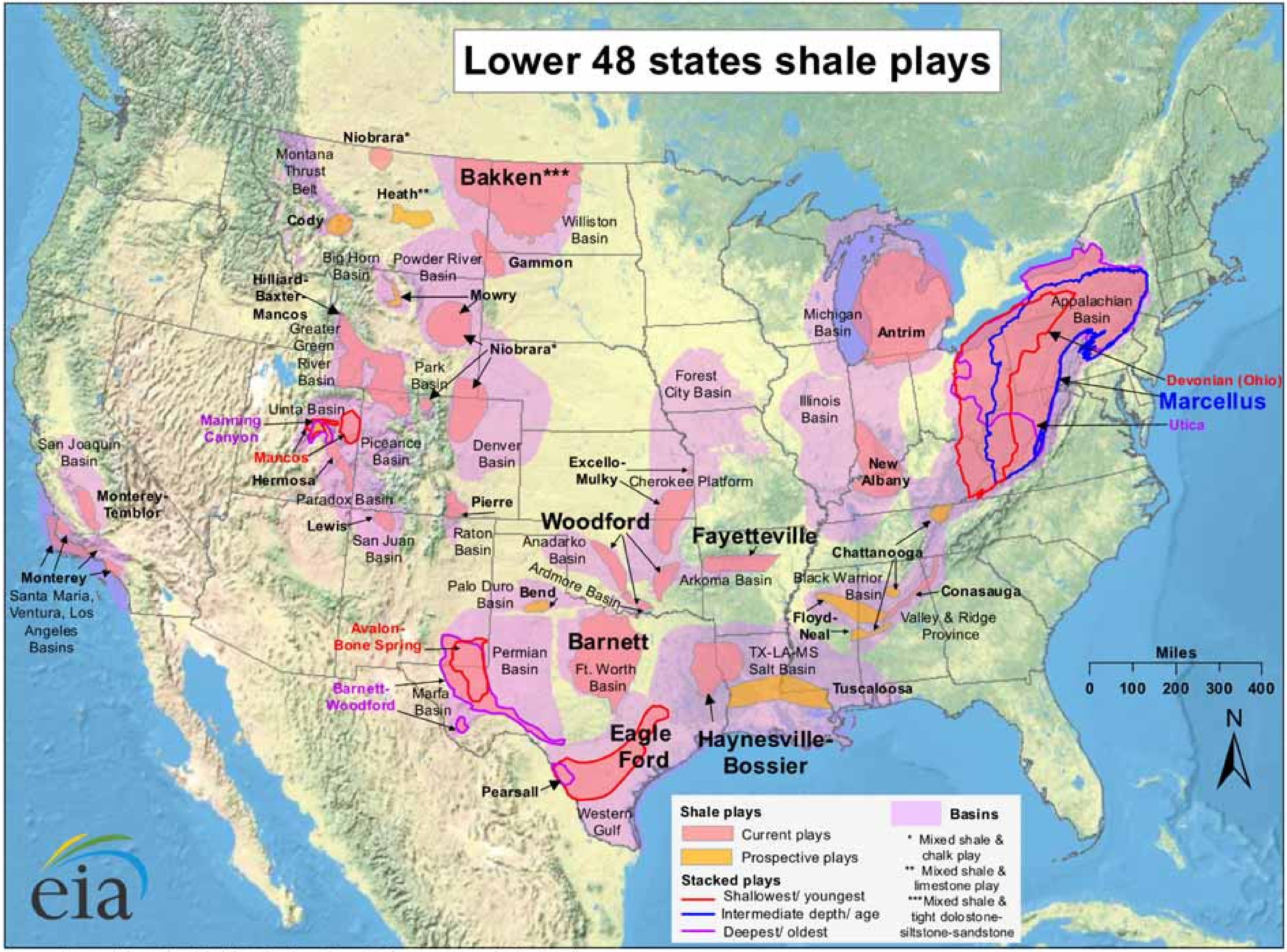
EVOLUTION IN GAS WELL COMPLETEION TECHNOLOGY - THE KEY TO TODAY'S NATURAL GAS REVOLUTION



Multi-stage hydraulic fracture stimulation (HF) unlocks gas in unconventional reservoirs

Mercator Energy

Source: *America's New Natural Gas,* America's Natural Gas Alliance



Source: Energy Information Administration based on data from various published studies.
Updated: May 9, 2011

Wall Street Journal

Editorial Page

9/7/2013

4% vs 42%

Fracking and the Poor

By now even the Obama Administration has recognized that the natural gas drilling boom has led to more high-wage jobs, more secure energy supplies and lower manufacturing costs. But one of the biggest benefits from fracking and other new drilling technologies is often overlooked: the windfall to American consumers, especially the poor.

> The natural gas boom may be America's best antipoverty program.

A new study by the Colorado-based energy broker Mercator Energy quantifies the multi-billion-dollar annual savings to American households through lower utility bills from the fall in natural gas prices.

From 2003-08, shortly before the fracking revolution took hold, the price of natural gas averaged about $7.20 per million BTUs. By 2012 after new drilling operations exploded across the U.S.—from West Texas to Pennsylvania to North Dakota—the increase in natural gas production had slashed the price to $2.80 per million BTUs.

Mercator examined Department of Energy data on natural gas usage to find out how this 61% price decline translated into lower home-heating and electricity bills. According to the federal Energy Information Administration, American households use about 7.4 billion MMBTUs for home heating and residential electricity each year.

Thanks to the lower price for natural gas, families saved roughly $32.5 billion in 2012. (That's 7.4 billion MMBTUs of residential use of natural gas times the $4.40 reduction in price.) The windfall to all U.S. natural gas consumers—industrial and residential—was closer to $110 billion. This is greater than the annual income of all of the residents in 14 states in 2011.

Mercator's most notable finding is that the income group helped the most by this bonanza is the poor because energy is a big component of their family budgets. Data from the annual report of the federal Low Income Home Energy Assistance Program (Liheap) show that poor households spend four times more of their income on home energy (10.4%) than do non-poor households (2.6%). That same report says that roughly 40 million households, or 36% of U.S. households, are eligible for Liheap. Though the poor on average spend less overall on heating and electricity, lower natural gas prices have still shaved about $10 billion a year from the utility bills of poor families.

To put it another way, fracking is a much more effective antipoverty program than is Liheap. In 2012, Liheap provided roughly $3.5 billion to about nine million low-income households to subsidize their home-heating costs. New drilling technologies saved poor households almost three times more. Low gas prices benefit nearly all poor households, while Liheap helps fewer than one in four.

These energy savings are especially impressive compared to what residents of other industrialized nations are paying. The natural gas price this summer increased to about $3.70 per million BTUs, but that compares to the roughly $10 that consumers pay in Spain or $13 in China. According to the Mercator analysis, if natural gas prices were that high in the U.S., average home heating bills for millions of Americans would be almost 75% higher.

You'd think that good liberal egalitarians would welcome these financial savings to poor households. Yet most green groups, in particular the Sierra Club, continue to oppose fracking and are using lawsuits and political lobbying to stop it. Rich Hollywood types like Matt Damon propagandize against it. No one is doing more to increase income inequality in America than the affluent environmentalists who oppose natural gas drilling.

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Fox News Coverage One Month Ago

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Denver Business Journal 9/17/13

Fracking helps families, cuts heating, power bills by $32.6 billion, Colorado energy exec says

Cathy Proctor
Reporter-
Denver Business Journal
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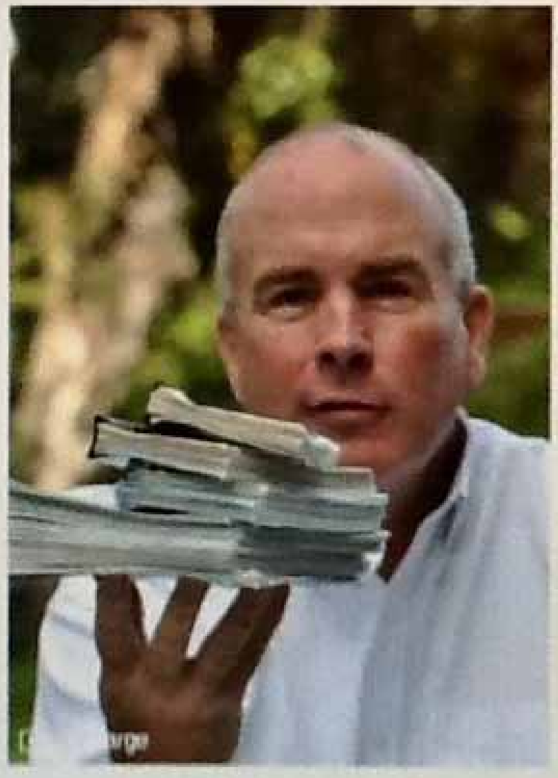


Kathleen Lavine | Denver Business

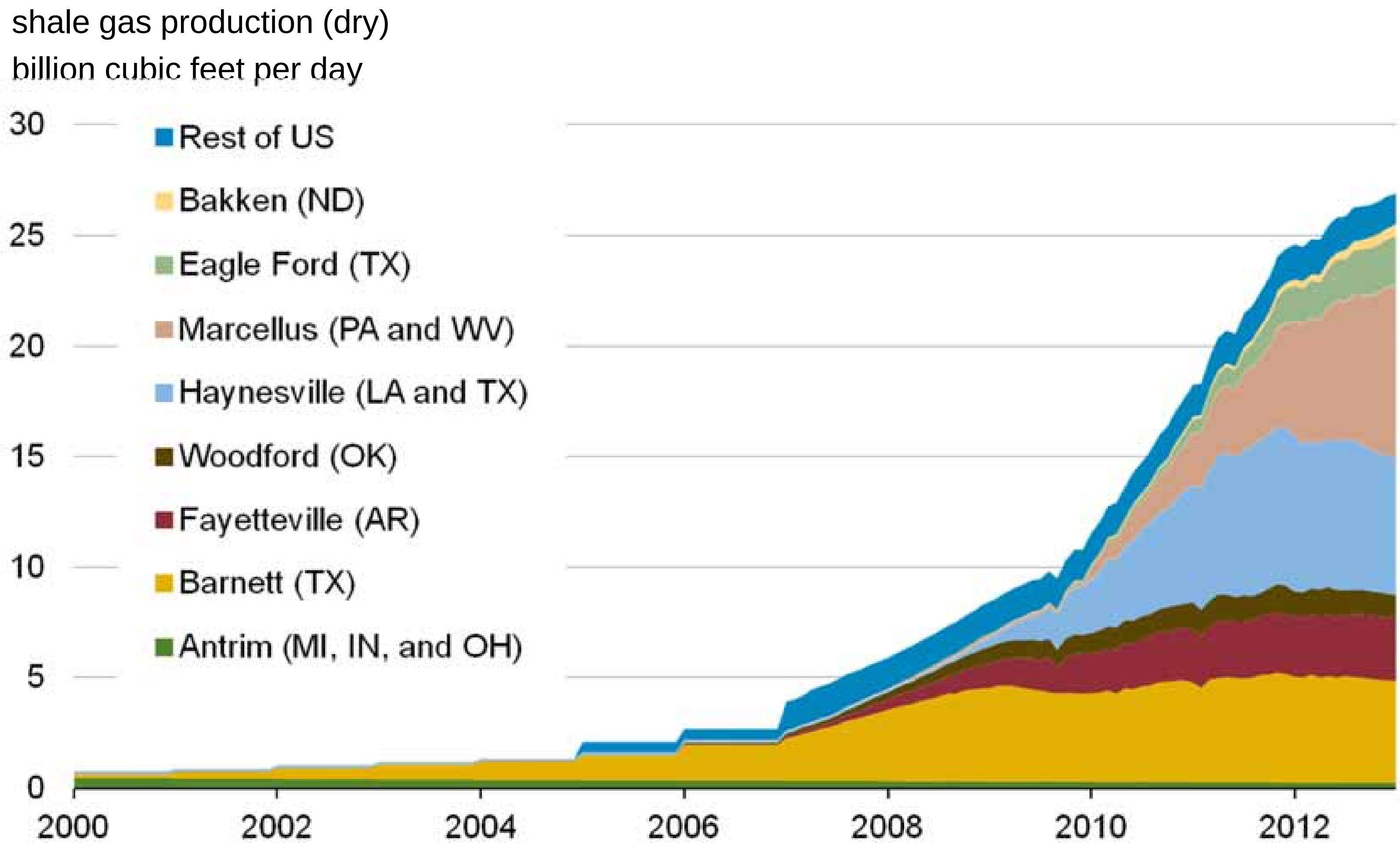
John Harpole, president of Mercator Energy LLC, a natural gas marketing and research company in Littleton, with 35 years of utility bills his mother kept in a box.

The mother of John Harpole, a longtime Denver oil and gas executive, kept 35 years of monthly utility bills in a box — making notes in the margins about the weather "in hopes that she could guess what next month's bill might be," her son says.

And it's people like his mother, Mary Harpole — who raised nine children in a home in Denver's Congress Park neighborhood after her husband died in 1966 — that John Harpole thinks of when he talks about how the oil and gas industry's use of hydraulic fracturing (or fracking) cut residential utility bills in the United States by $32.6 billion in 2012.

"There's not a bill in that pile [of utility bills] that is over $90 — maybe a really expensive lunch for some folks — but she

Domestic production of shale gas has grown dramatically over the past few years



Sources: LCI Energy Insight gross withdrawal estimates as of January 2013 and converted to dry production estimates with EIA-calculated average gross-to-dry shrinkage factors by state and/or shale play.

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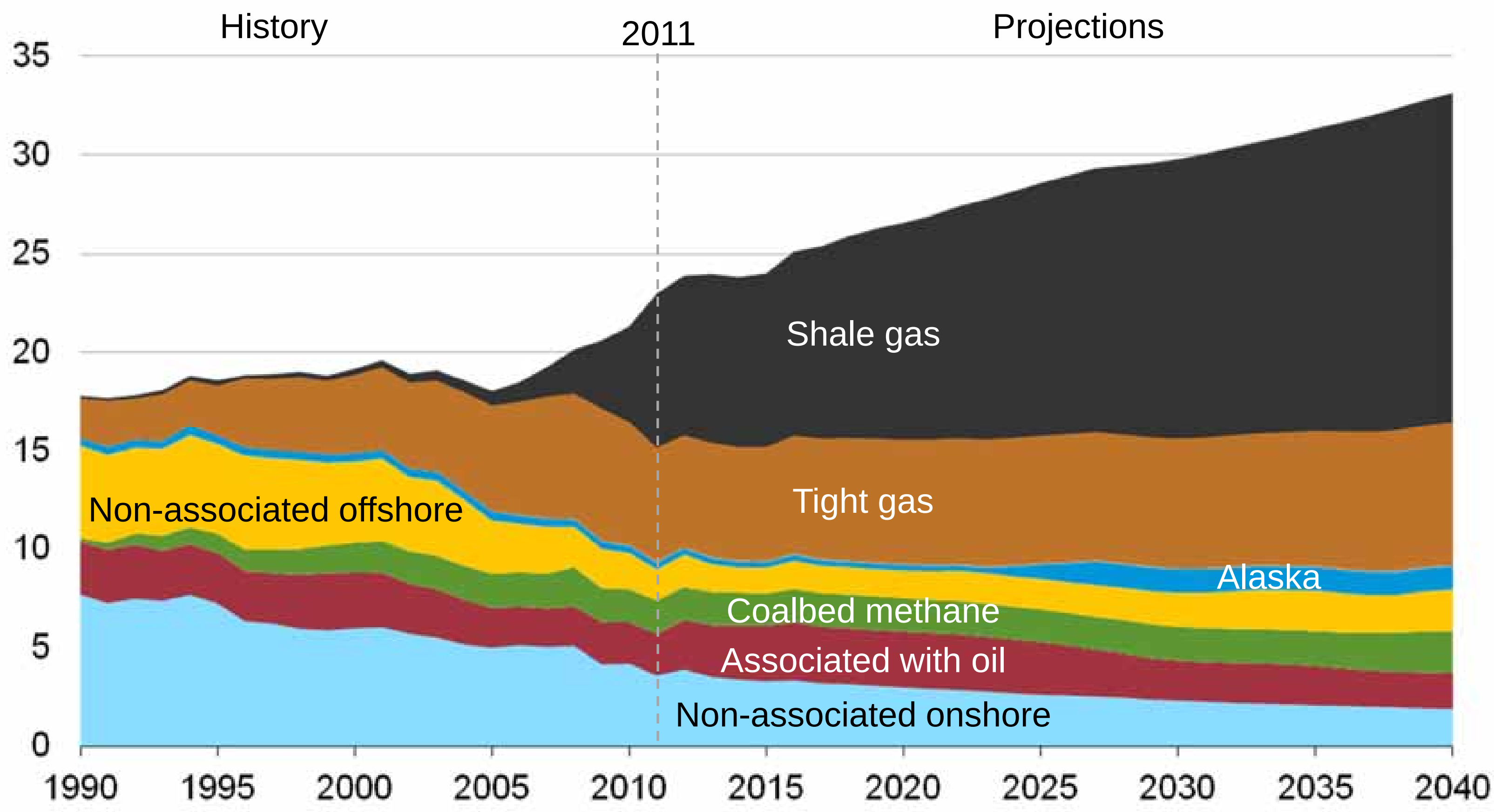
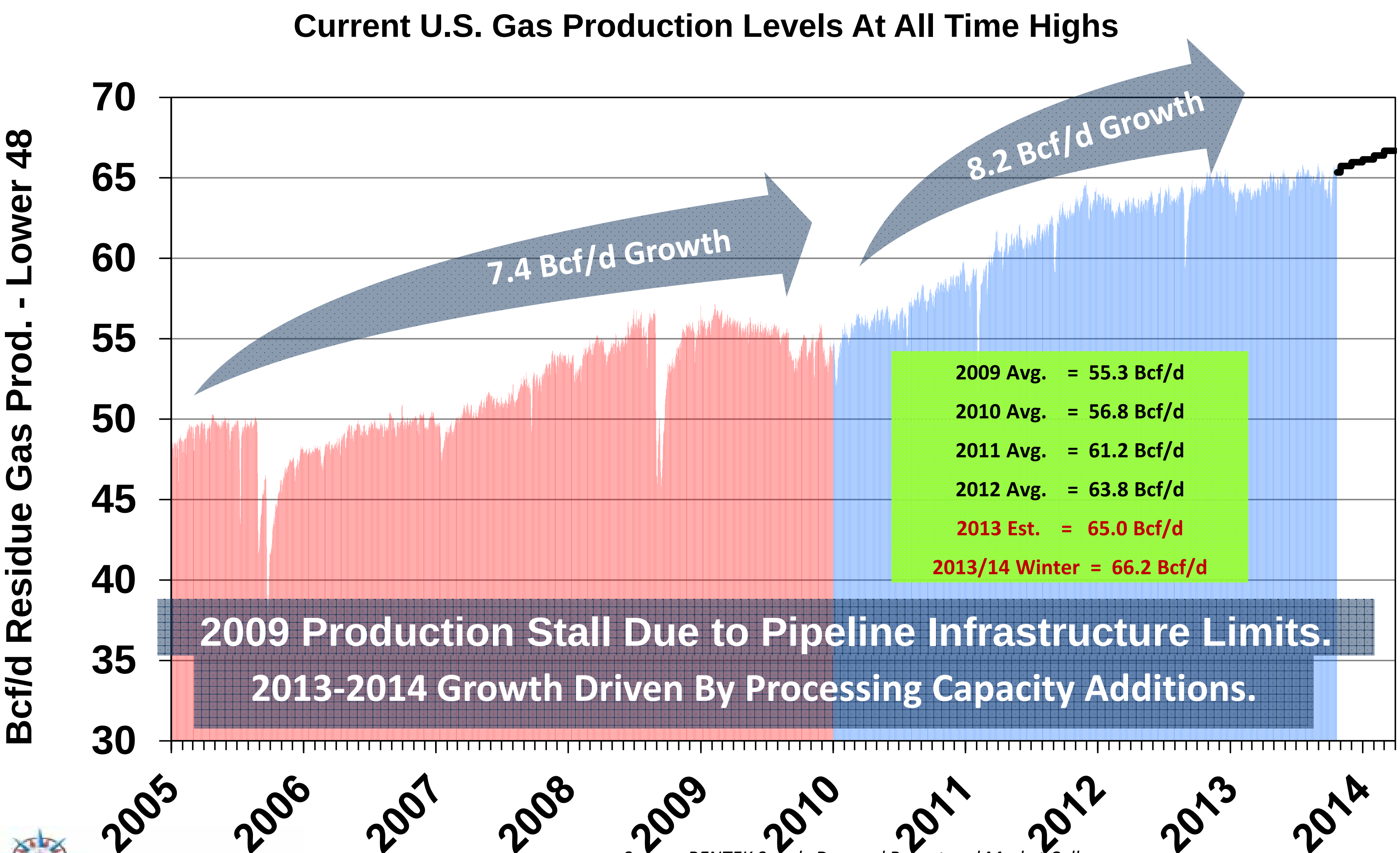
Shale gas leads growth in total gas production through 2040

U.S. dry natural gas production
trillion cubic feet



Source: EIA, Annual Energy Outlook 2013 Early Release

Growth Spurts in U.S. Natural Gas Production



Source: BENTEK Supply Demand Report and Market Call

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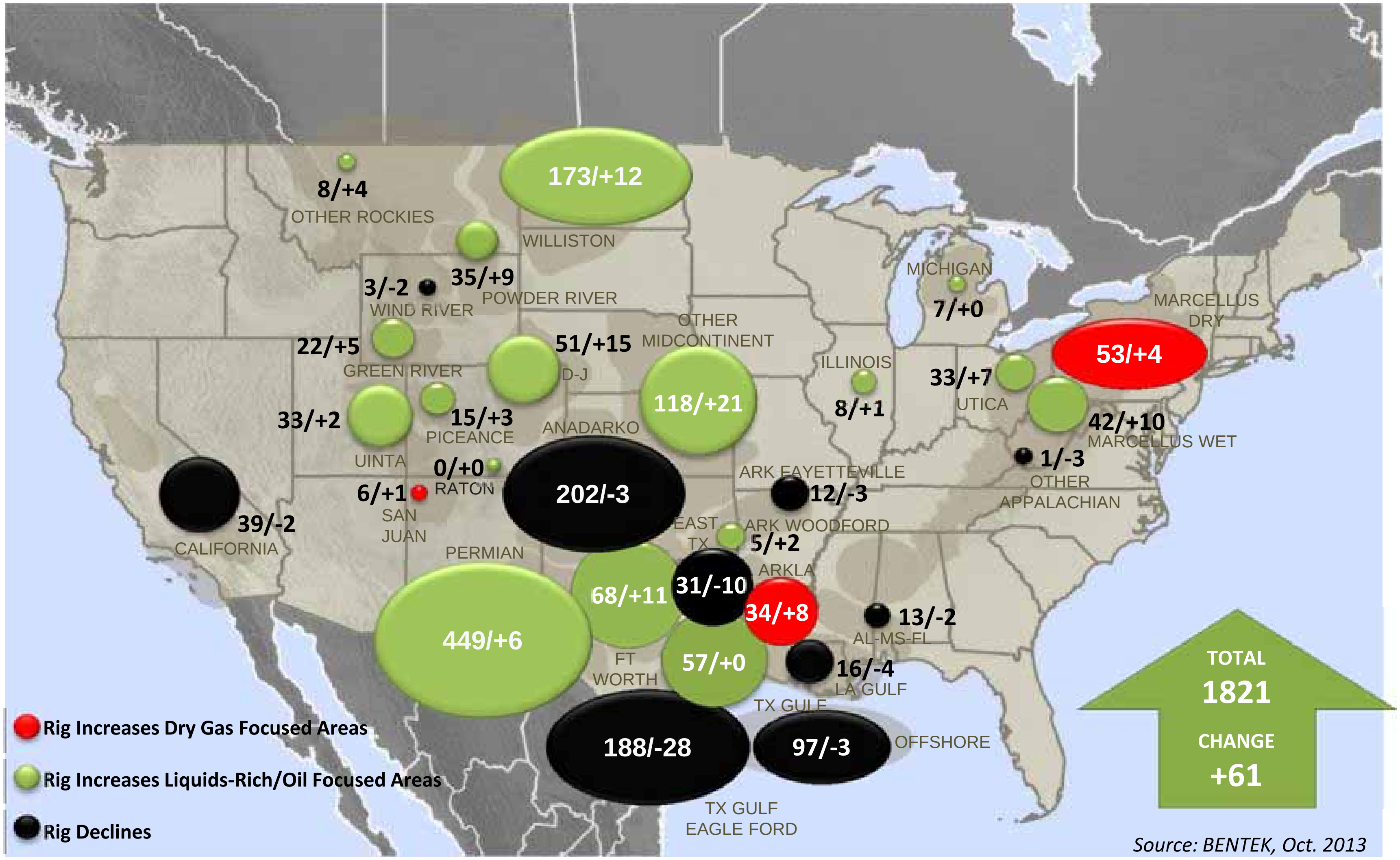
Plays With High Returns Attract Drilling Rigs



Active rig count: Oct. 4, 2013 / Change in rig count from Jan. 4, 2013

Source: Bentek

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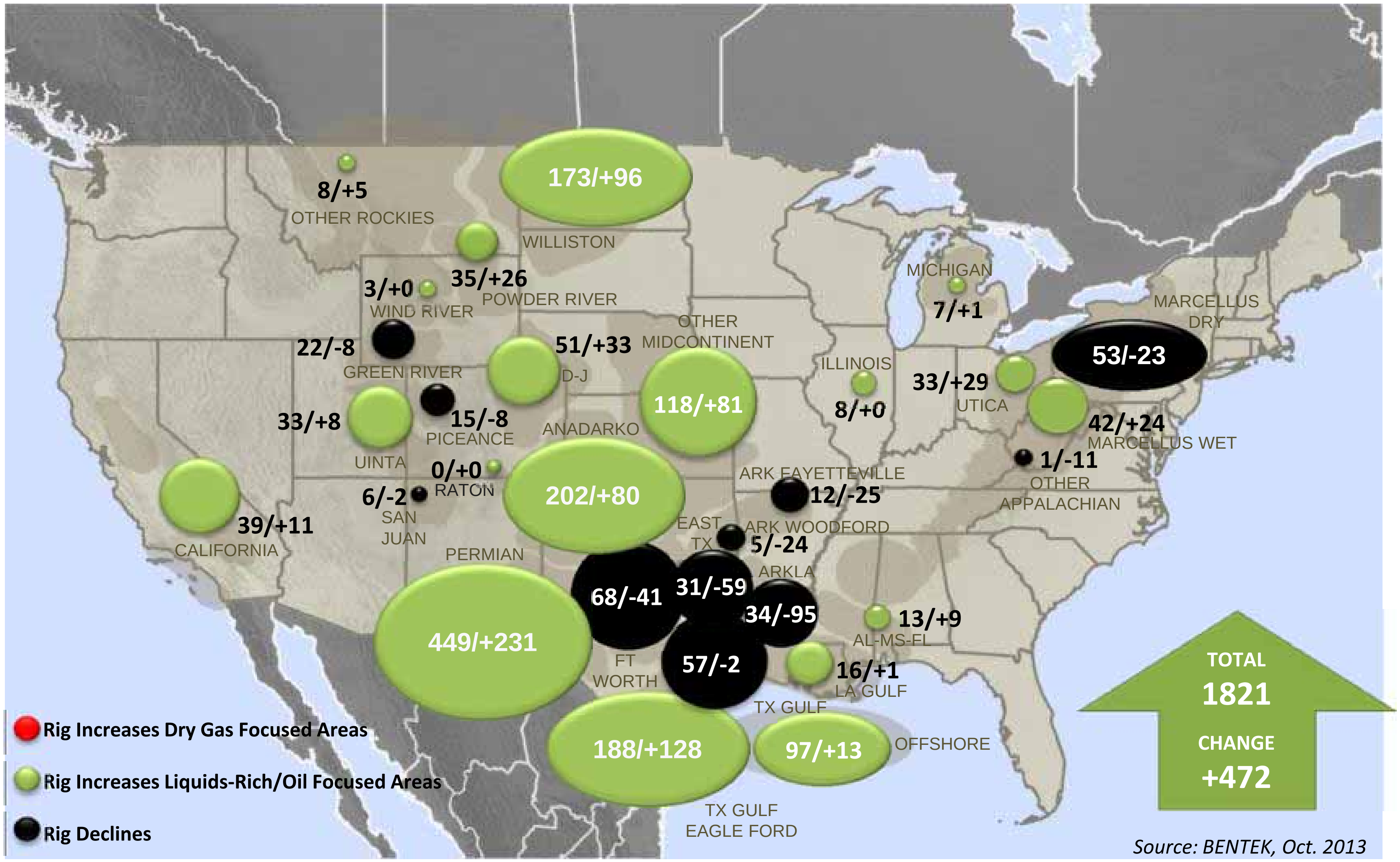
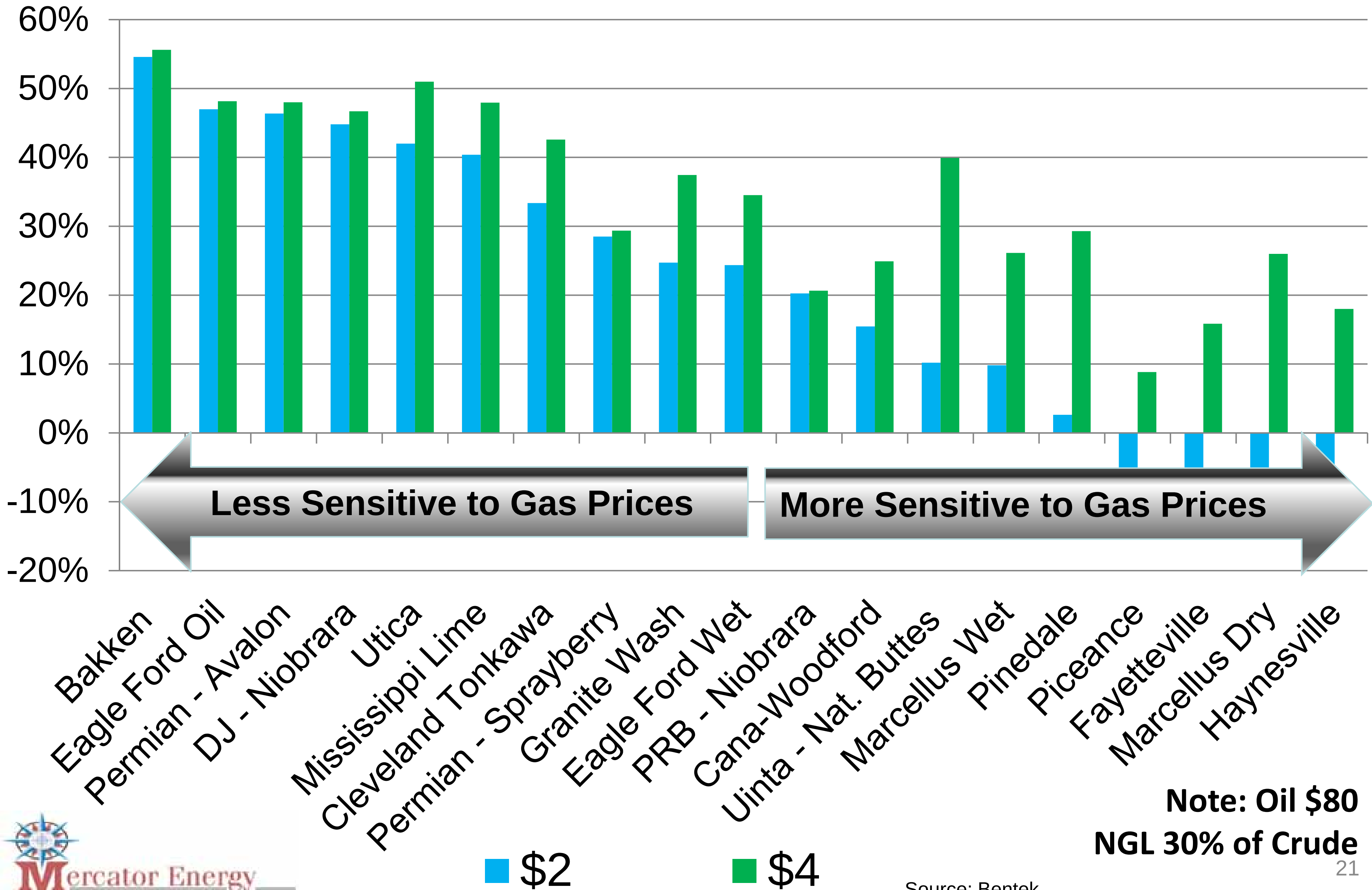
Plays With High Returns Attract Drilling Rigs



Active rig count: Oct. 4, 2013 / Change in rig count from Jan. 1, 2010

Source: Bentek

Diverse Hydrocarbon Mix Maintains Gas Production



Note: Oil $80
NGL 30% of Crude

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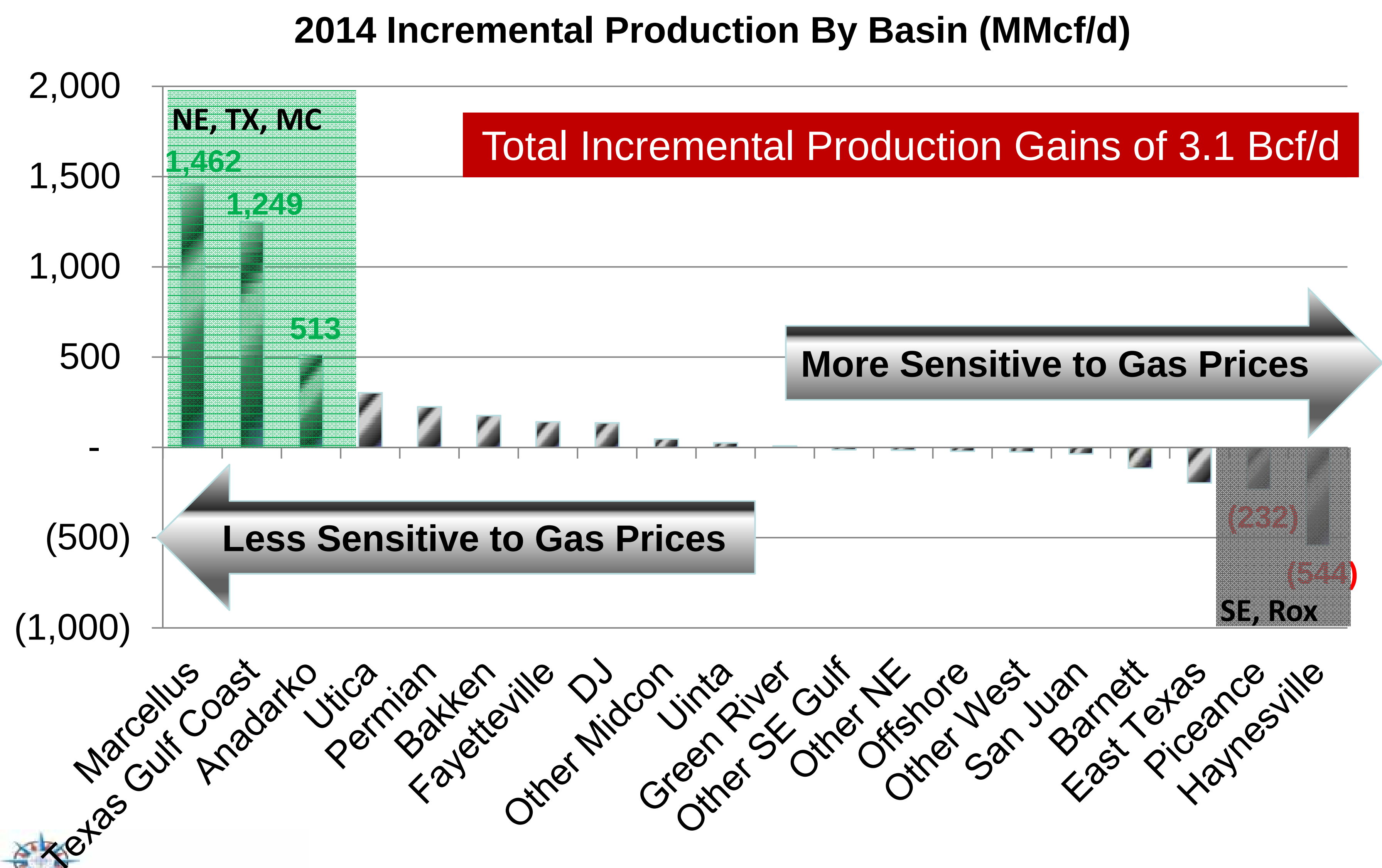
Source: Bentek

Diverse Hydrocarbon Mix Maintains Gas Production



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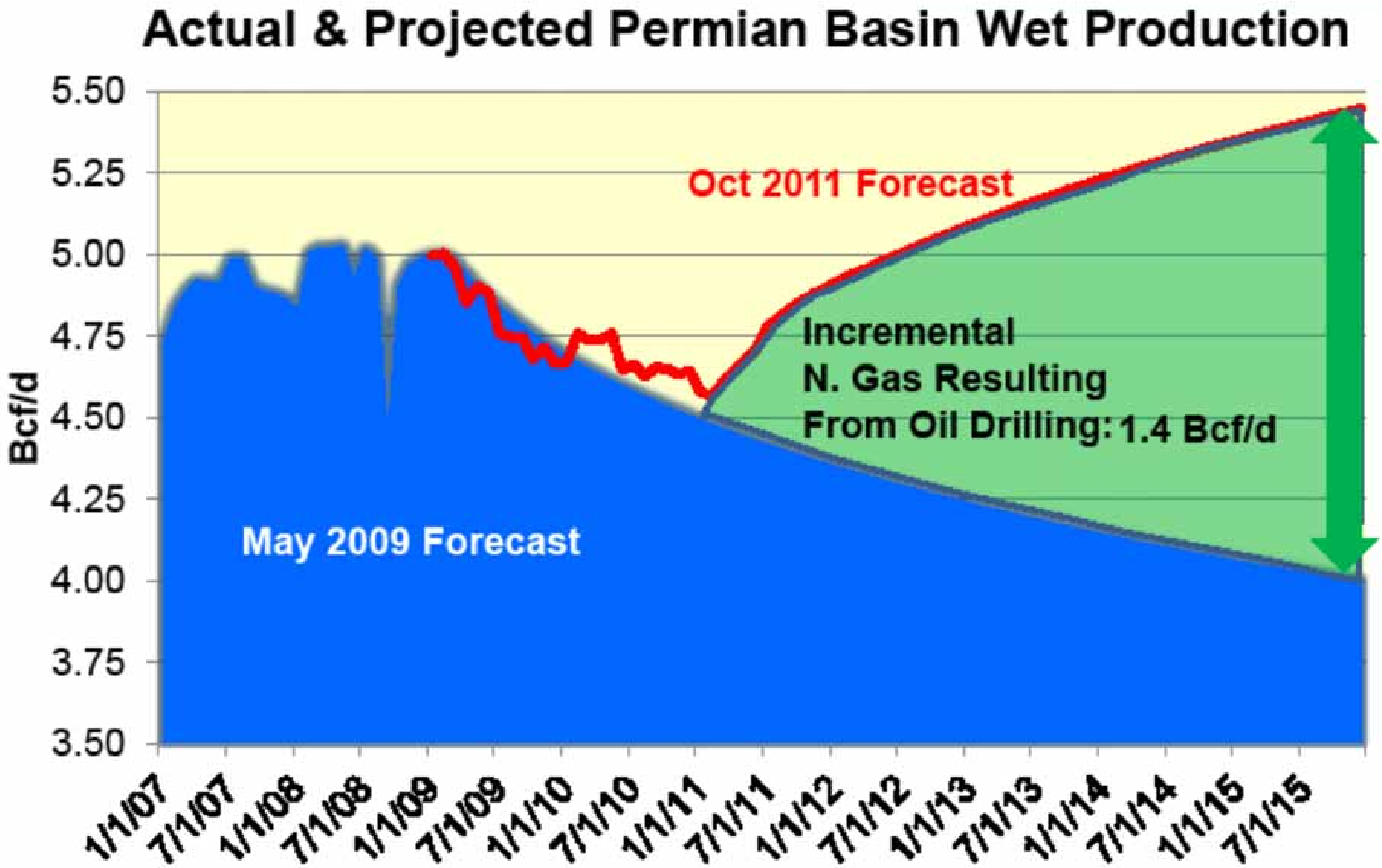
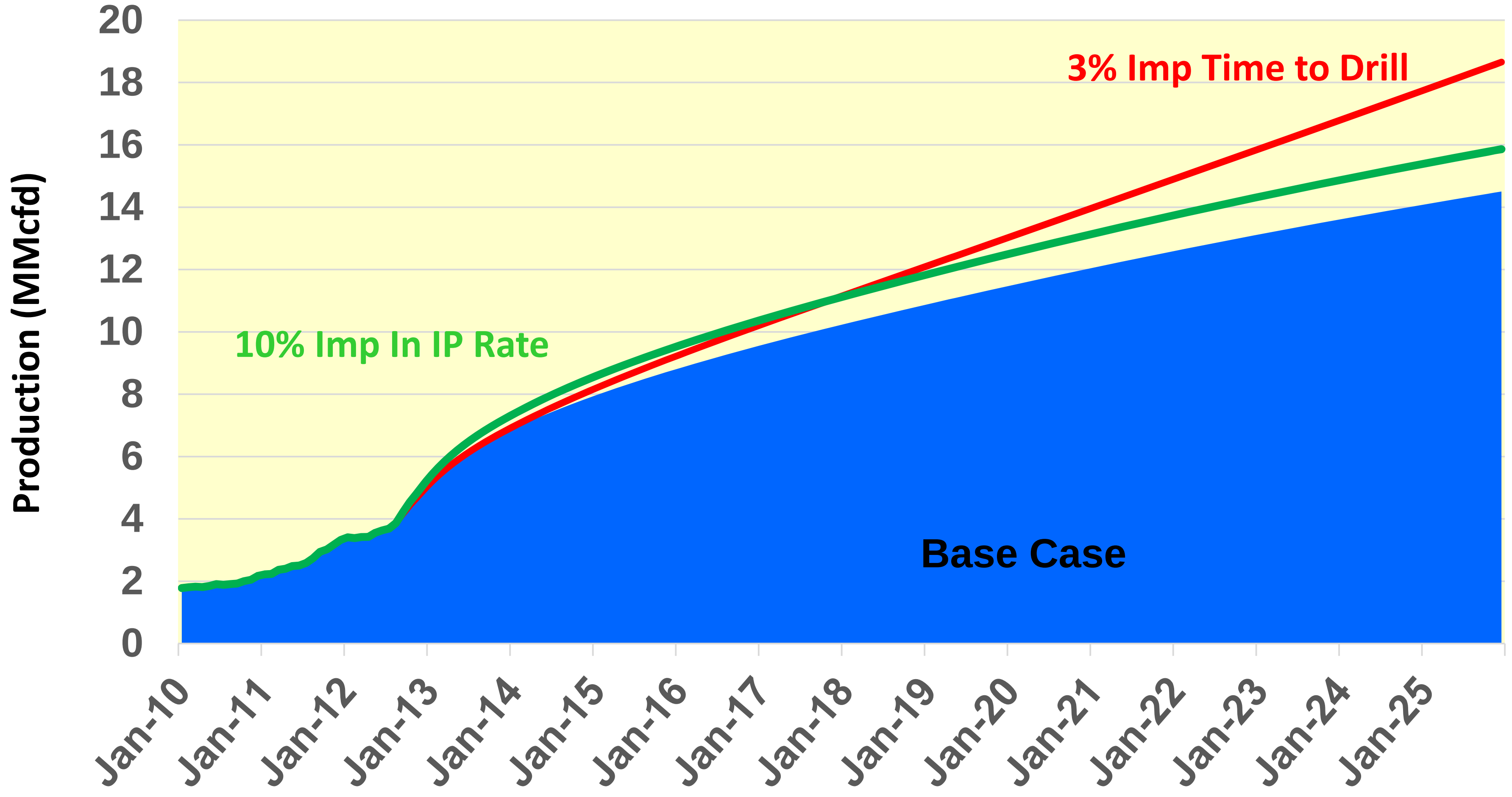
Source: Bentek

Ironically, Oil & Liquids Exploration Drives Gas Production



Faster Drilling Times Yield More Wells, More Production



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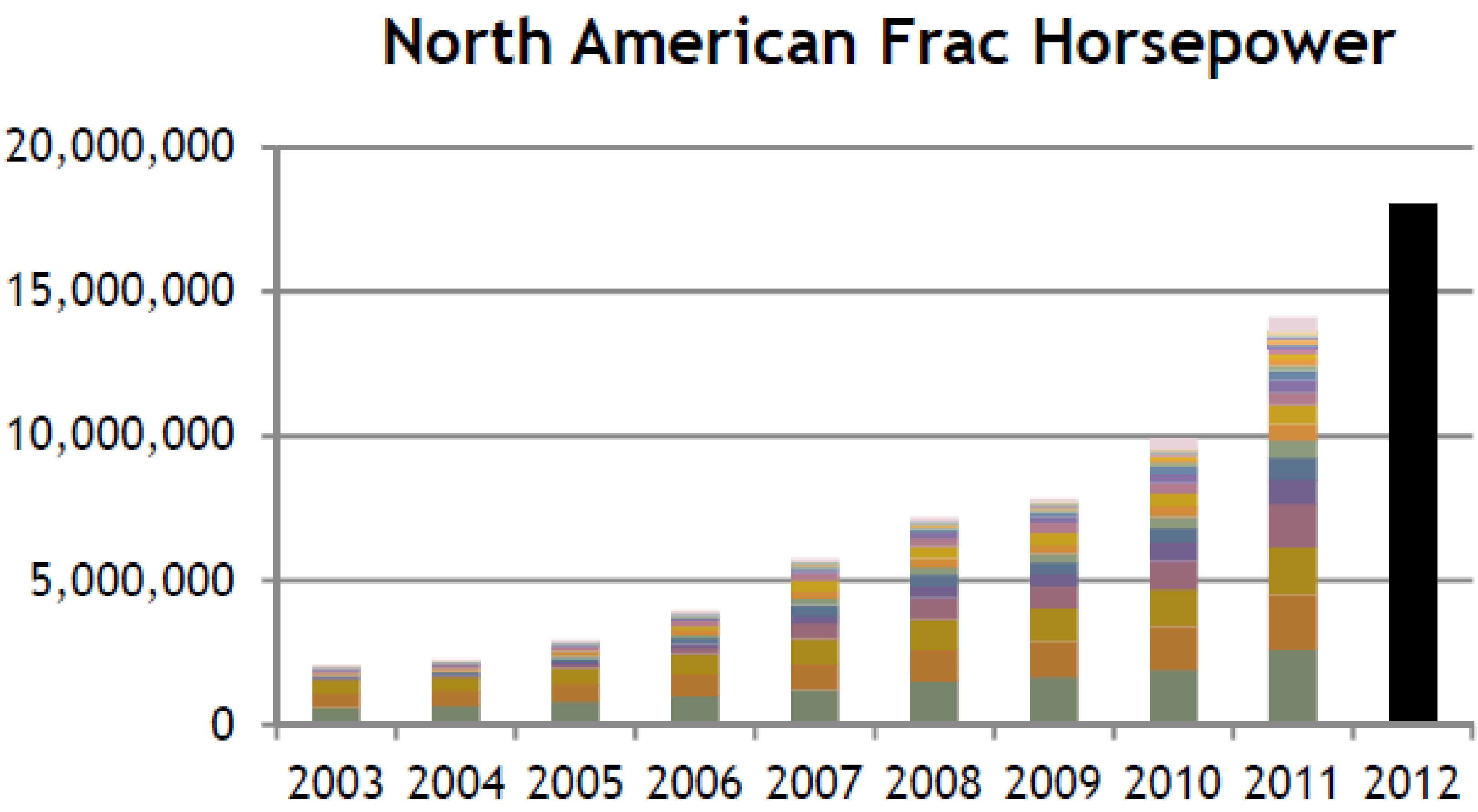
Source: Ponderosa Advisors LLC

Fracturing Application Exploded



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

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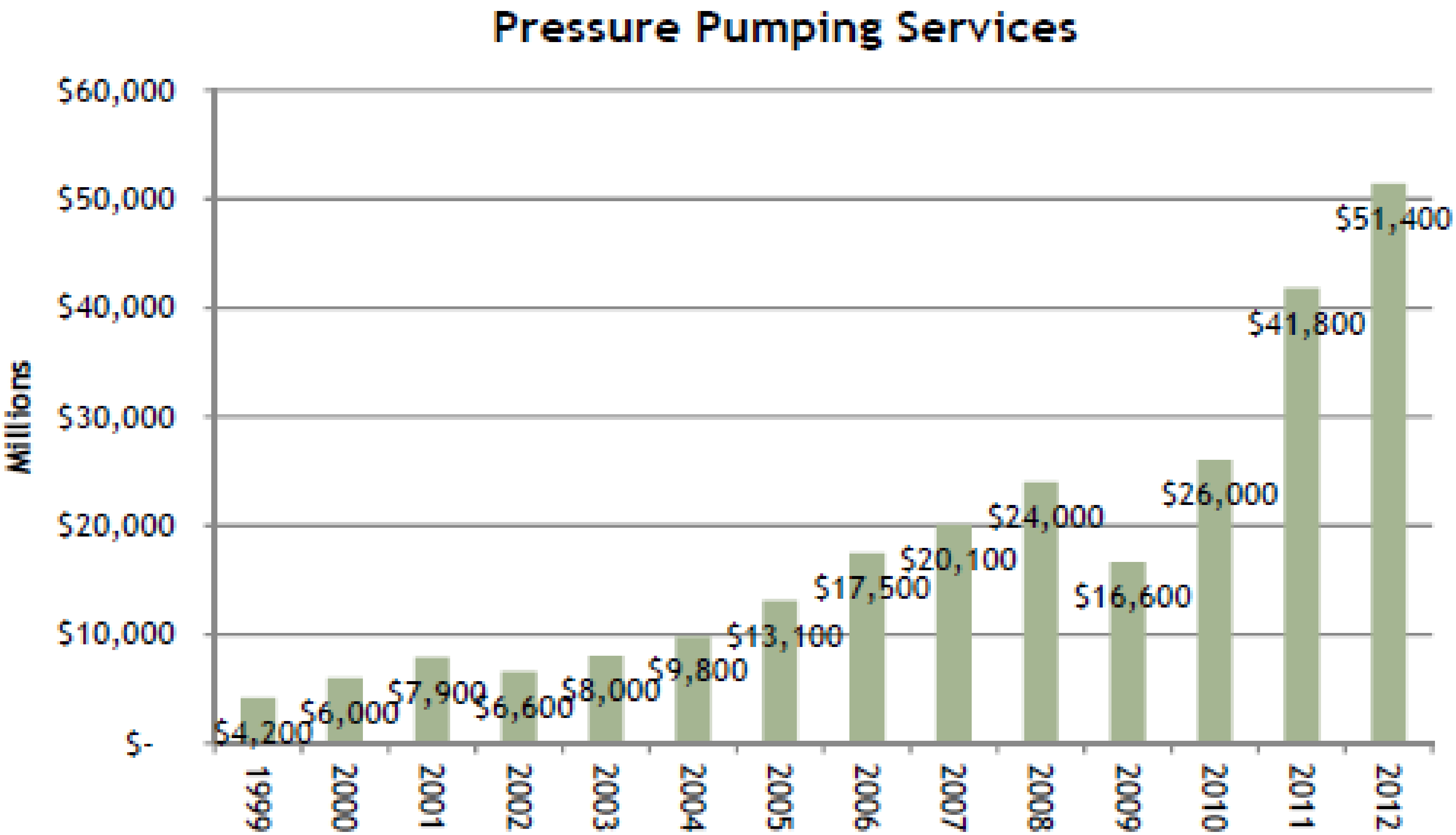
10-fold growth in 10 years



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

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Forecasts for Shale Gas Resource?

- 2008 - **347 TCF** - Energy Information Administration (EIA)
- 2008 - **840 TCF** - Navigant for Clean Skies Foundation
- 2009 - **616 TCF** - Potential Gas Committee (PGC)
- 2011 - **827 TCF** - Energy Information Administration (EIA)
- 2013 – **1,073 TCF** - Potential Gas Committee (PGC)

Source: Various resource estimates

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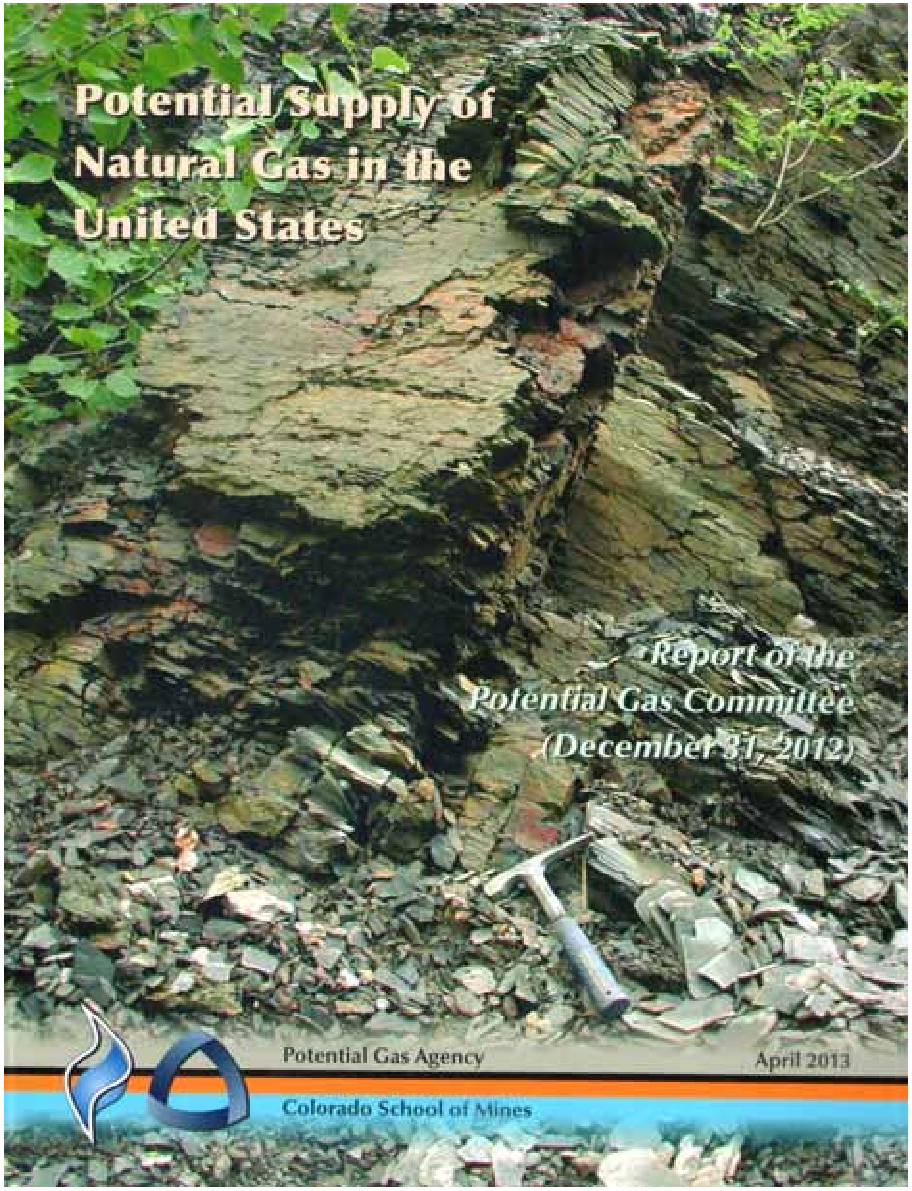
THE SUPPLY CURVE HAS MOVED

According to the Potential Gas Committee, during the last two years, the future gas supply estimate for the US rose nearly 25% to a 48-year record of **2,688 TCF**.

PGC Report Released April 2013

The Mancos Shale play was not included in the PGC Report



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Shale Plays Comparison

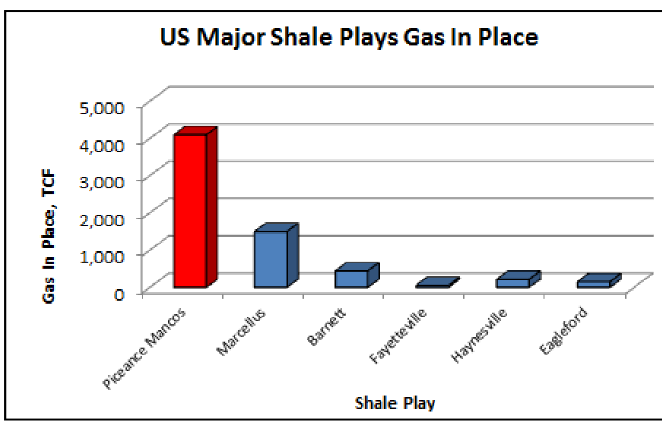
Property	L. Mancos GEC	Barnett Core	Fayetteville	Haynesville	Eagleford	Marcellus
Age	Cretaceous	Mississippian	Mississippian	U. Jurassic	Cretaceous	Devonian
Basin		Fort Worth	Arkoma	Gulf Coast		Appalachian
Depth (ft)	5,600-7,900	6,500-9,000	1,500-6,500	10000-13000	<11,500	5000-8500
Gross Thickness (ft)	2,300	200-1000	50-325	200-240		50-200
Net Thickness (ft)	2,300	100-500	20-200		600-1,000	
Bottomhole Temp (ºF)	275	200				
TOC (%)	1.0-3.8	3.5-8	4-9.5	3-5		2-10
Vitrinite Refectance (%Ro)	1.19-1.7	2.2	1.5-4.0	2.2-3.0		1-2.5
Total Porosity (%)	0.6-9.1	4-6	2-8	8-12		6
Gas Filled Porosity (%)	2.91	2.5				
Water Filled Porosity (%)	8.34	1.9				
Permeability(nd)						500-2000
Gas Content (scf/t)	105-164	300-350				
Adsorbed Gas (%)	NA	20				
Silica Content (%)		40-60	20-60			40-60
Clay Content (%)	25-41				11	
Pressure Gradient (psi/ft)	est 0.45	0.46-0.52	0.44	0.7-0.9		0.4-0.7
Water Production (Bwpd)	9-100	0				
Gas Production (Mcf/ton)	NA	100-1,1000				
Well Spacing (acres)	NA	80-160	40-80	60-80		80.16
IP Rates (MMcf/d)	550-4,400		2-4	8+	0.8, 1.1, 3.8 (horiz)	2.6-5.8
Ave. Peak Prod. (Mcf/d)	1,100-2,650	650-700	1,600			
First Year Decline (%)	60-75%	70%	68%	81%		75%
Recovery Factor (%)	NA	20-50	20-40	30		10
Expected EUR per Well, Bcfe		2-9 (ave 3)	2-3	4.5-8.5		3.5
Average Well Cost ($MM)			$1.75-3.05	$6-7		$4.00
Expected F&D/Mcfe ($)		$0.8-1.3	$1.00-1.75	$1.00-1.50		$0.90-1.60
Lateral Lengths (ft)	est 5,000	2,500-3,000	1500-5000	4000		2500
Frac Type	Slickwater	slickwater				Slickwater
Frac Stages	3-17		4-5	5-6		
# Producing Wells	6					
Gas-In-Place (Bcf/section)	682	50-200	25-65	150-250		70-150
Estimated Recovery Factor (%)	10-16			25-30		10
Reserves (MMcf)	NA	500-1,500				
State	CO	TX	AR	LA, E. Texas	S. Texas	PA, NY, WV, OH

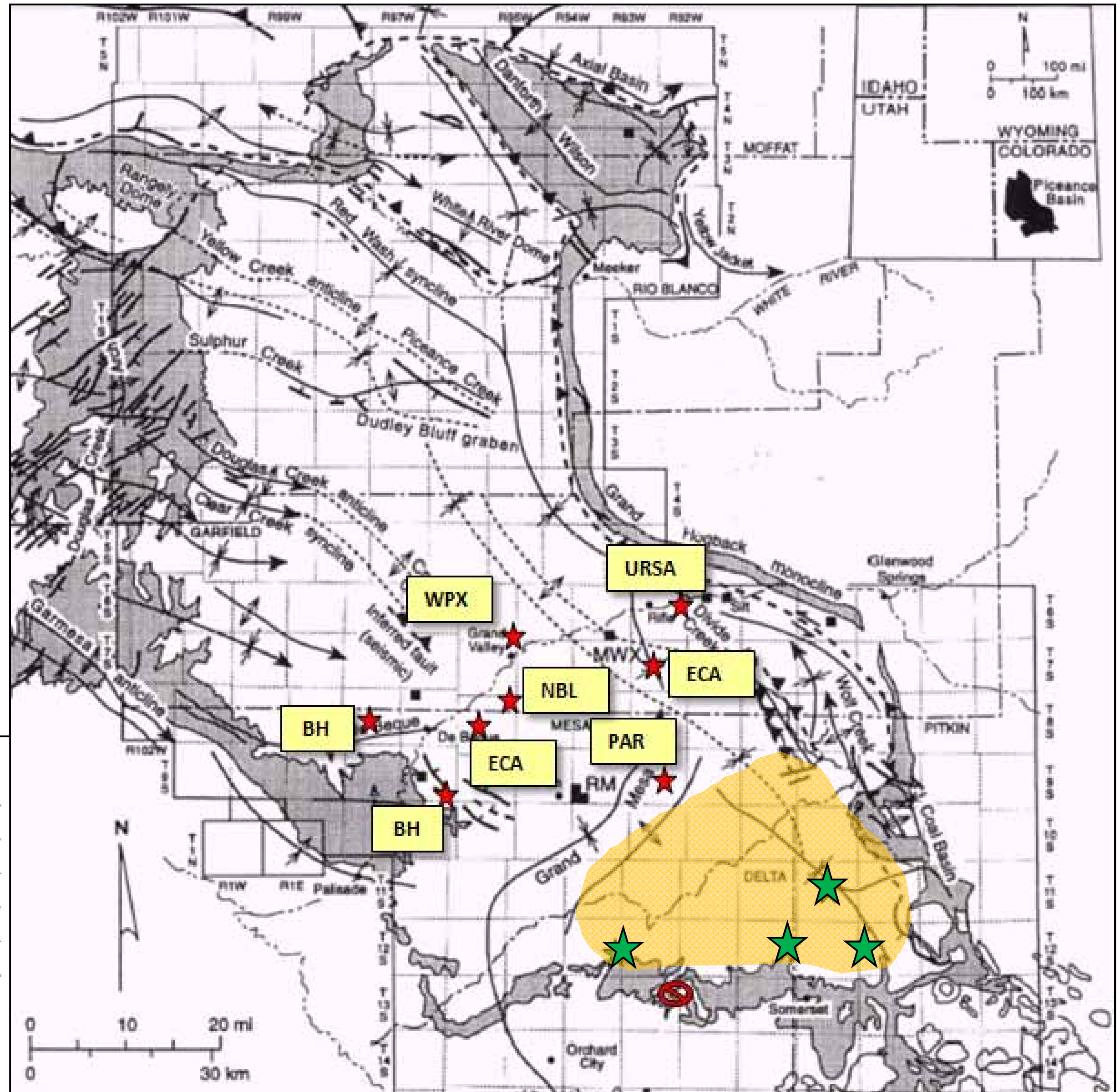
Courtesy of Gunnison Energy Corp

Mancos Shale Gas Resource Play

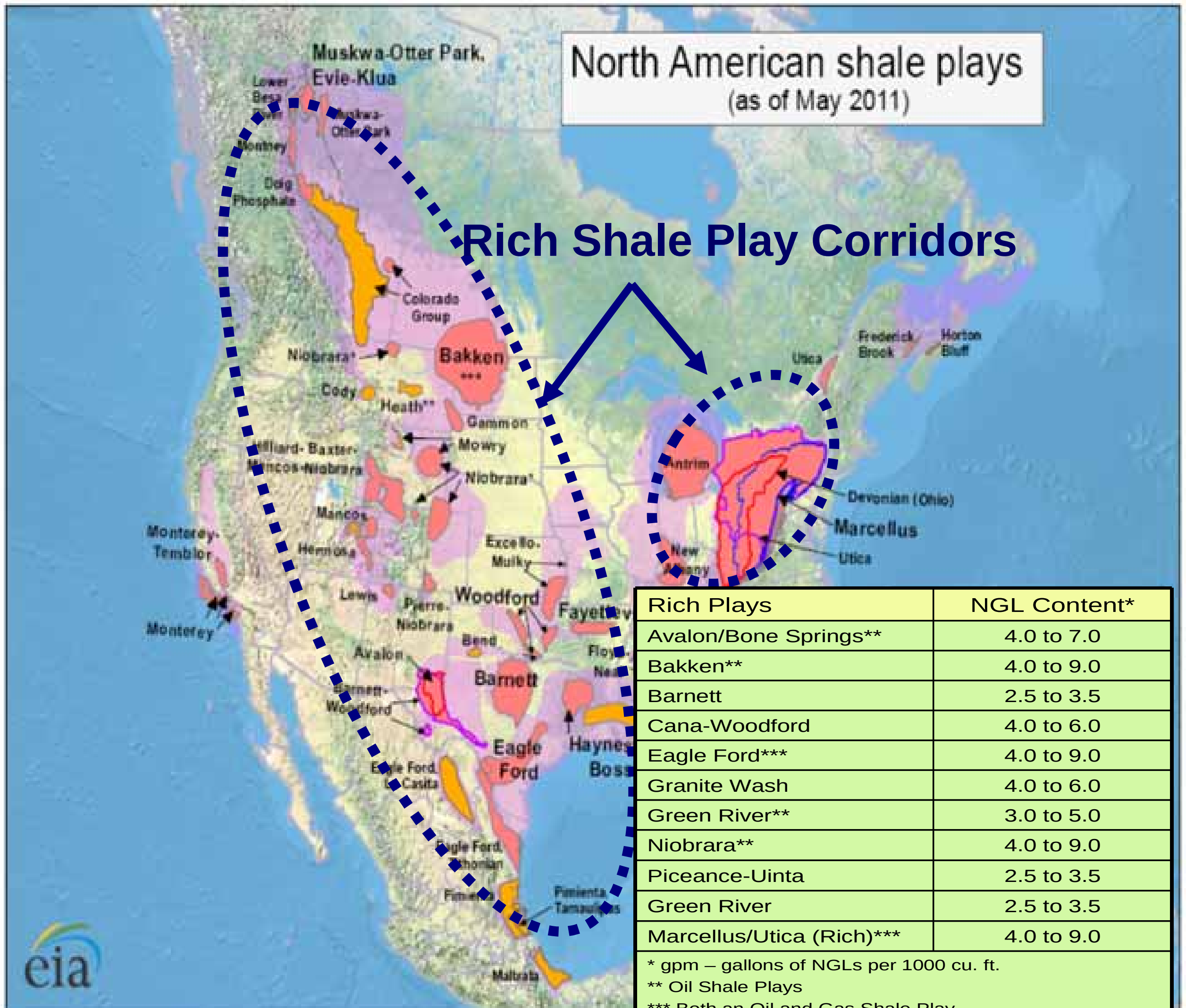
An Emerging Giant:

- **~3X larger than the Marcellus shale deposit**
- **Thickness of 2,200 to 4,000ft vs. Marcellus ~ 200ft.**
- **Massive GIP - > 4,000 TCF vs. Marcellus - > 1,000 TCF**
- **Very thick, gas-saturated shale deposit**
- **Deposited across a large area, >3.9 Million acres**
- **Proven productive across the Piceance Basin**





Rich Hydrocarbon Shale Plays



Rich Plays	NGL Content*
Avalon/Bone Springs**	4.0 to 7.0
Bakken**	4.0 to 9.0
Barnett	2.5 to 3.5
Cana-Woodford	4.0 to 6.0
Eagle Ford***	4.0 to 9.0
Granite Wash	4.0 to 6.0
Green River**	3.0 to 5.0
Niobrara**	4.0 to 9.0
Piceance-Uinta	2.5 to 3.5
Green River	2.5 to 3.5
Marcellus/Utica (Rich)***	4.0 to 9.0

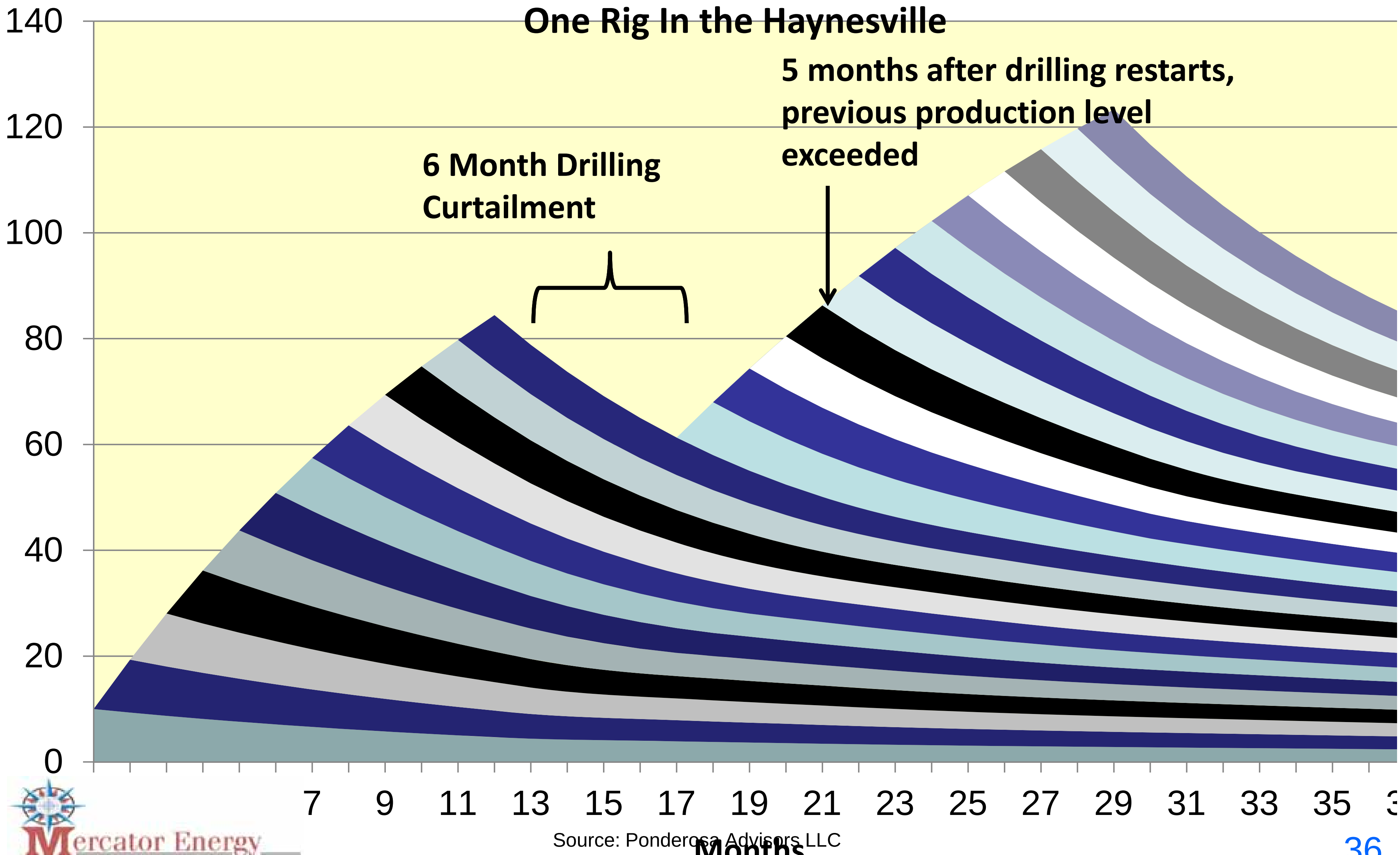
* gpm – gallons of NGLs per 1000 cu. ft.
** Oil Shale Plays
*** Both an Oil and Gas Shale Play

US Emerging New Plays

- Utica Shale – oil & gas play – mainly in eastern Ohio and western PA
- Wolfcamp Shale – oil & gas play - Permian Basin
- The Cline Shale – oil play – Permian Basin
- Brown Dense – oil & gas play – Arkansas and N. Louisiana
- Tuscaloosa Marine Shale – oil & gas play – mainly central LA.

en*vantage Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage

The "Ferrari" Affect Substantially Reduces The Likelihood Of Price Spikes



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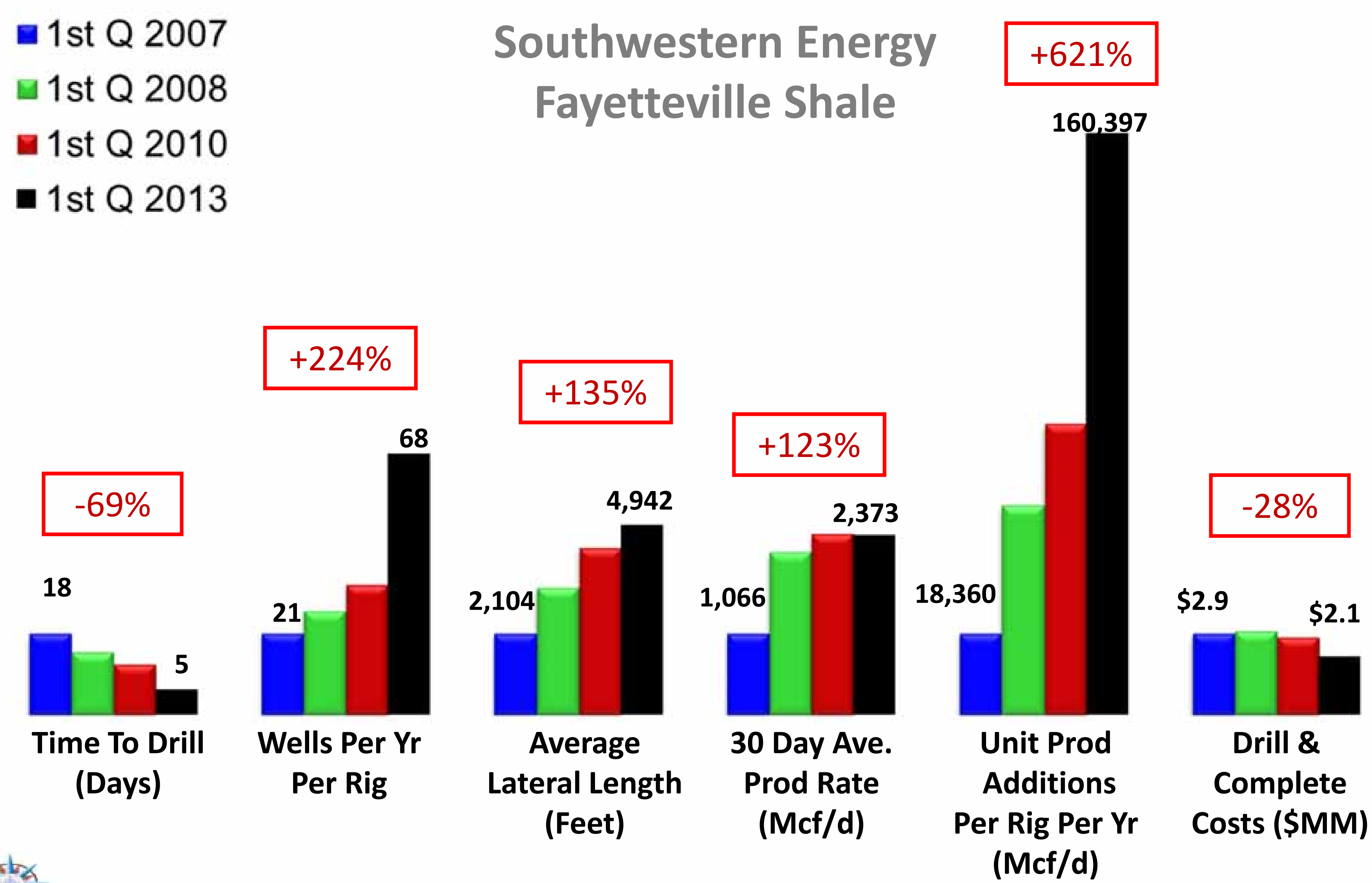
Source: Ponderosa Advisors LLC

Drilling Rig Productivity Continues To Improve



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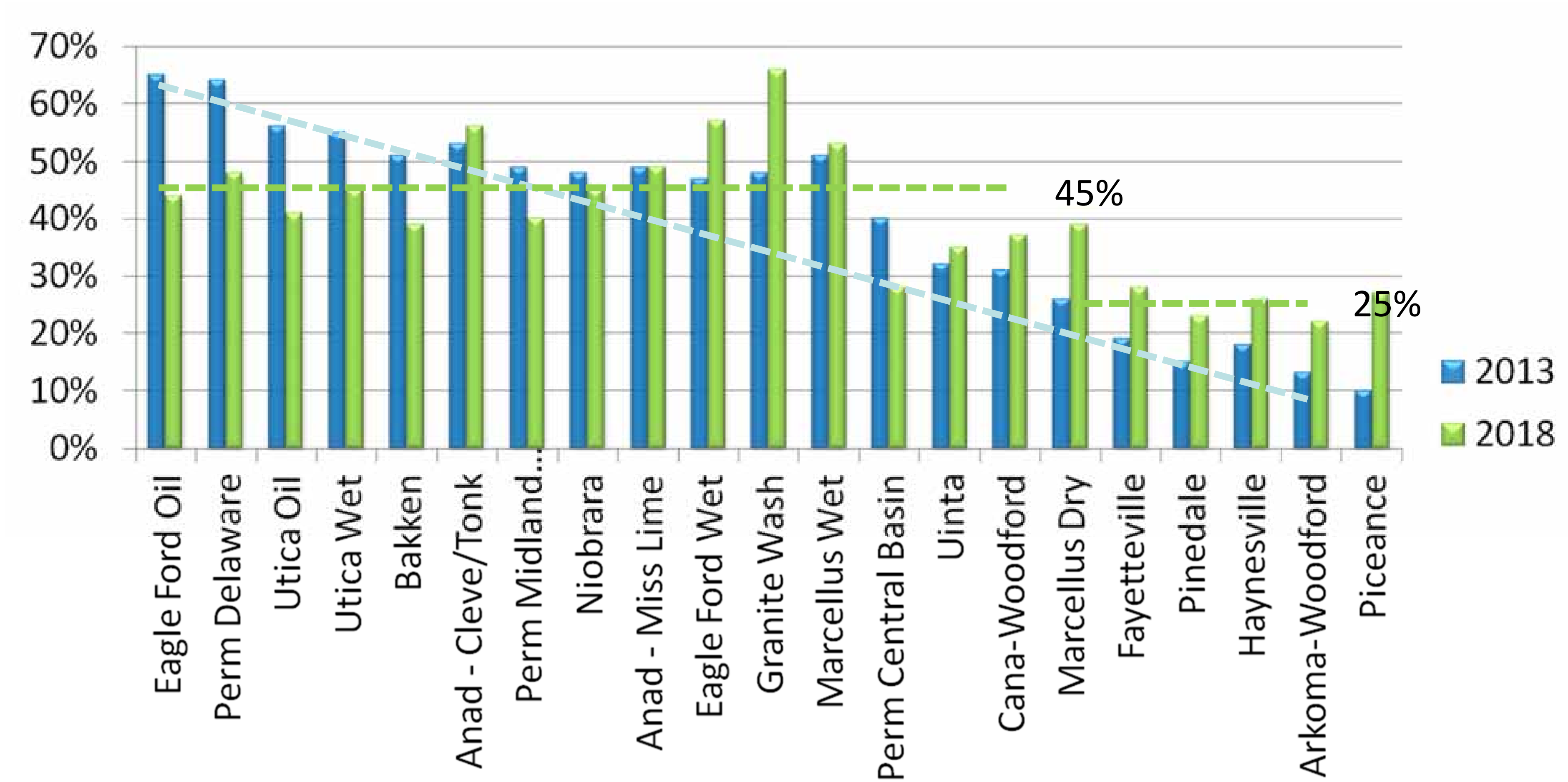
Source: Southwestern Energy Financials

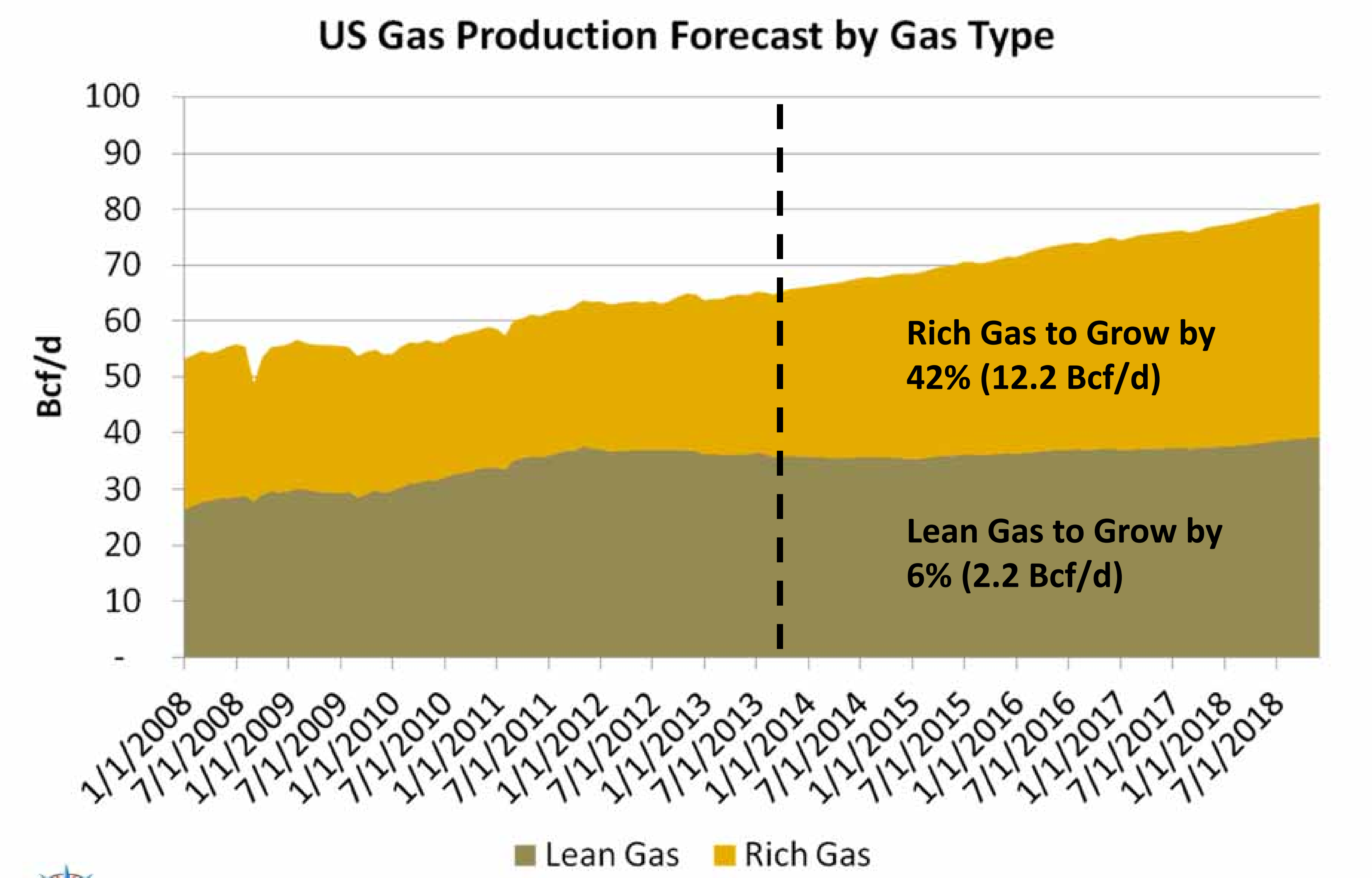
2018 IRRs Support Lean and Rich Gas Production



2013 Price Assumptions: *Gas = 12 month forward average curve for each regional pricing point (range $4.03-$4.28/Mcf)*
Oil = 12 month forward average WTI +/- differential (range $79-$96/barrel)
NGLs = weighted average $/barrel , 12-mo forward average Mt. Belvieu prices (range $25-$51/barrel)
2018 Forward Curve Price Assumptions: *Gas = $4.91/Mcf, NGLs = $44/barrel, Oil = $77/barrel)*

Source: Bentek

Rich Gas Production Leading Growth Expectations



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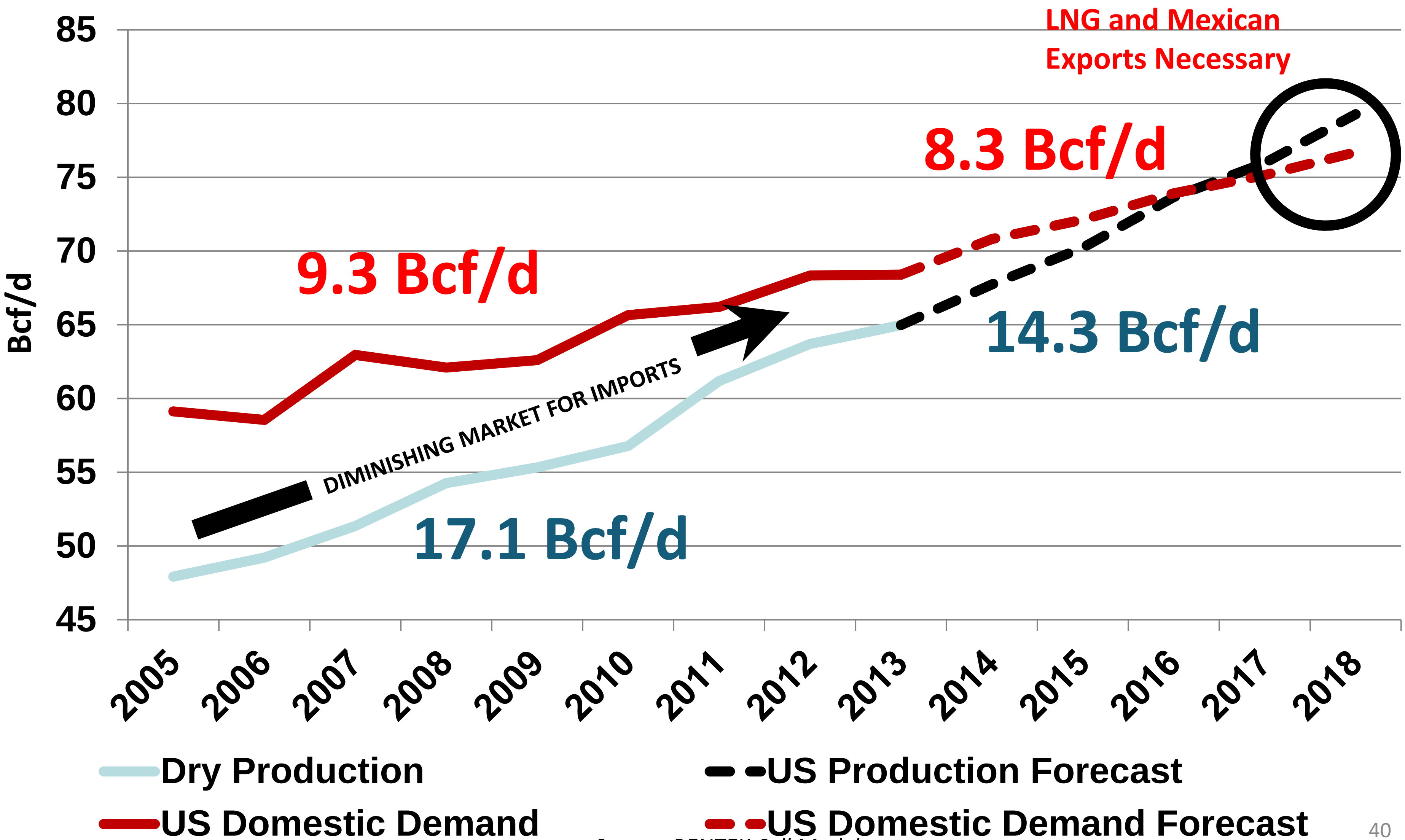
Source: Bentek

Growth in Domestic Demand Not Enough: Exports Needed

U.S. Supply/Demand Balance



Source: BENTEK Cell Model

World LNG Estimated June 2013 Landed Prices

Source: *Waterborne Energy, Inc.* Data in $US/MMBtu

Updated Mayl 23, 2013

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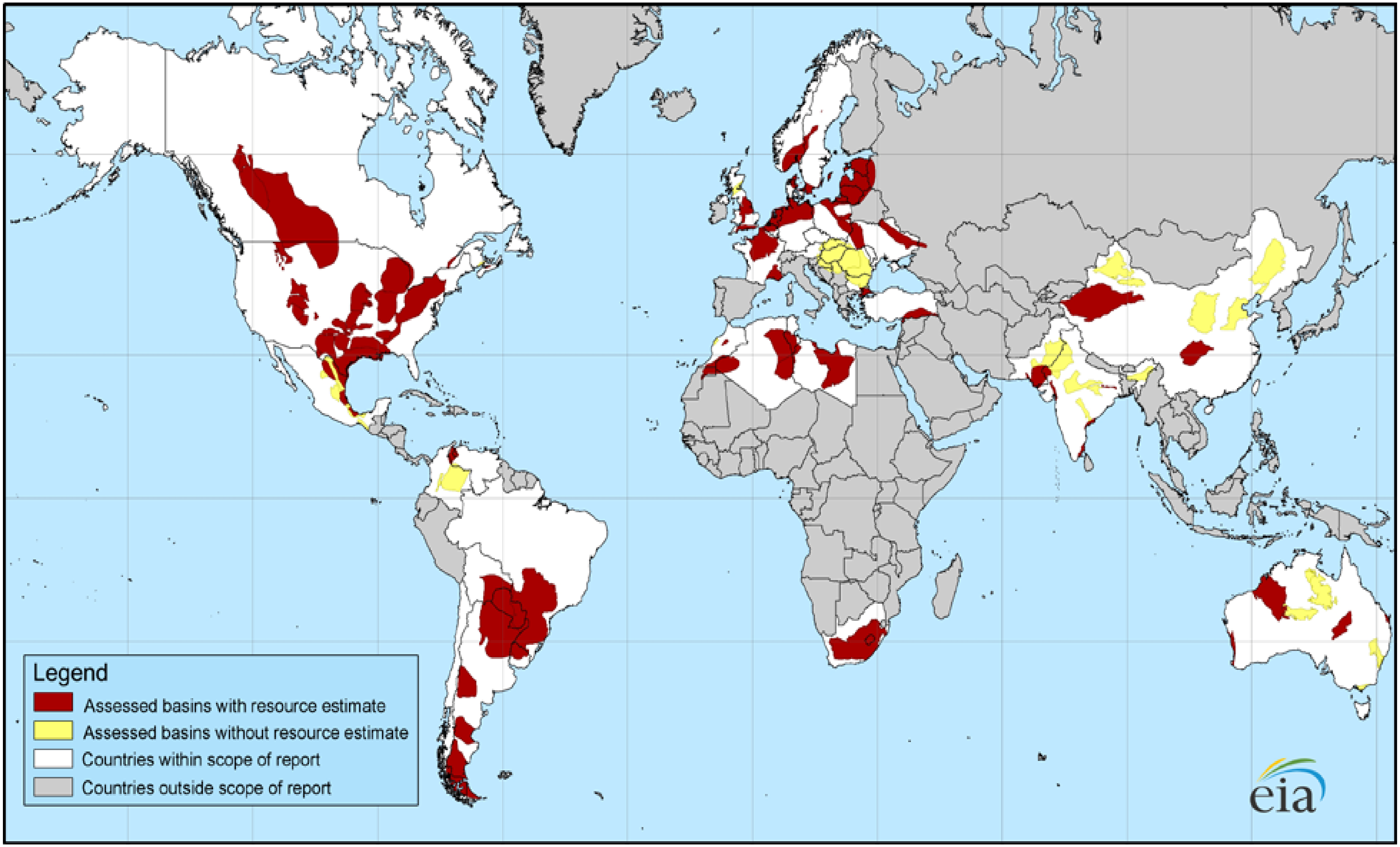
Global Shale Reserves

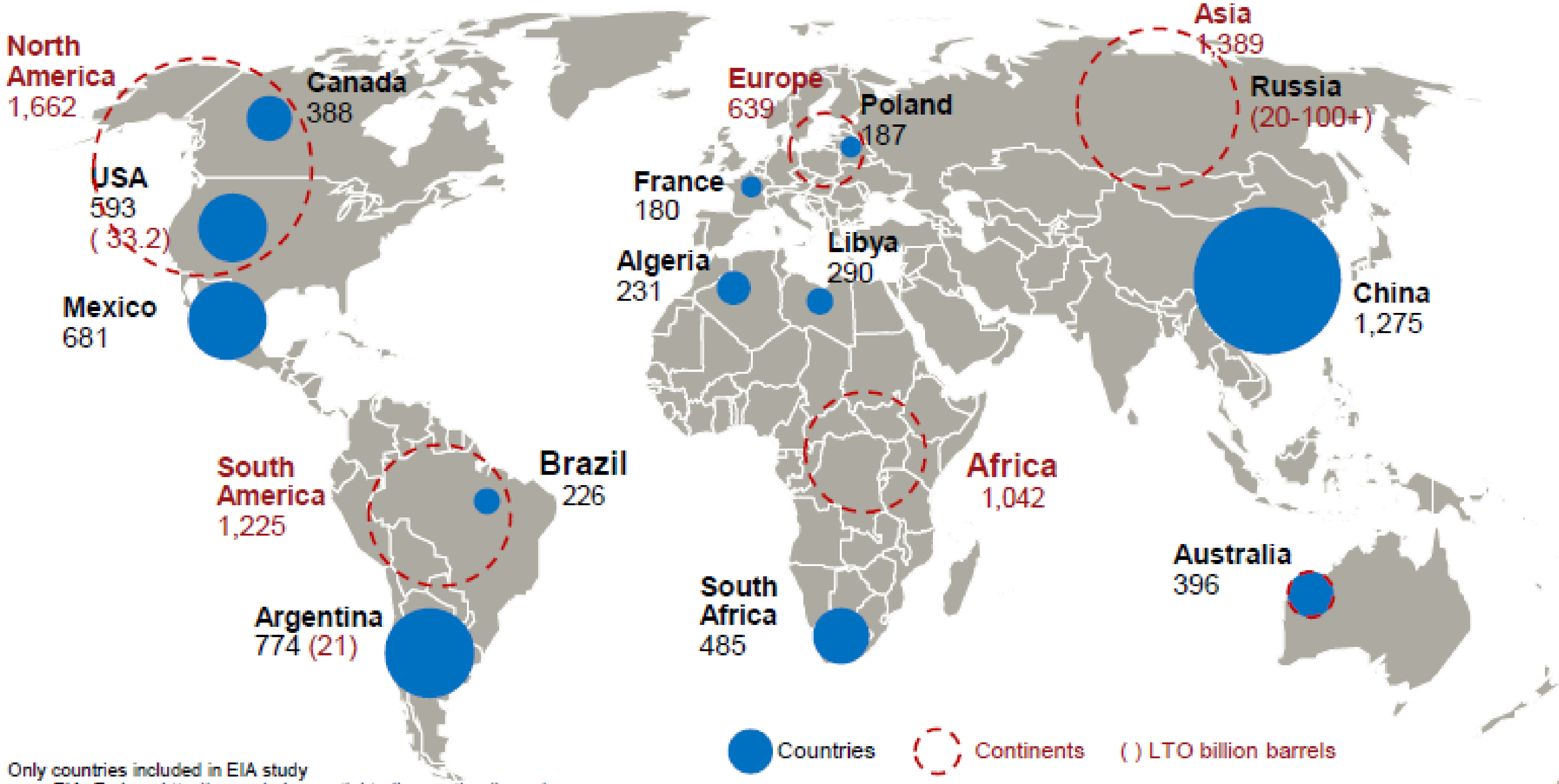


Source: EIA; Dr. Jim Duncan, ConocoPhillips, *Decoding the Relevance of Abundant Supply,* 2011 COGA Presentation

Resource potential in North America is massive – with the Rockies accounting for a significant fraction

Major global shale gas and LTO opportunities[1]

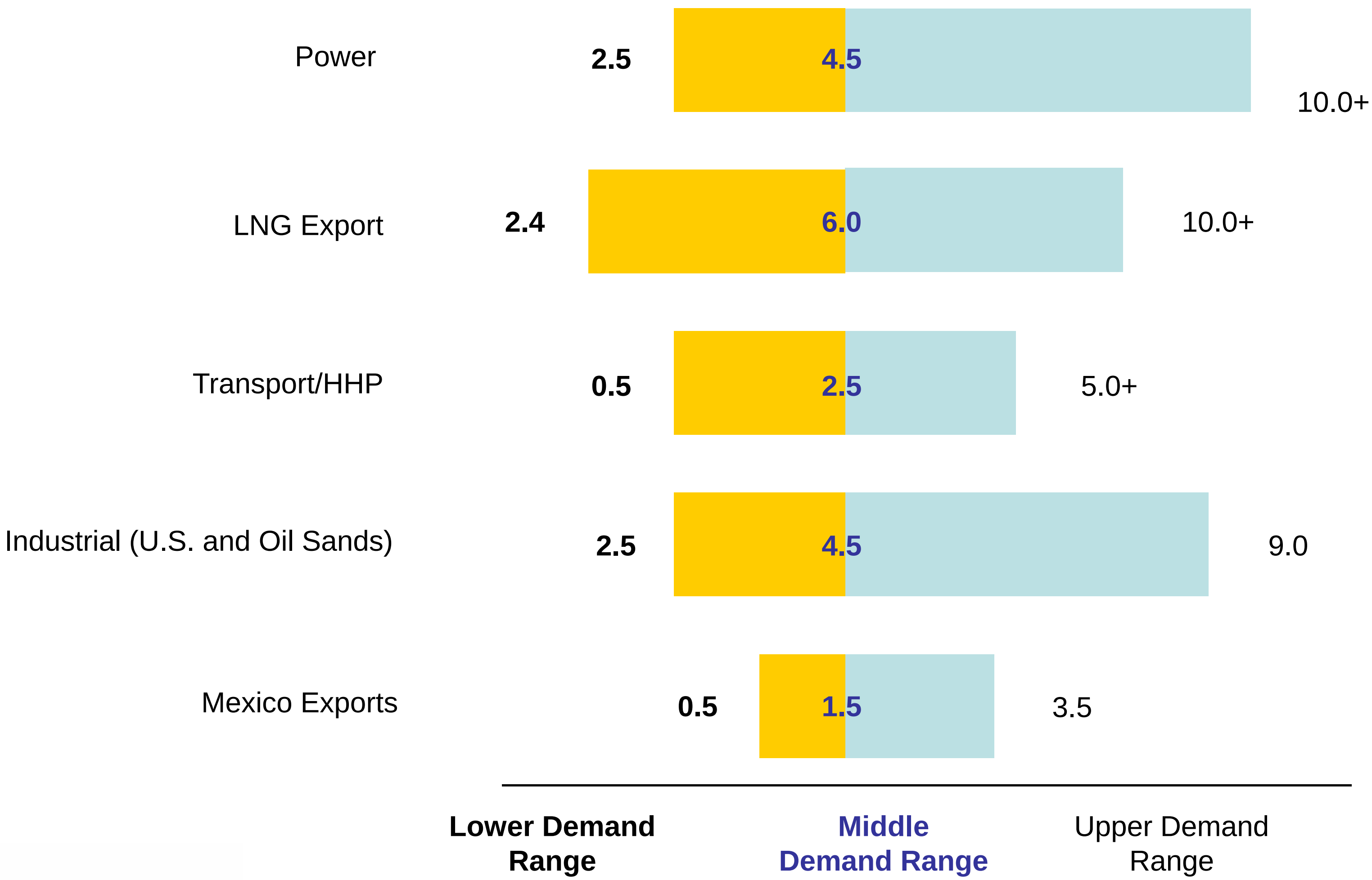
Technically recoverable shale gas (trillion cubic feet) and LTO (Billion barrels) resources



1. Only countries included in EIA study
Source: EIA, Forbes, http://www.shale-gas-tight-oil-argentina-ii.com/

North American Natural Gas
Demand Ranges by Selected Sector

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



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Source: Encana Corporate Presentation, August 2013; Industrial Energy Consumers of America; Bentek Energy; Raymond James; Michael Smith, Chairman & CEO Freeport LNG, Industry Sources

Conclusions

- 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

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Conclusions (cont'd)

- Infrastructure investment in the 4 areas of potential new demand (CNG/NGV, coal to gas, industrial demand growth, LNG exports) could take 5-8 years to be meaningful
- Natural gas liquids will continue to be the driving force in drilling
- BTU value disparity between natural gas and crude oil will continue for many years
- Beware of entities that are "talking their own book" (ie – chemical and manufacturing trade associations, LNG developers, NGV advocates, etc.)
- Exports must become a greater part of the demand equation, with obvious political implications.

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Citations for Report

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

Ponderosa Advisors LLC
Blue, Johnson Associates, Inc.
Chris Wright, Liberty Resources
Office of Fossil Energy
Office of Oil Gas Global Security Supply
U.S. Department of Energy
Raymond James and Associates, Inc.
Charif Souki, Cheniere Energy Inc.; Cheniere Research
U.S. Federal Energy Regulatory Commission
Institute for Energy Research (IER)
Energy Information Administration (EIA)
Bernstein Research
Western Energy Alliance
Sutherland LNG Blog
Platts Gas Daily Report, A McGraw Hill Publication
Colorado Oil and Gas Association
Peter Fasullo, En*Vantage

NGL – US Supply/Demand Matrix

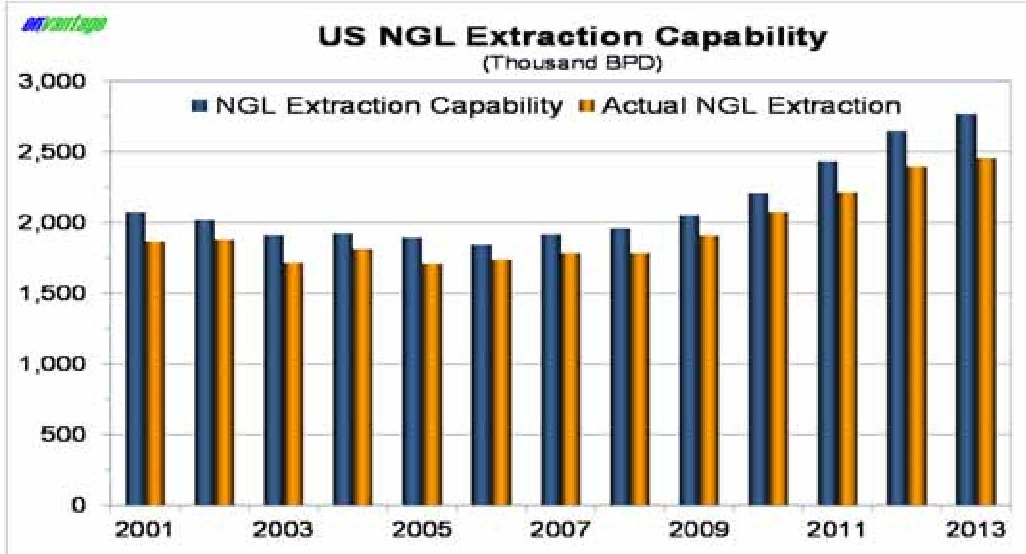
Current Size of US NGL Market – 3.3 million bpd

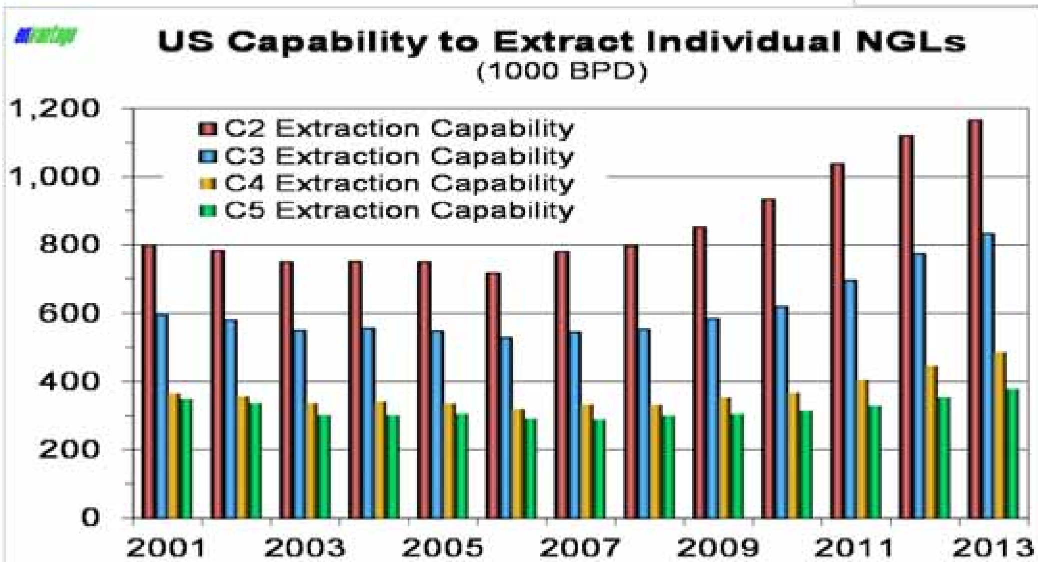
envantage	Ethane	Propane	N-Butane	I-Butane	C5+
Supply Source					
Oil Refining (21%) ↔	x	X	X	X	X
Gas Processing (74%) ↑	X	X	X	X	X
Imports (5%) ↓	-	X	X	X	X
Demand Sector					
Petrochemical (51%) ↑	X	X	X	X	X
Heating Fuel (12%) ↓	-	X	x	-	-
Agricultural Fuel (2%) ↔	-	X	-	-	-
Motor Fuels (20%) ↓	-	-	X	X	X
Oil Diluent (4%) ↑	-	-	x	x	X
Exports (11%) ↑	Not Yet	X	X	X	X

Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage

NGL Extraction Capability By Component

- Since 2006, NGL extraction capability up 54% (1 MM BPD) to 2.8 MM BPD.
- Currently, actual NGL extraction is running 89% of extraction capability mainly due to ethane rejection.





- *Ethane extraction capability up 62% (447 MBPD) to 1.16 MM BPD.*
- *Propane extraction capability up 46% (303 MBPD) to 830 MBPD.*
- *Butane extraction capability up 52% (166 MBPD) to 485 MBPD.*
- *C5+ extraction capability up 30% (87 MBPD) to 380 MBPD.*

Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage

Transitioning to an NGL Rich Environment Poses Threats & Opportunities

Threats

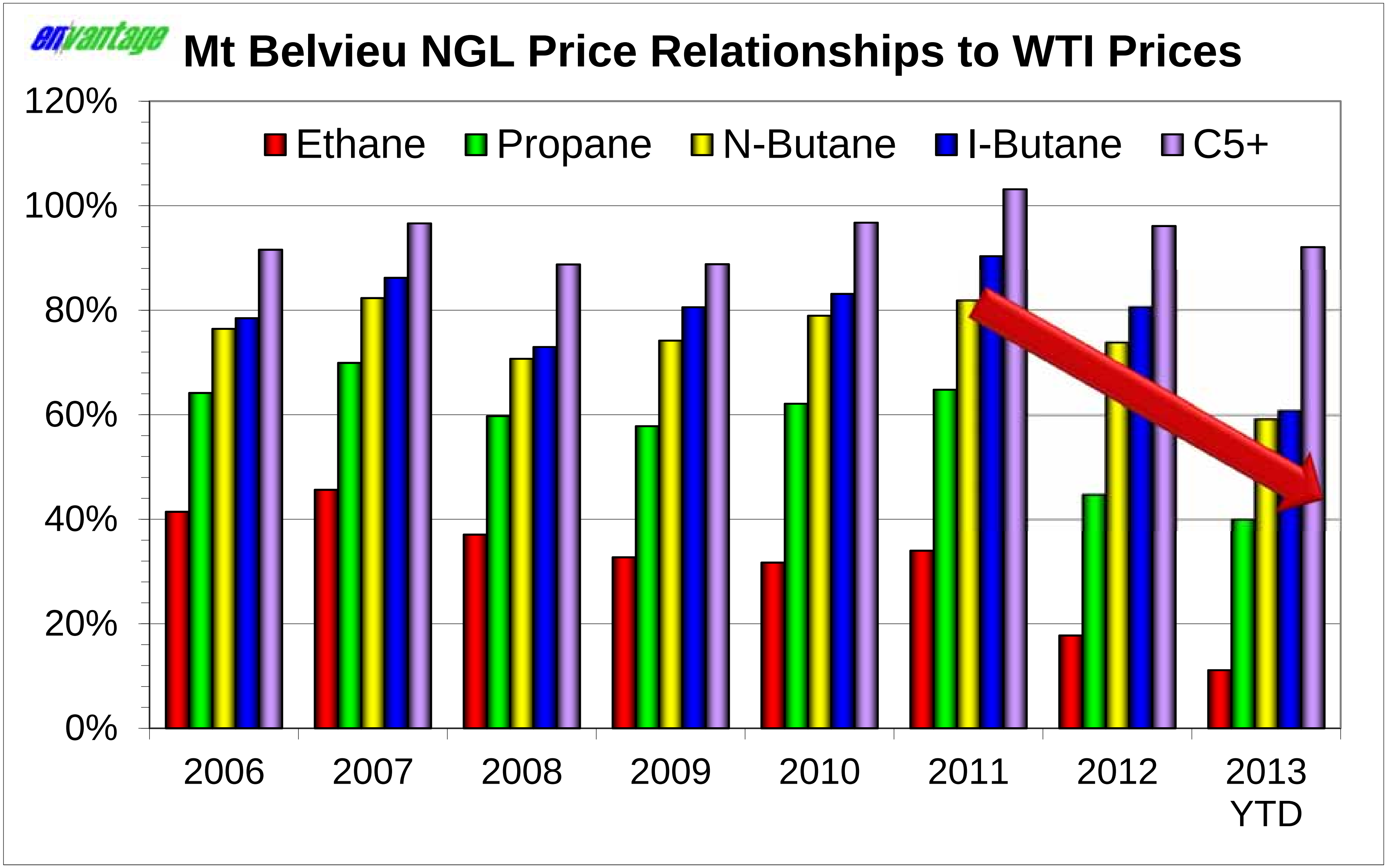
- Rapid NGL growth can depress NGL prices and frac spreads.
- Can cause logistical bottlenecks, depressing regional NGL prices.
- Threatens profitability of processing contracts exposed to NGL prices.
- Short-term - producers could throttle back the development of rich-gas shale plays if NGLs fail to provide a sufficient value uplift.

Opportunities

- Incentivizes NGL markets to expand – timing is critical.
- Creates opportunities to add more logistics to handle NGLs.
- Benefits integrated midstream players that can expand services across the NGL value chain.
- Ultimately, NGL supply base & infrastructure are enhanced providing a secure platform for market growth and/or exports.

Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage

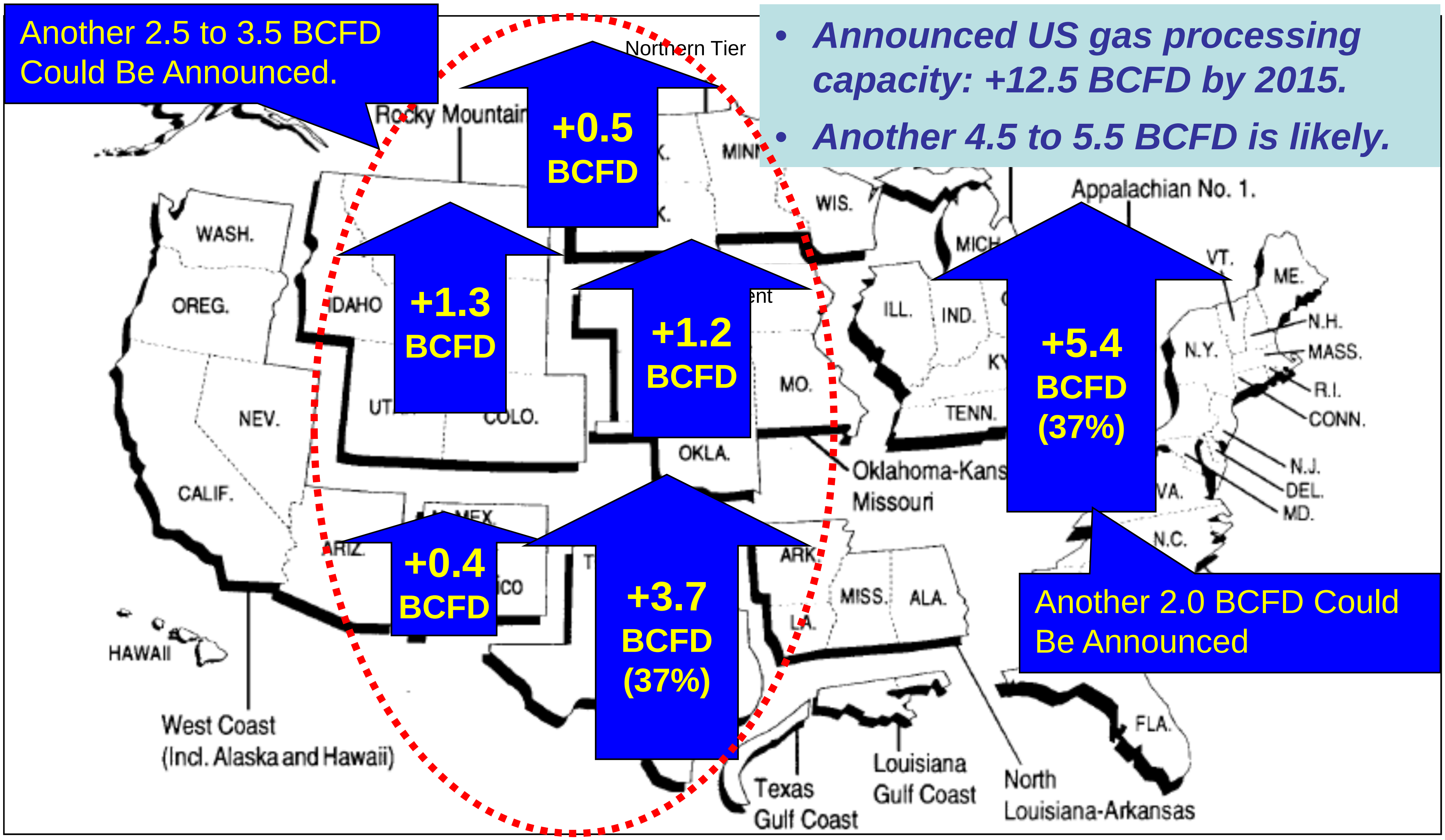
Mt Belvieu NGL Price Relationships to WTI



Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage

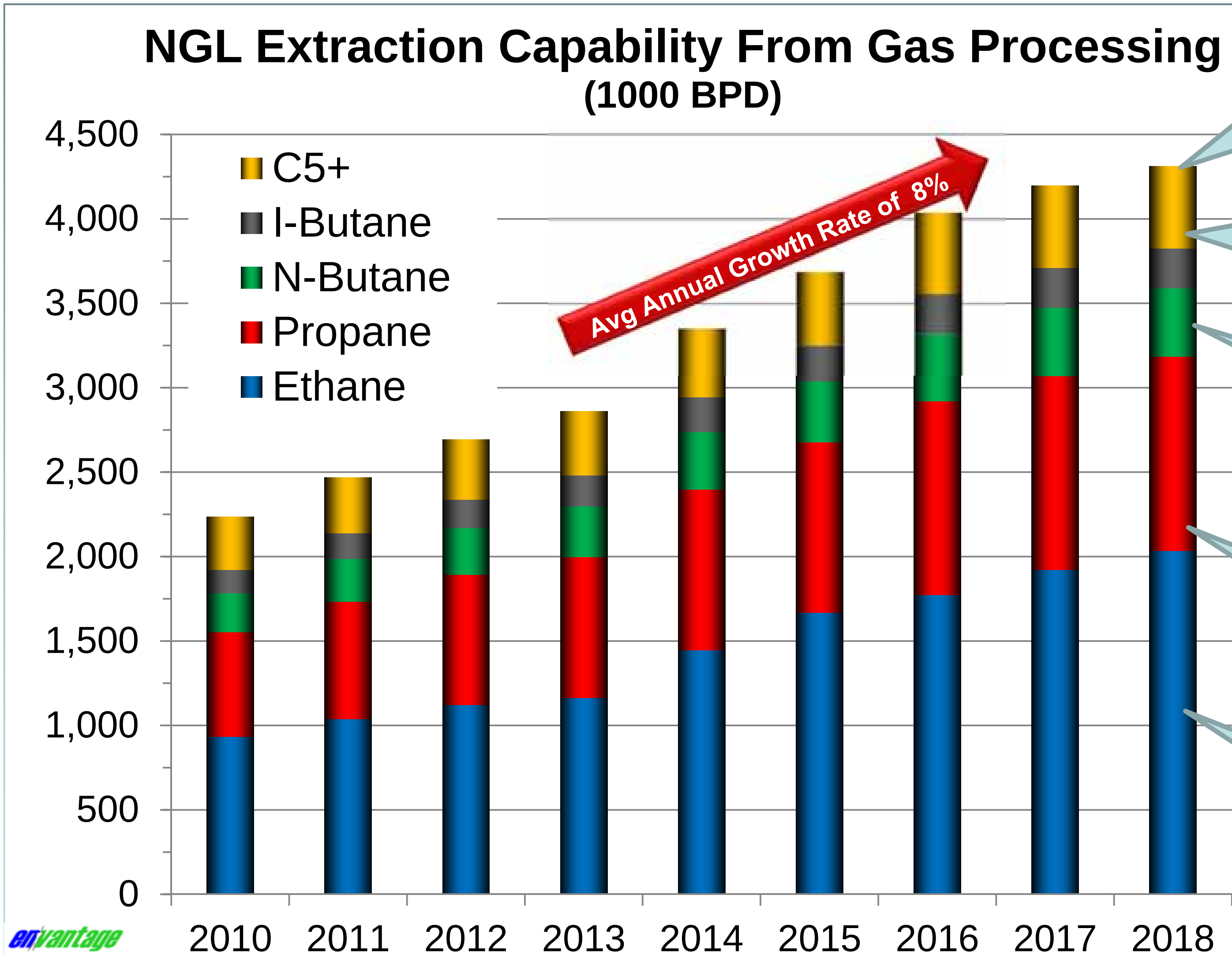
Gas Processing Additions
2013 to 2020

- ***Announced US gas processing capacity: +12.5 BCFD by 2015.***
- ***Another 4.5 to 5.5 BCFD is likely.***



Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage

US NGL Extraction Outlook Without Logistical Constraints



NGL extraction capability to reach 4.3 MM BPD by '18.

C5+ extraction capability to reach 486 BPD by 2018.

N-C4 and I-C4 extraction to reach 406 MBPD and 237 MBPD, respectively

Propane extraction to reach 1.15 MM BPD by 2018.

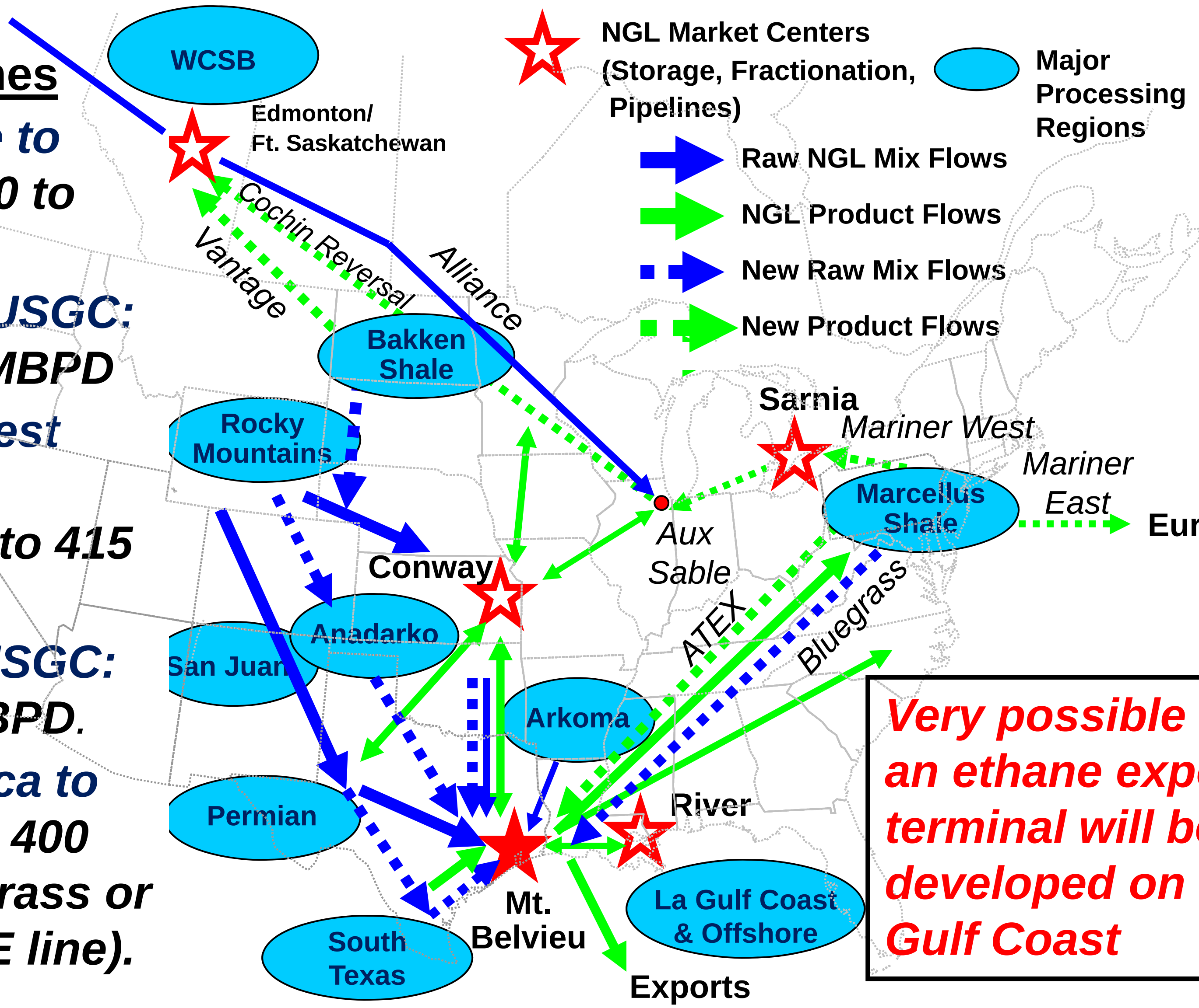
Ethane extraction to reach 2.0 MM BPD by 2018.

Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage

Future NGL Transportation Corridors

New Y-Grade Lines

- ***Bakken Shale to Mid-Cont. – 60 to 135 MBPD.***
- ***Mid-Cont. to USGC: – 543 to 660 MBPD***
- ***Rockies to West Texas and to Conway: 289 to 415 MBPD.***
- ***W. Texas to USGC: 580 to 640 MBPD.***
- ***Marcellus/Utica to USGC: 200 to 400 MBPD (Bluegrass or the KMP/MWE line).***

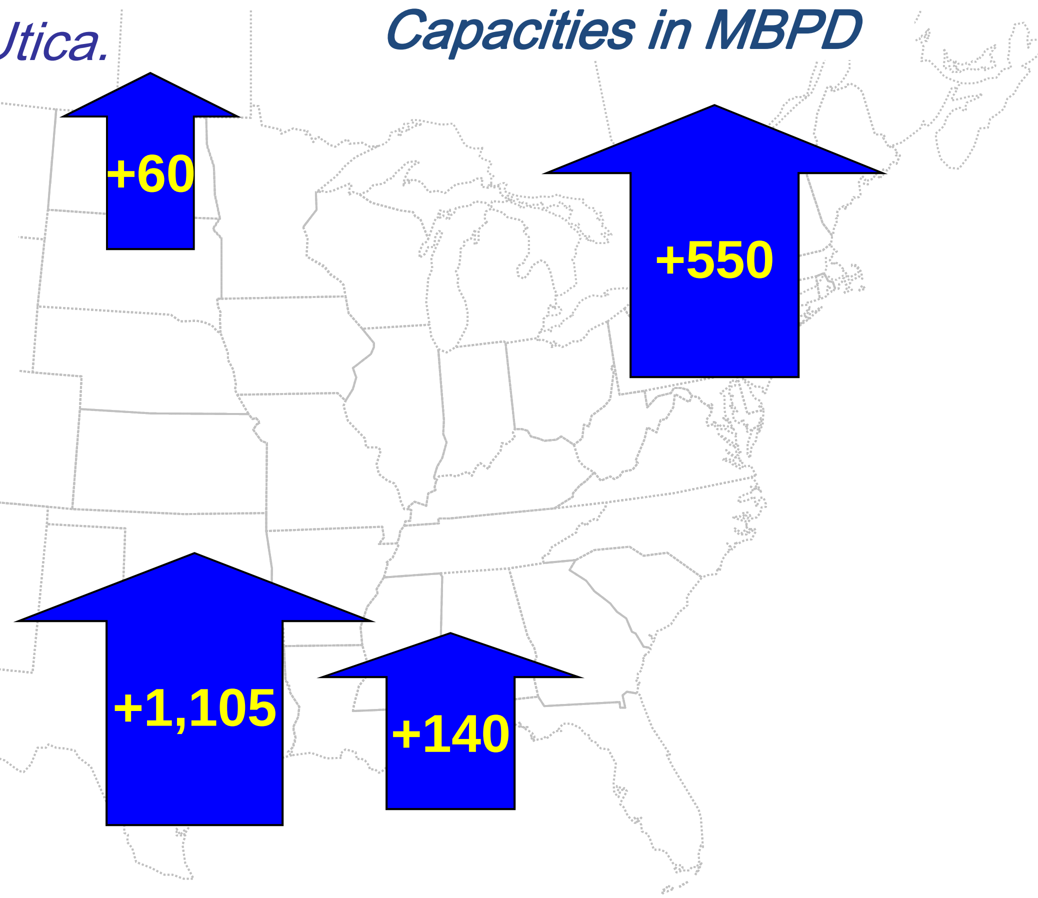


Very possible that an ethane export terminal will be developed on US Gulf Coast

Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage

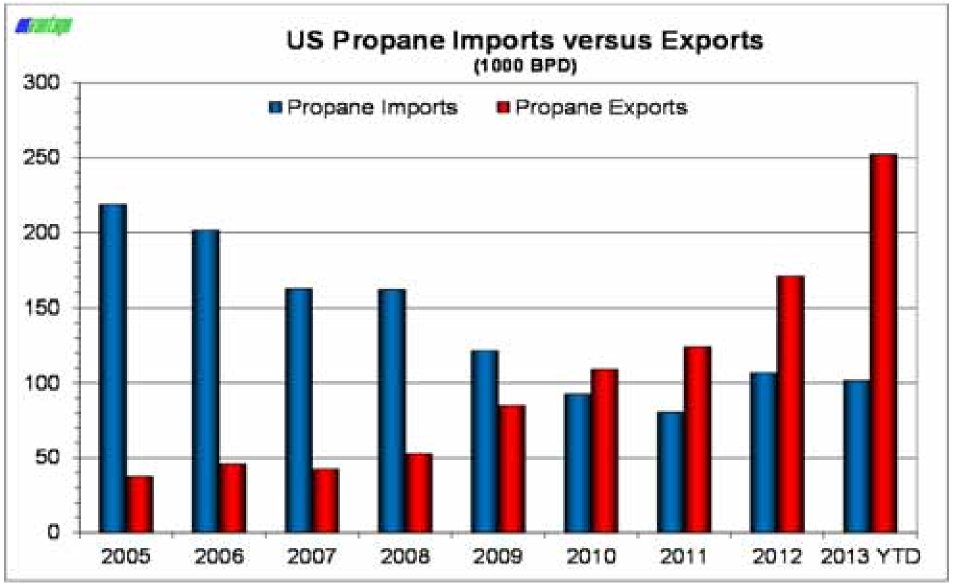
Increases to US Fractionation Capacity

- US fractionation as of 1/1/13 – <u>3.01 MM BPD</u> (67% on USGC)
- By 2016 – <u>1.85 MM BPD</u> of new capacity will be added:
  - *1.245 MMBPD on the USGC.*
  - *550 MBPD in Marcellus/Utica.*
  - *60 MBPD in Bakken*
- Probable that another <u>200 MBPD</u> of capacity will be built on USGC.
- By 2018, nearly 70% of all US NGLs extracted from gas processing will be fractionated on USGC.

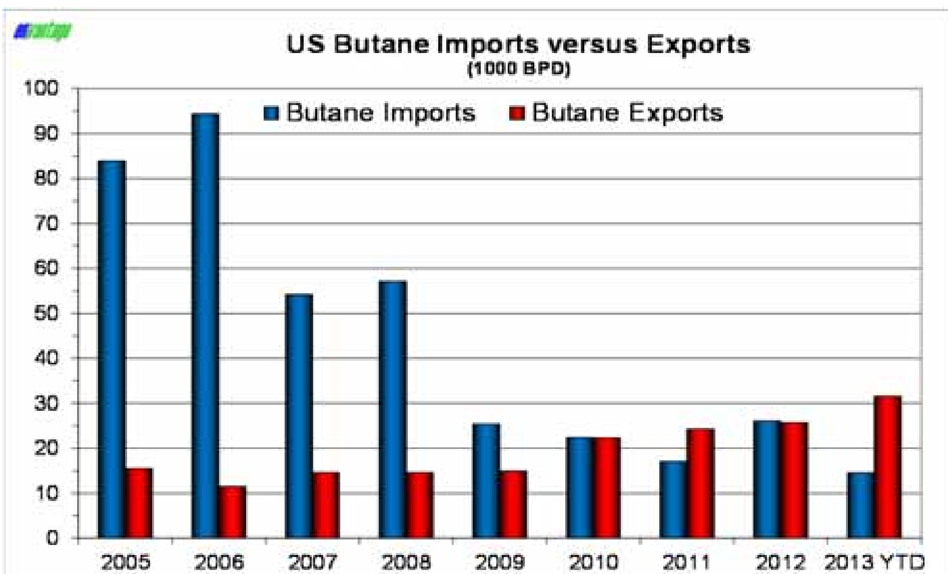


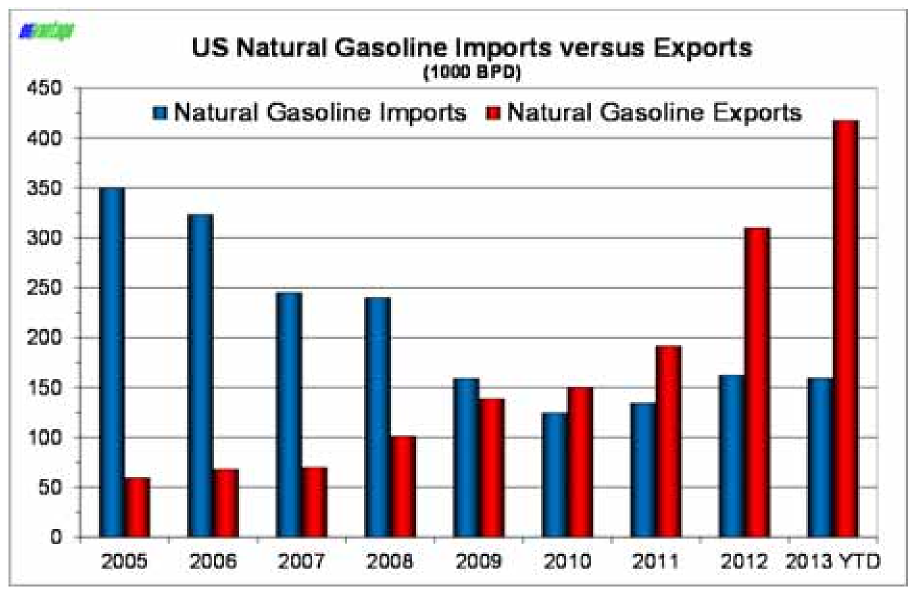
Source: Companies' Press Releases

US is a Net Exporter of NGLs



- US is currently a net exporter of 258 MBPD of C3+ NGLs in 2013.
- USGC waterborne LPG export capacity could reach 750 MBPD by 2016 – w/ at least 50 MBPD in N.E.
- Waterborne exports of ethane commences in 2015 in the N.E., with a possible ethane export terminal on USGC.





Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage

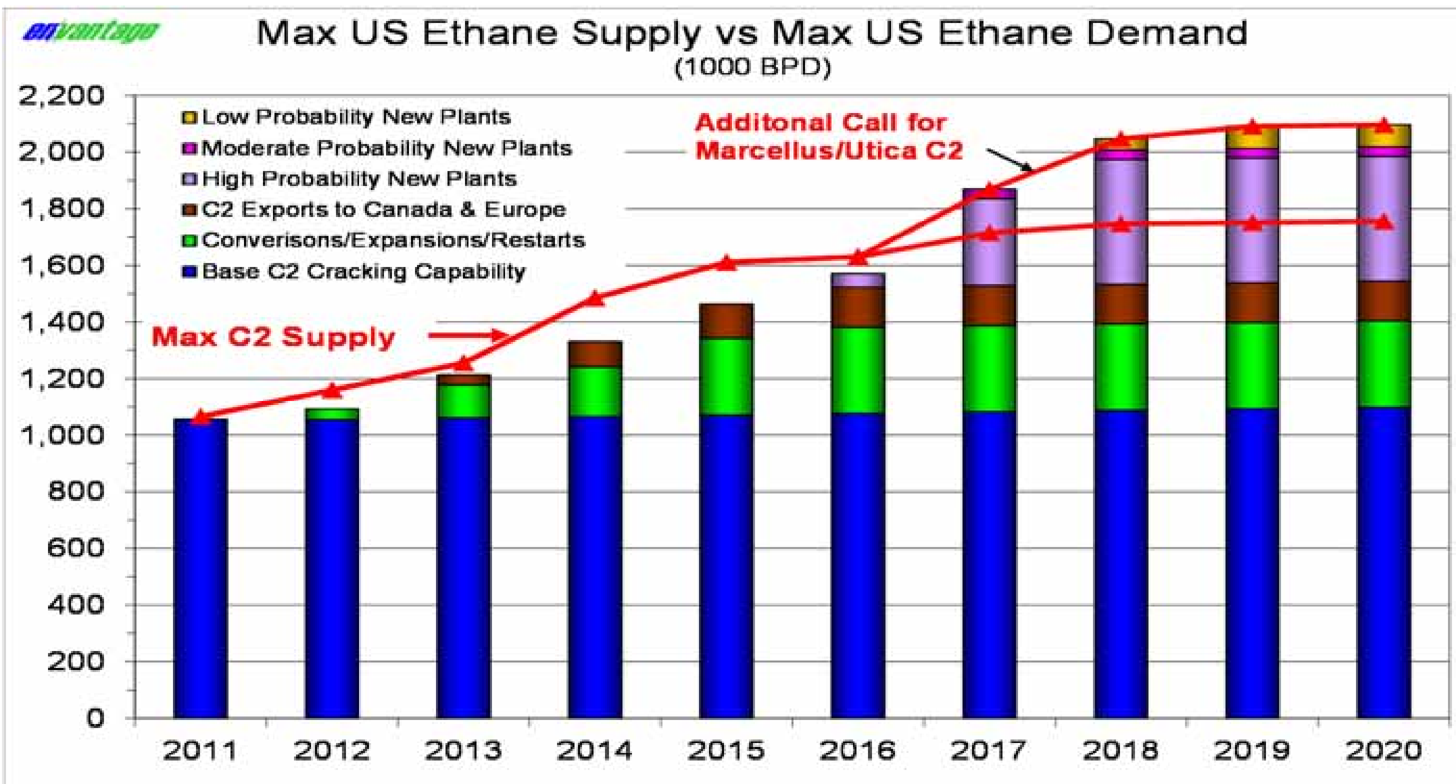
NGL Storage – The Next Bottleneck

- About 457 MM Bbls of NGL salt dome storage on USGC.
- Marginal increases in salt capacity based on announcements:
  - *Increases to 472 - 477 MM Bbls over the 2013 to 2020 period.*
  - *USGC salt storage must handle an additional 1.4 MM BPD of NGLs coming to the USGC needed to fill new fractionation capacity.*
- No major storage projects in Mid-Continent.
- Limited quality salt formations in Marcellus/Utica - cost of logistics is very high. DCP developing ethane (salt) storage in Marysville, MI.
- Implications – more stress to efficiently absorb incremental NGLs. Expect USGC NGL storage rates to increase.

Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage

Market Summary for Ethane

- **Ethane – to remain oversupplied until 2017 when new world-scale ethylene plants are completed on USGC.**
  - *Expansion of existing ethylene plants through 2016: +230 MBPD*
  - *5 new world-scale ethylene plants (2017 – 2018 period): +440 MBPD.*
  - *Exports to Canada and from the Northeast to Europe: +130 MBPD*



Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage

Market Summary for the Remaining NGLs

- **Propane – US exports of propane will increase and will be needed to keep US propane markets balanced.**
  - *Traditional propane markets in US will show flat growth at best.*
  - *PDH will be a growing end-use for US propane – expect 4 new PDH plants between 2015 – 2018, in addition to the 1 plant now operating.*
- **Butanes – greater exports are needed - either outright or blended into gasoline to be exported.**
  - *Some refiners considering expanding their alkylation capacity.*
  - *Butane dehydrogenation to butadiene and butylenes - possible but these are long-term, high cost projects.*
- **Natural Gasoline – competition from condensate production will increase the need to export natural gasoline.**
  - *Greater use as a diluent for Canadian tar sand production – several projects are underway to transport USGC C5+ volumes to Alberta.*
  - *Growing exports of natural gasoline outright to Europe or Latin America or blended into gasoline being exported out of Gulf Coast.*

Source: *The Transformation of the US NGL Midstream Sector,* Peter Fasullo, En*Vantage