

Super Abundant Energy ... It's not a scare resource anymore!

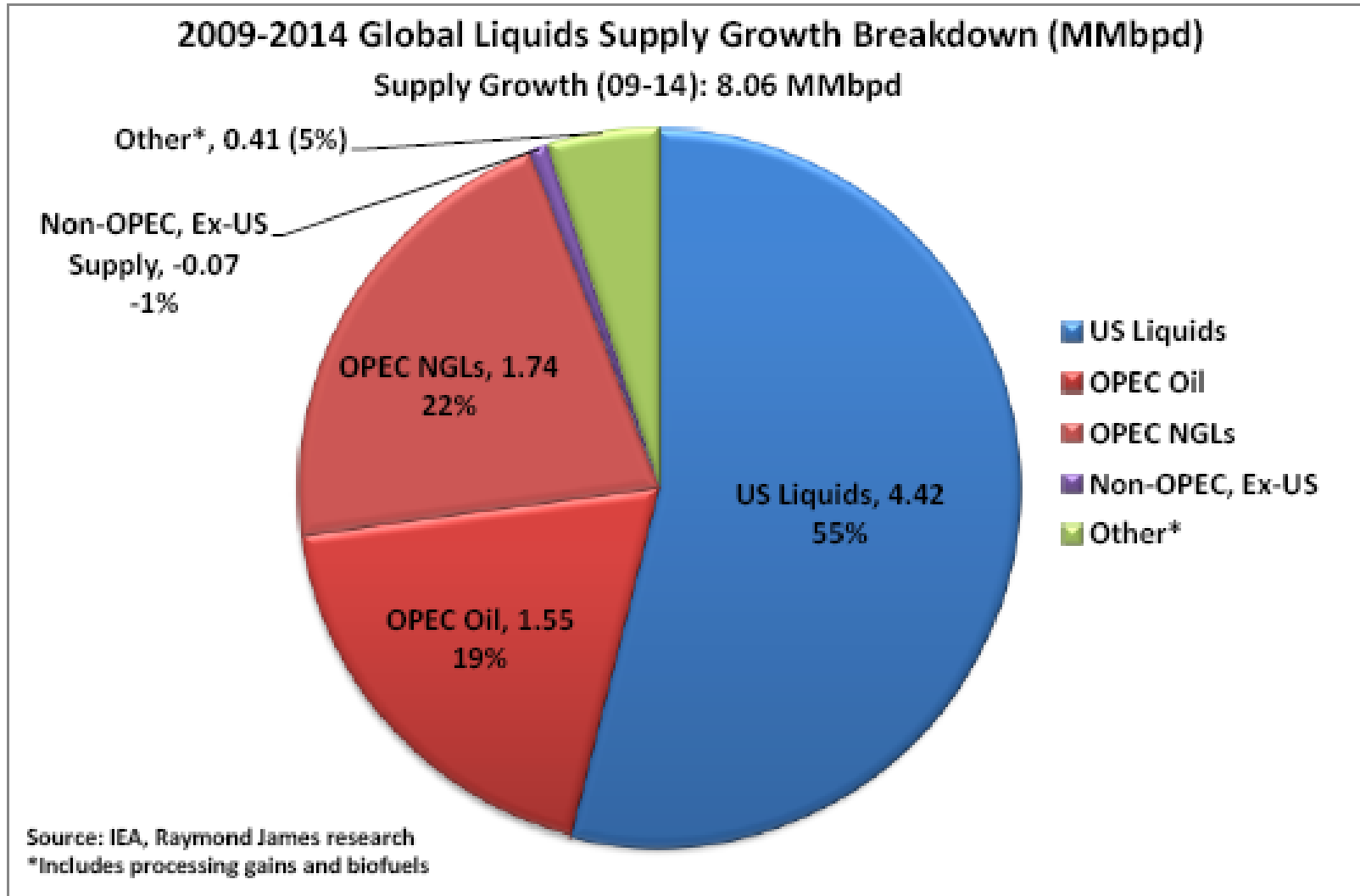
Presentation to:
The Colorado Farm Bureau

By:
John Harpole



February 7, 2017

The House of Saud's Motivation



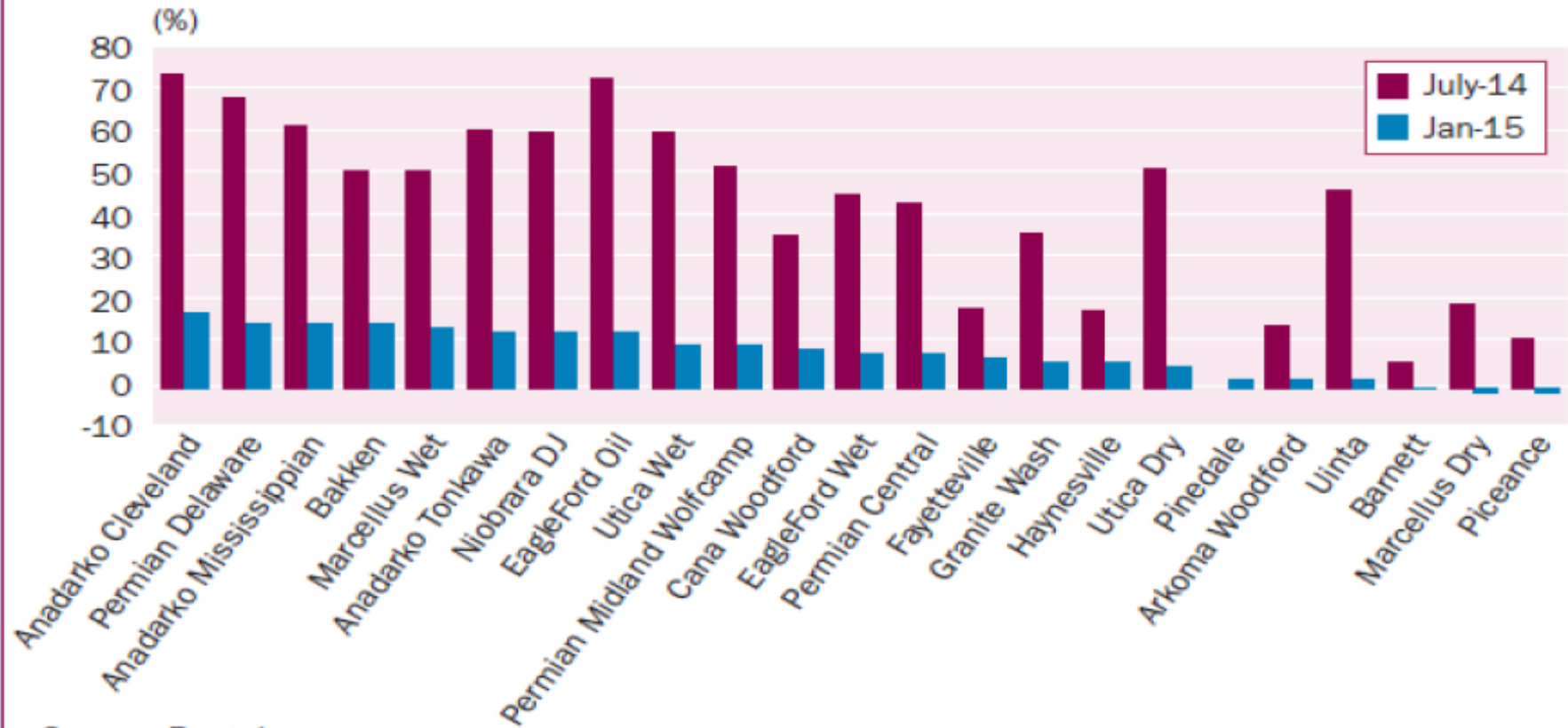
Source: Raymond James U.S. Research Energy Report, January 12, 2015

Major Takeaways – last talk April 14, 2015

- 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.)
- Current crude oil prices are too low and will rise to meet demand. \$100/b is no longer going to be the normal.
- Marginally economic areas across the U.S. will be negatively impacted. Geography and crude quality can tip the sales either way.
- North American LNG exports will be affected.



Internal Rates of Return per Well by Basin/Play (January 2015 versus July 2014)



Source: Bentek



Source: *Shale economics challenged as prices plummet*, Arjun Sreekumar, Platts Gas Daily Volume 32 / Issue 7 / Monday, January 12, 2015

OPEC's Strategy?

“In 2016, when OPEC *completes this objective of cleaning up the American marginal market*, the oil price will start growing again,” said Fedun, who’s made a fortune of more than \$4 billion in the oil business, according to data compiled by Bloomberg. *“The shale boom is on a par with the dot-com boom. The strong players will remain, the weak ones will vanish.”*”

- Leonid Fedun, VP and Board Member at OAO Lukoil (LKOD)



Source: *OPEC Policy Ensures U.S. Shale Crash, Russian Tycoon Says*, Asst Natl Dir Melony B. DeFord, Tea Party Command Center, November 28, 2014

Prince Alwaleed bin Talal

Saudi Prince: \$100-a-barrel oil 'never' again



Saudi Crown Prince
Abdullah bin Abdul Aziz

Saudi Foreign Minister
Prince Saud al-Faisal (C)

Saudi billionaire Prince
Alwaleed bin Talal



Source: *The Fabulous Life of Prince Alwaleed Bin Talal Alsaud*, Forbes and Maria Bartiromo for USA Today, January 11, 2015

Oil at \$65 Until Mid-2015: Kuwait Official

“The reason, according to Iranian Oil Minister, Bijan Namdar Zanganeh, ***was to keep prices low enough and long enough to threaten the U.S. shale oil industry and restore OPEC’s market share in America.*** Shale extraction requires expensive methods such as fracking and horizontal drilling, and many observers say it isn’t profitable if the price of oil drops below \$65 per barrel.”



Source: Real Money, The Street Ratings, By: Oilprice.com, December 11, 2014

Mercator Energy

A Game of Chicken?

Nation	Oil price per barrel required to break even or balance budget
US producers	\$38-\$77
Qatar	\$58
Kuwait	\$59
UAE	\$90
Saudi Arabia	\$92
Angola	\$94
Russia	\$101
Iraq	\$116
Venezuela	\$117
Algeria	\$119
Ecuador	\$122
Nigeria	\$124
Iran	\$136

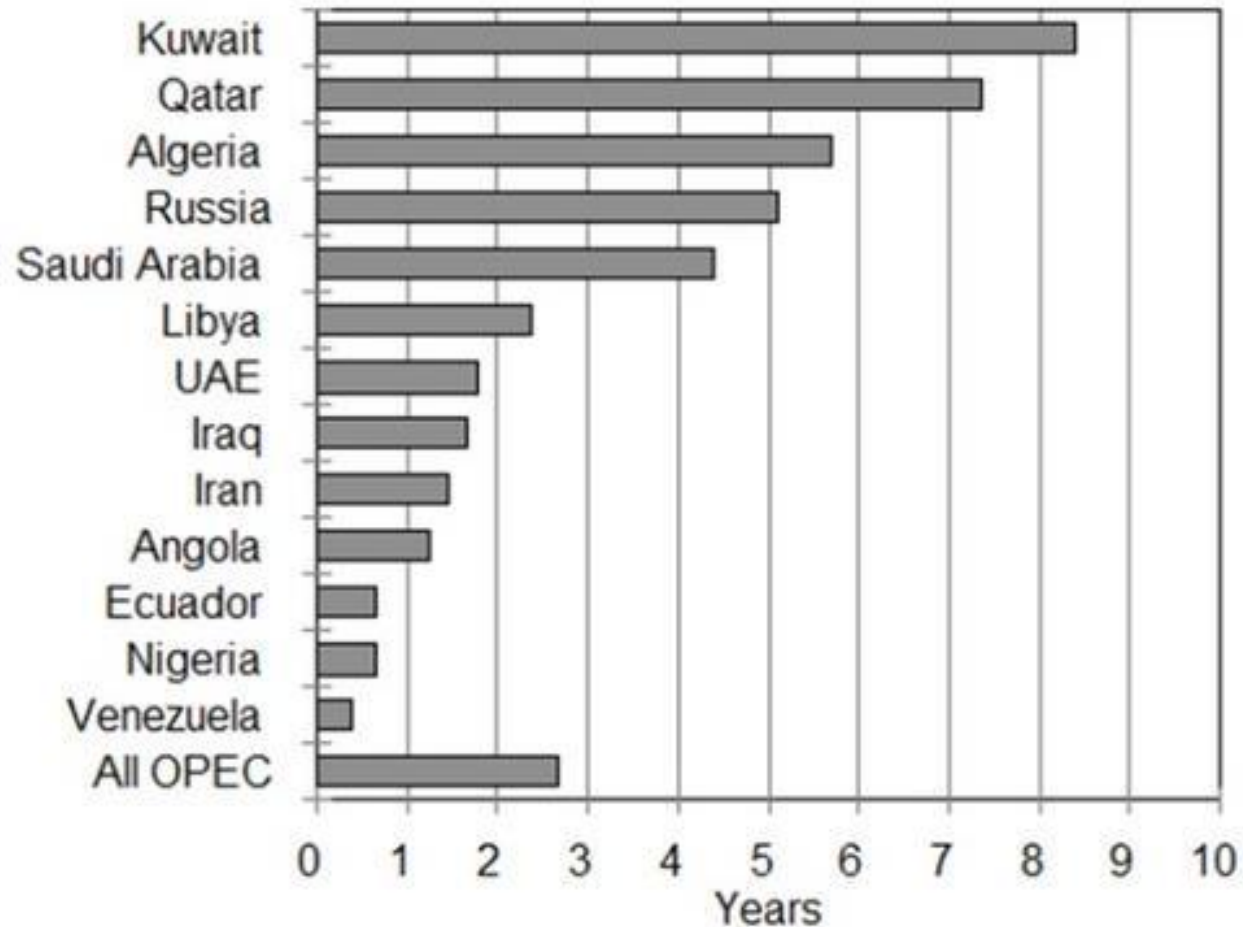
According to data compiled by Bloomberg, *“prices have dropped below the level needed by at least 9 OPEC member states to balance their budgets.”*

Source: Reuters, *The Saudi Arabian Oil Conspiracy and What it Might Mean for Your Portfolio*, The Motley Fool, Adam Galas, January 18, 2015

Survival of fittest as oil tumbles below \$65, Bloomberg News, December 1, 2014

Survival of the Fittest?

DURATION OF FOREIGN RESERVES @ \$50/BBL DEFICIT



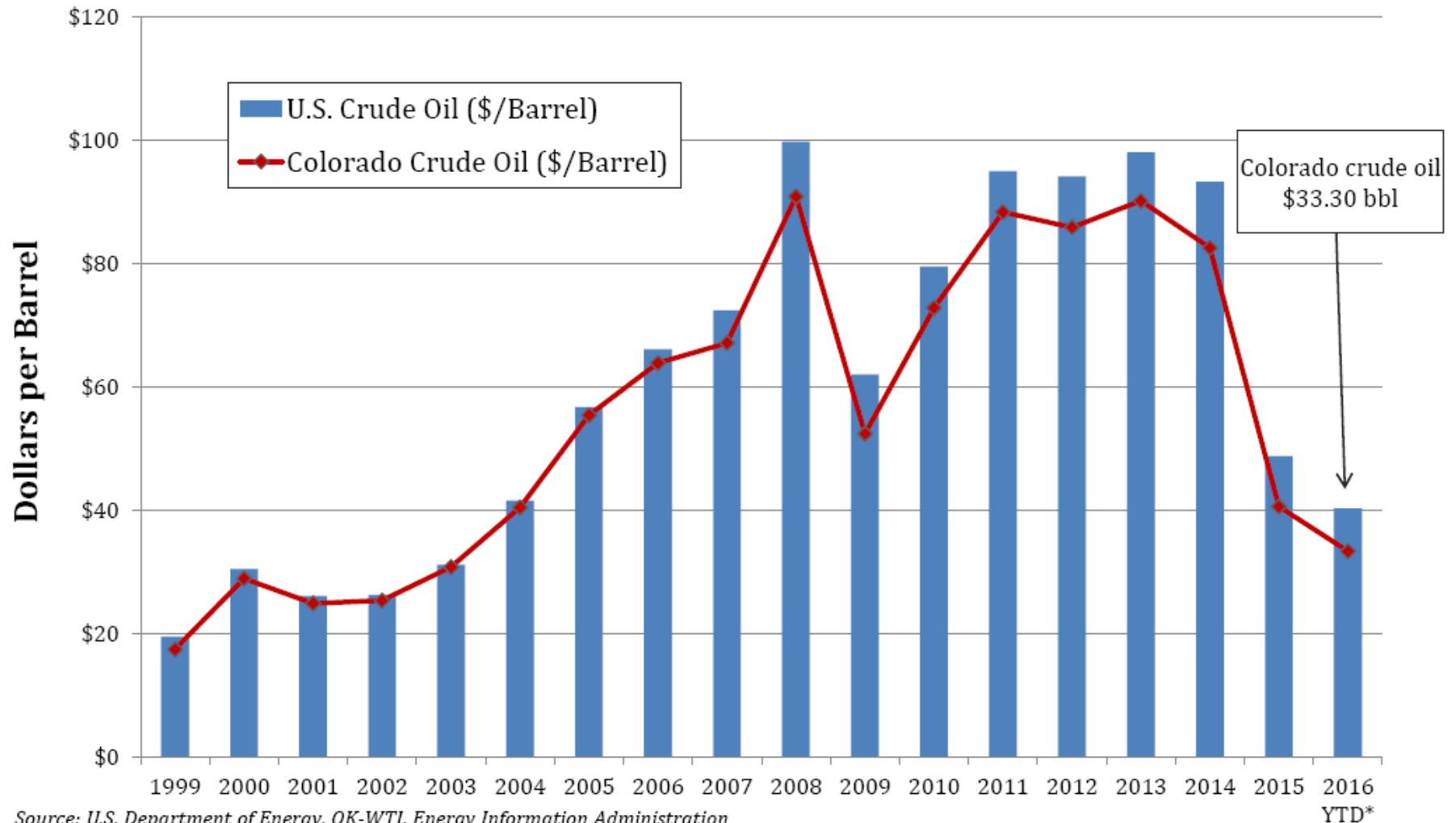
Saudis have staying power; \$750 billion in foreign country reserves



Source: Oilprice.com, *The Saudi Arabian Oil Conspiracy and What it Might Mean for Your Portfolio*, The Motley Fool, Adam Galas, January 18, 2015

Annual Average Crude Oil Prices, 1999-2016

Prices for Colorado-produced oil trend below the national average to account for fuel transportation costs to markets outside the state



Source: U.S. Department of Energy, OK-WTI, Energy Information Administration

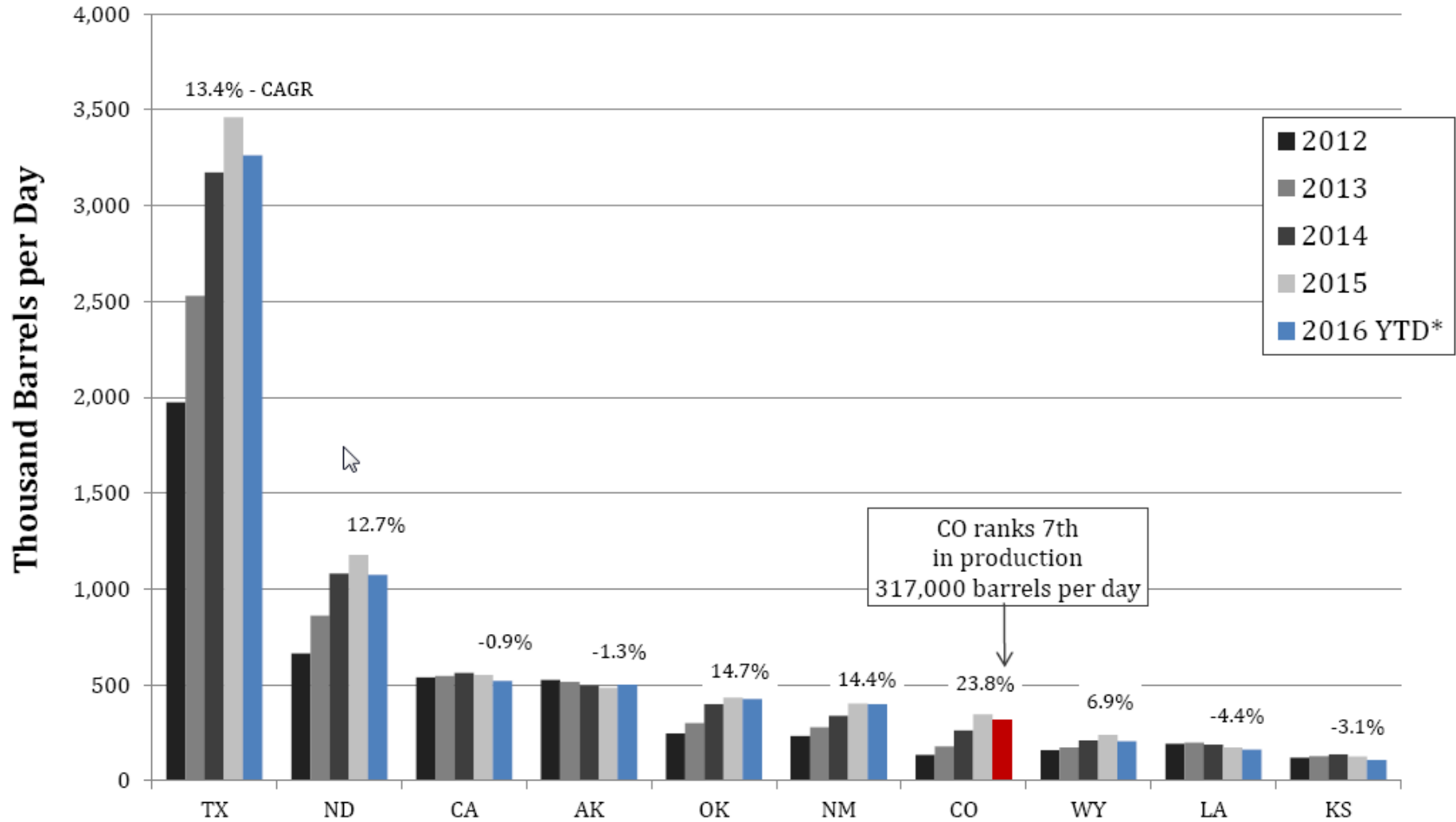
Note: Crude oil includes lease condensate recovered as liquid from natural gas wells. Colorado price represents the first-purchase price.

*2016 year-to-date data represents US average daily spot price from January to July and Colorado monthly average price over the same time.

Fig. 1

Crude Oil Production by State, 2012-2016

U.S. 2012 to 2016 compound annual growth rate (CAGR) was 8.6% compared with 23.8% in Colorado



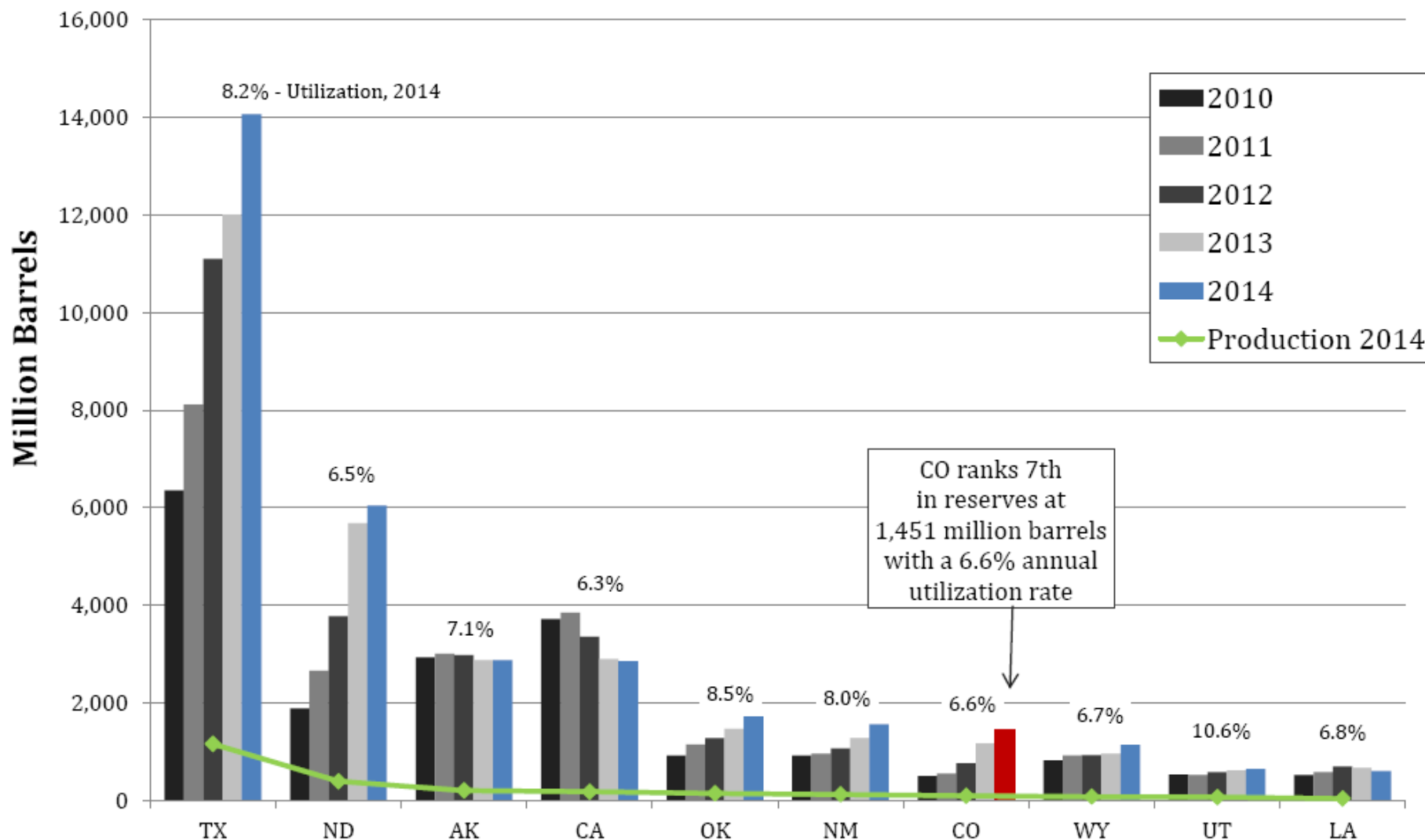
Source: U.S. Department of Energy, Energy Information Administration

Note: Crude oil includes lease condensate recovered as liquid from natural gas wells; the compound annual growth rate (CAGR) reflects the 2012 to 2016 period; *2016 year-to-date represents January to June.

Fig. 2

Crude Oil Reserves & Utilization Rate, 2010-2014

Technology improvements contribute to growing reserves



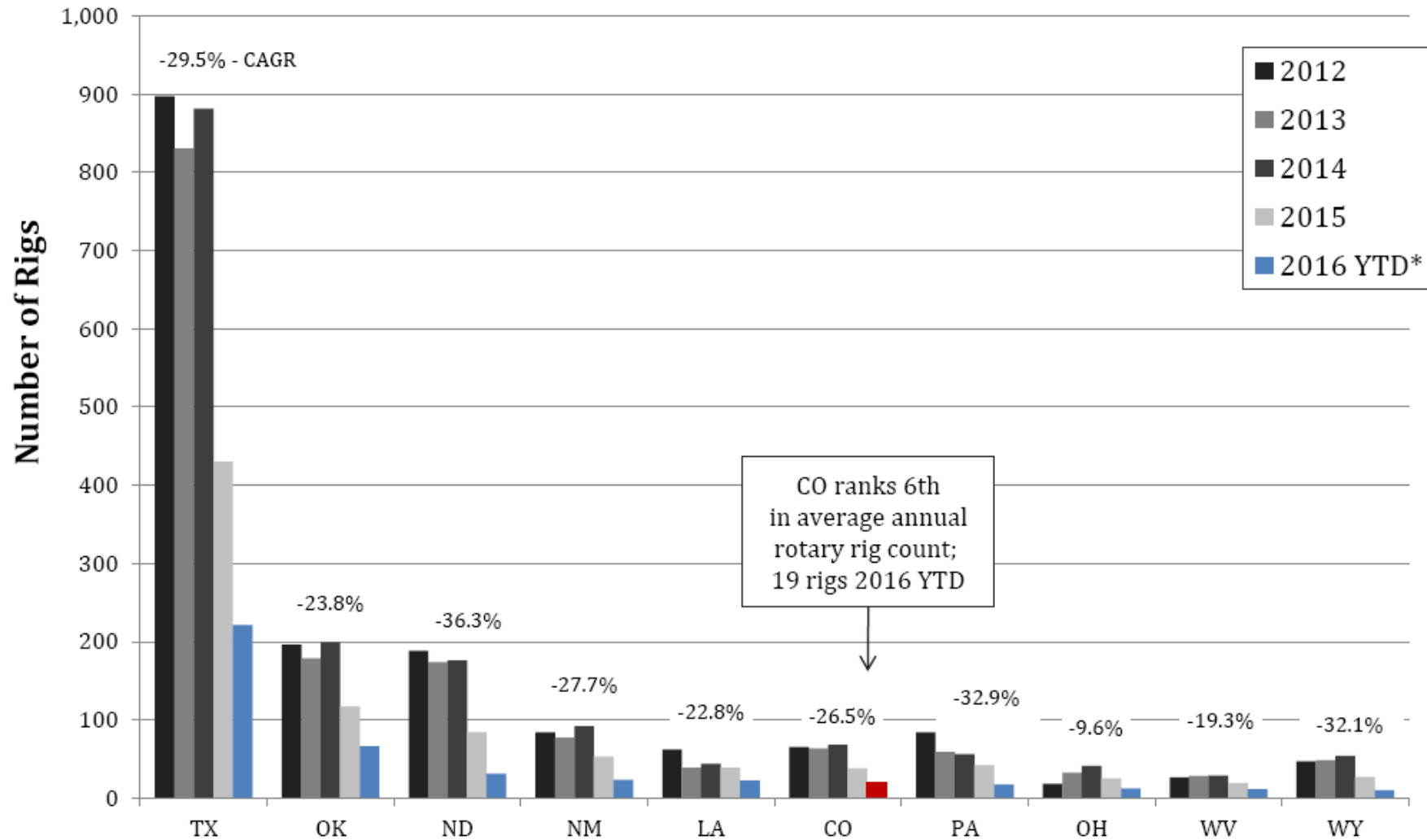
Source: U.S. Department of Energy, Energy Information Administration

Note: Utilization rate is the amount of reserves developed/produced annually; crude oil reserves include lease condensate

Fig. 3

Annual Average Rotary Rig Count, 2012-2016

DJ-Niobrara formation driving Colorado rotary rig count activity; 1,456 new wells were drilled in 2015; as of August 2016 there were 53,724 active wells in Colorado



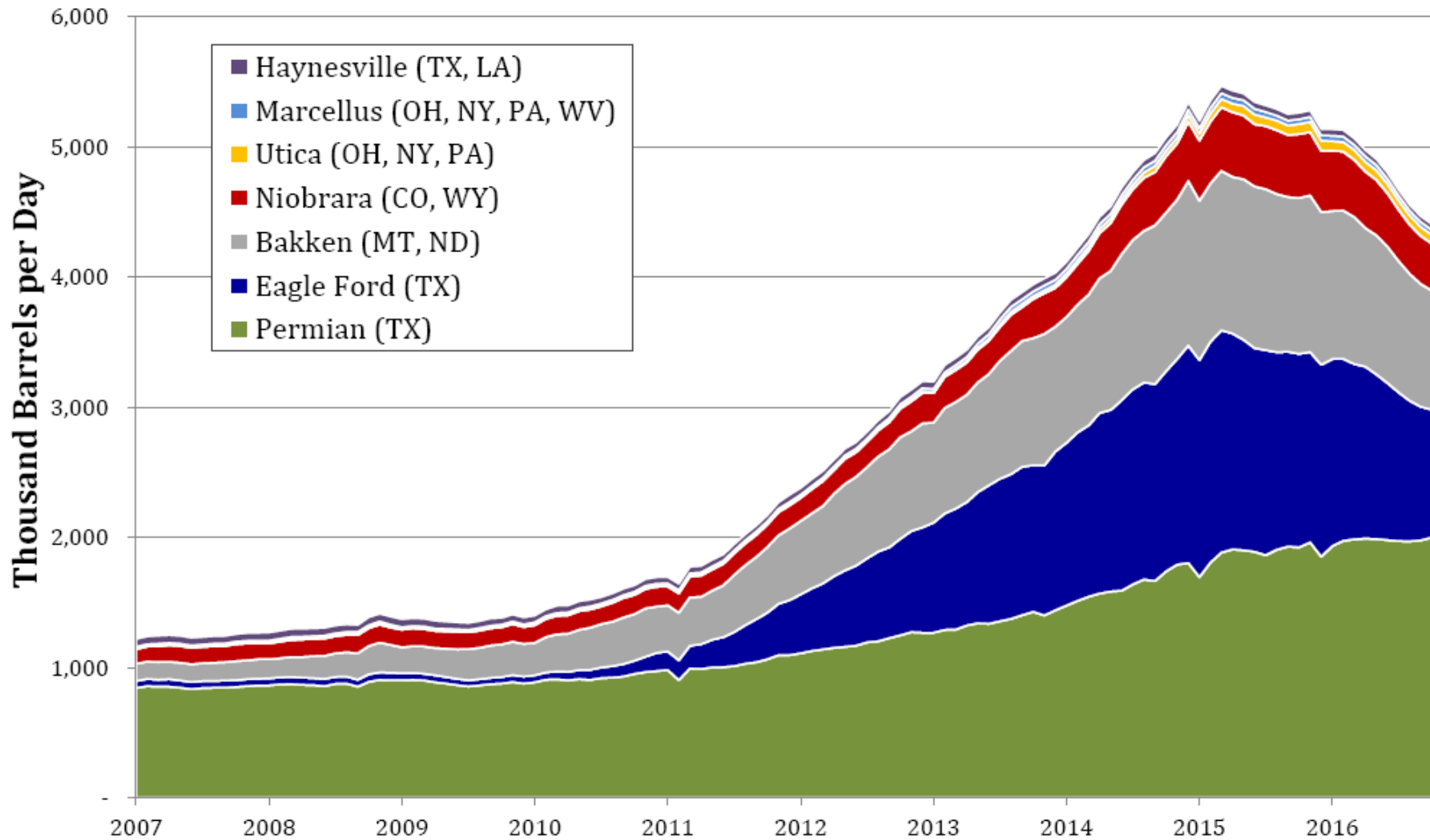
Source: Baker Hughes; Colorado Oil and Gas Conservation Commission

*2016 year-to-date represents January to September average; the compound annual growth rate (CAGR) reflects the 2012 to 2016 period.

Fig. 4

U.S. Shale Oil Production by Major Resource Play

Approximately 361,000 barrels per day in the Niobrara formation



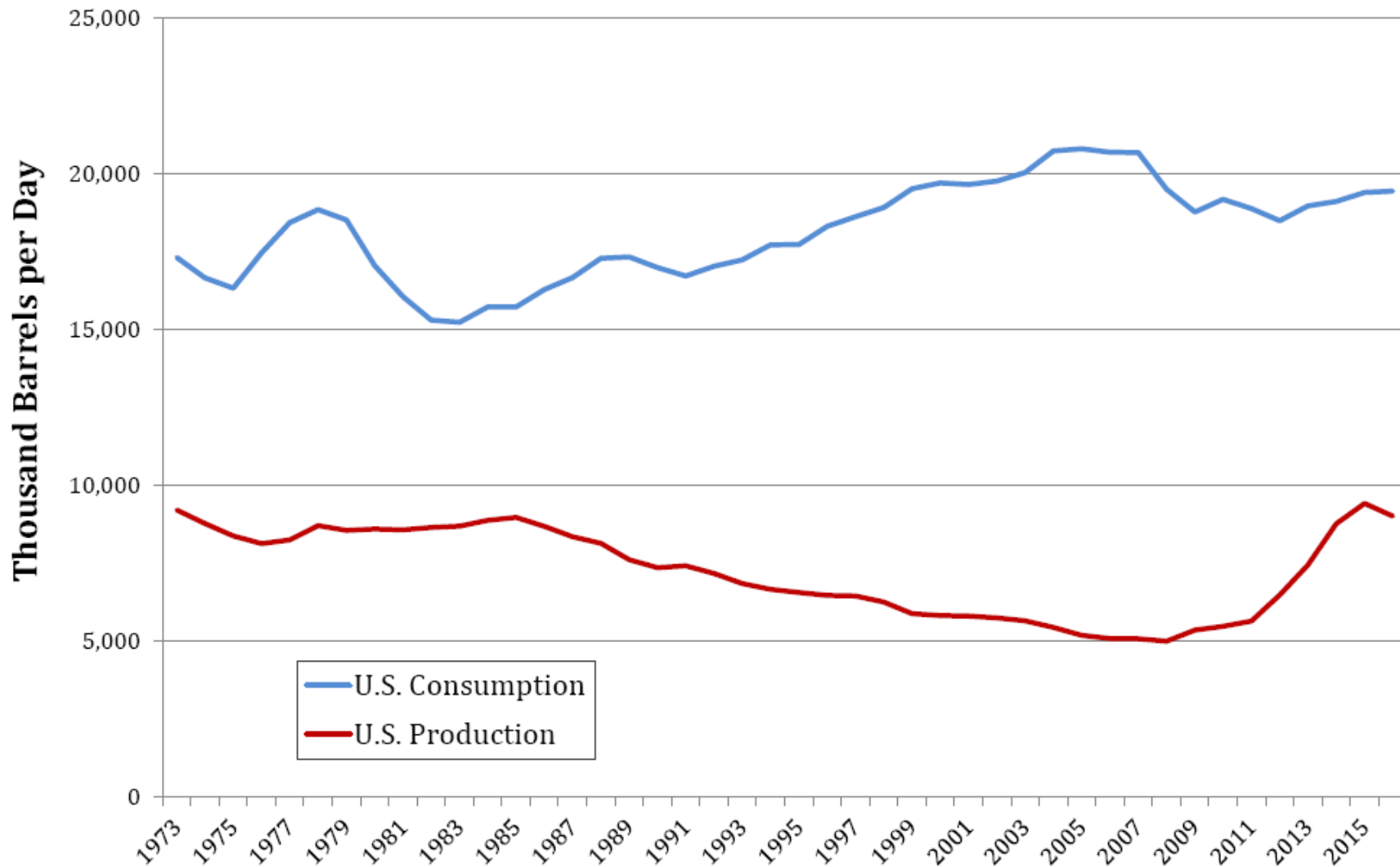
Source: U.S. Department of Energy, Energy Information Administration, Drilling Productivity Report

Note: Does not include legacy production; 2016 data through October

Fig. 6

U.S. Crude Oil Production & Consumption, 1973-2016*

YTD 2016, U.S. refiners processed 19.4 million barrels per day compared to domestic U.S. production of 9 million barrels per day



Source: U.S. Department of Energy, Energy Information Administration

*2016 year-to-date represents January to June average

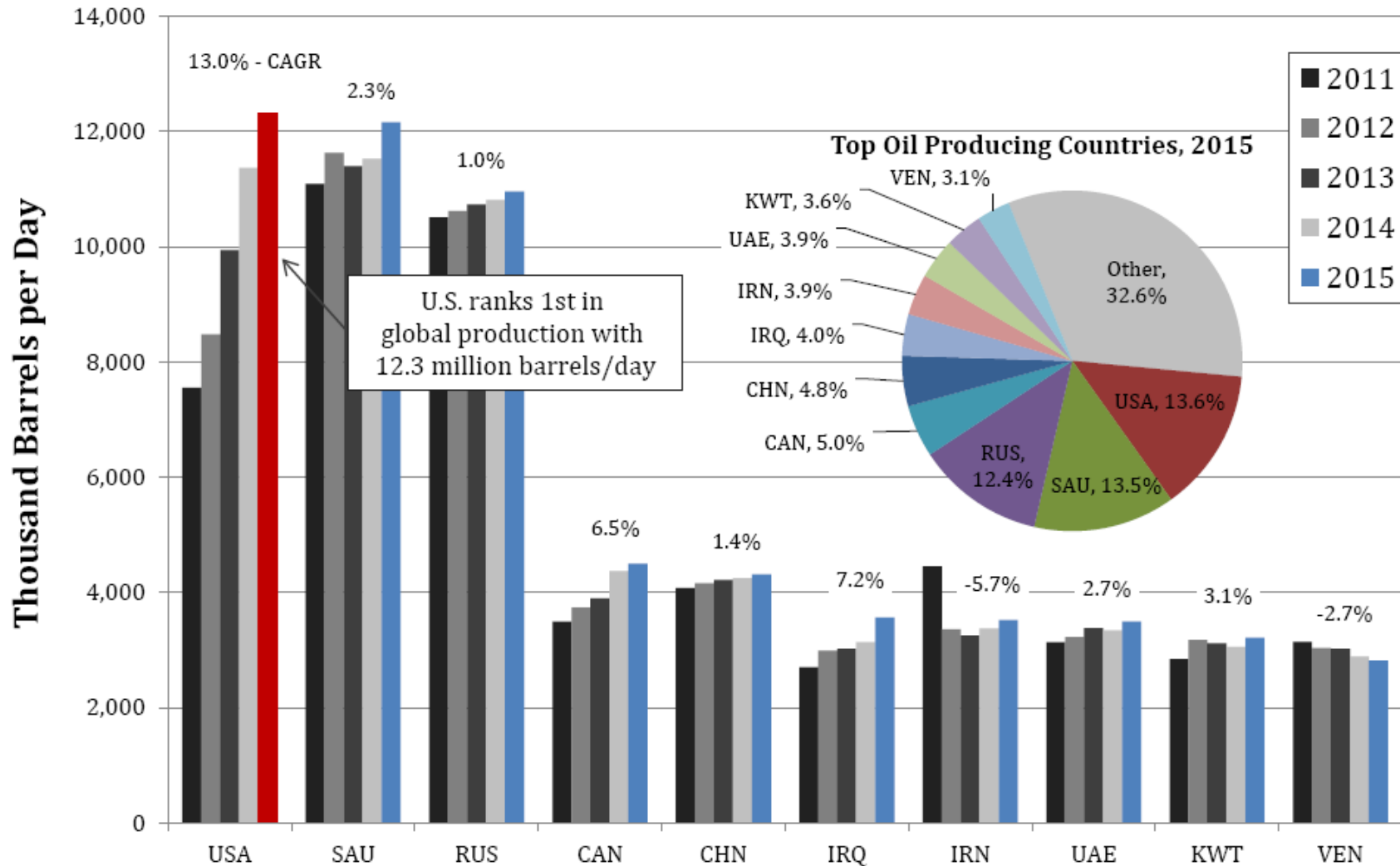
Fig. 7



Source: Resource Rich Colorado, Colorado's National And Global Position in the Energy Economy, Eighth Edition December 2016, Colorado Energy Coalition

Global Oil Production Leaders, 2011-2015

U.S. ranks 1st in global production with 12.3 million barrels/day



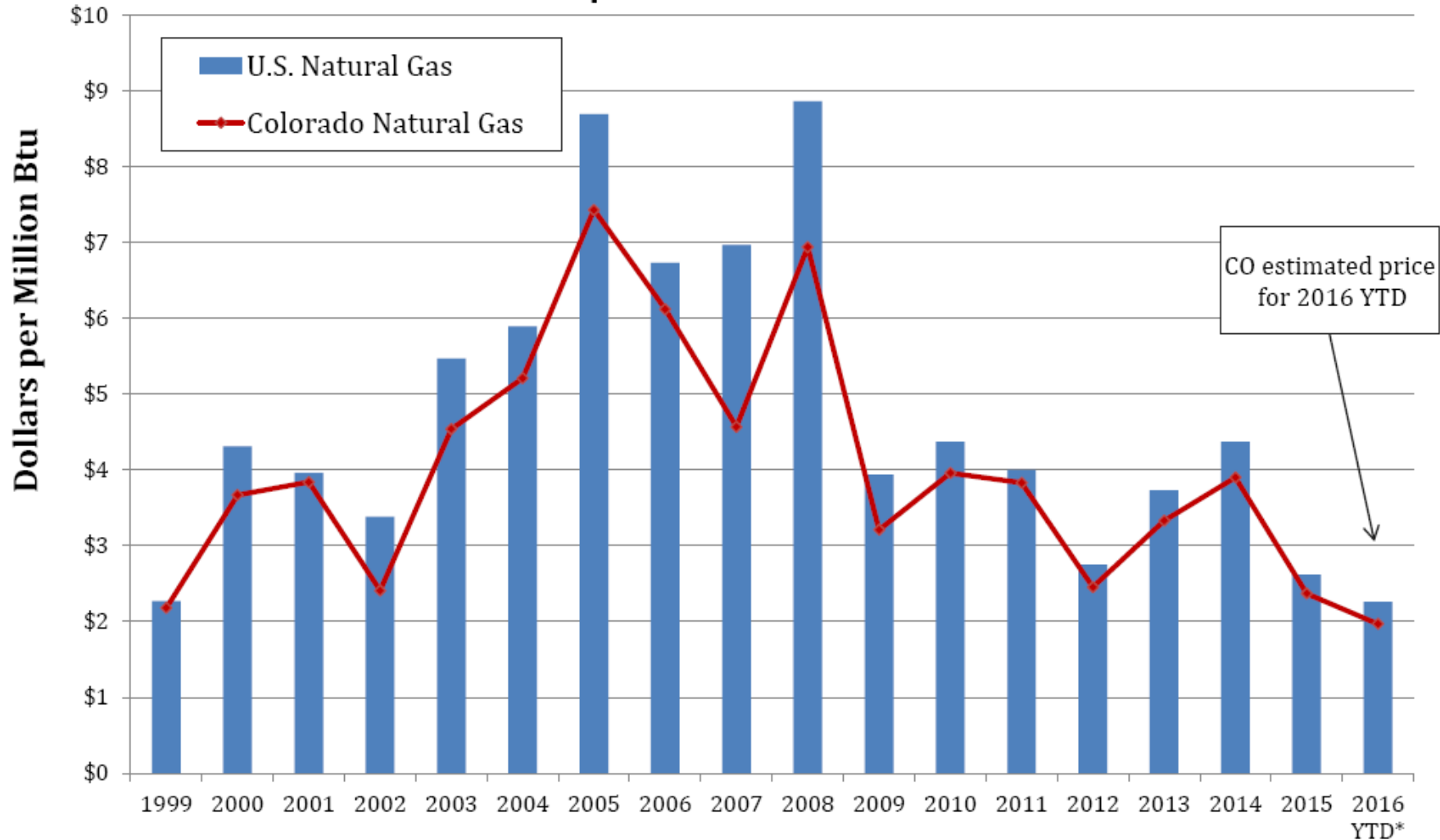
Source: International Energy Agency

Note: Includes crude oil, natural gas liquids, feedstocks, additives, and other hydrocarbons; 2015 data represents estimates; the compound annual growth rate (CAGR) reflects the 2011 to 2015 period.

Fig. 9

Average Annual Natural Gas Prices, 1999-2016

Colorado wellhead prices trend below the benchmark trading price to account for fuel transportation costs to markets outside the state



Source: U.S. Department of Energy, Energy Information Administration

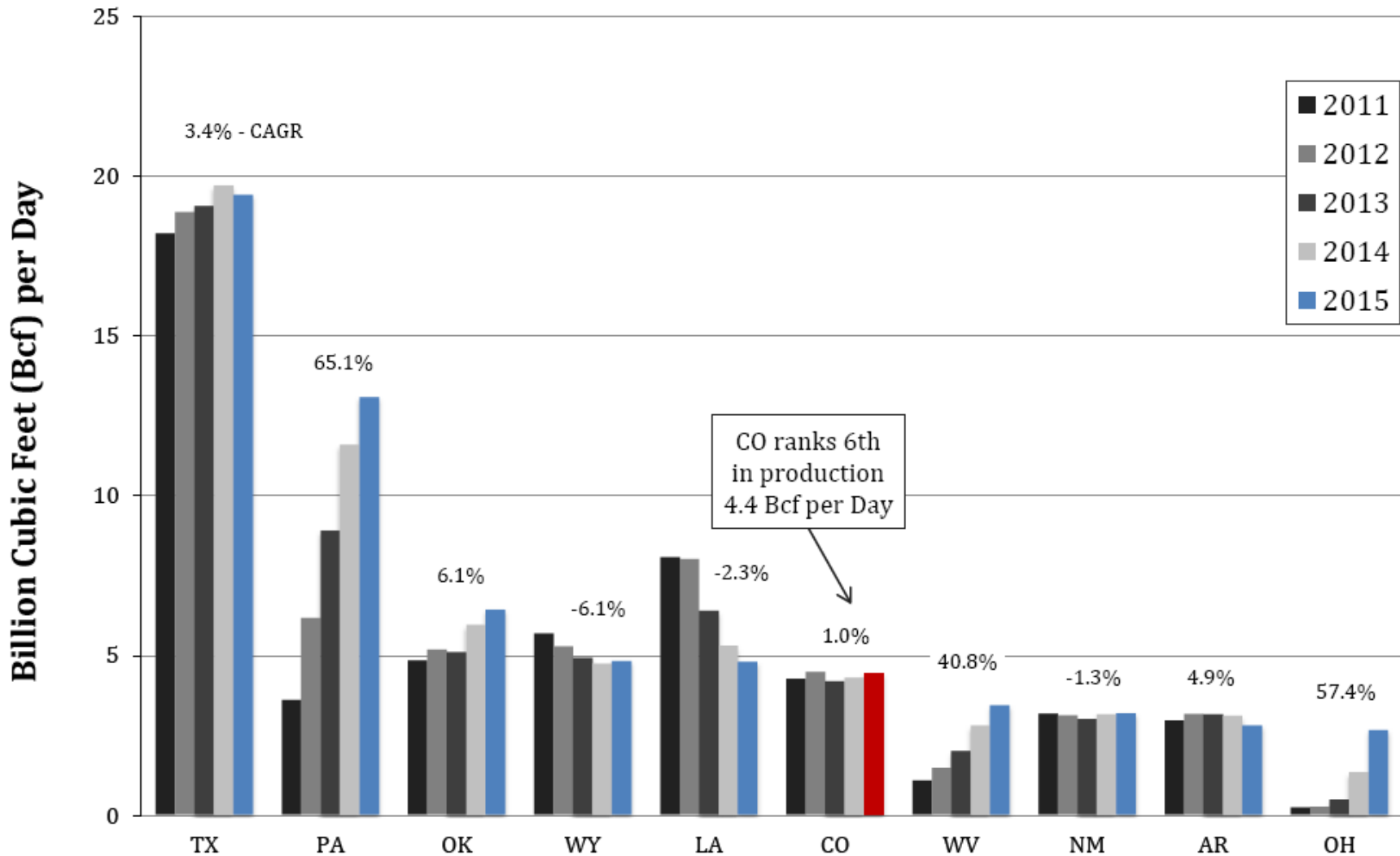
Note: Henry Hub is a common trading benchmark price. Does not include 2014 polar vortex price spike for Colorado.

*2016 year-to-date data represents U.S. average daily spot price from January to August. 2012 to 2016 Colorado price estimated.

Fig. 12

Natural Gas Production by State, 2011-2015

Colorado's production has remained stable since 2011;
U.S. production has increased at a CAGR of 4.3% since 2011

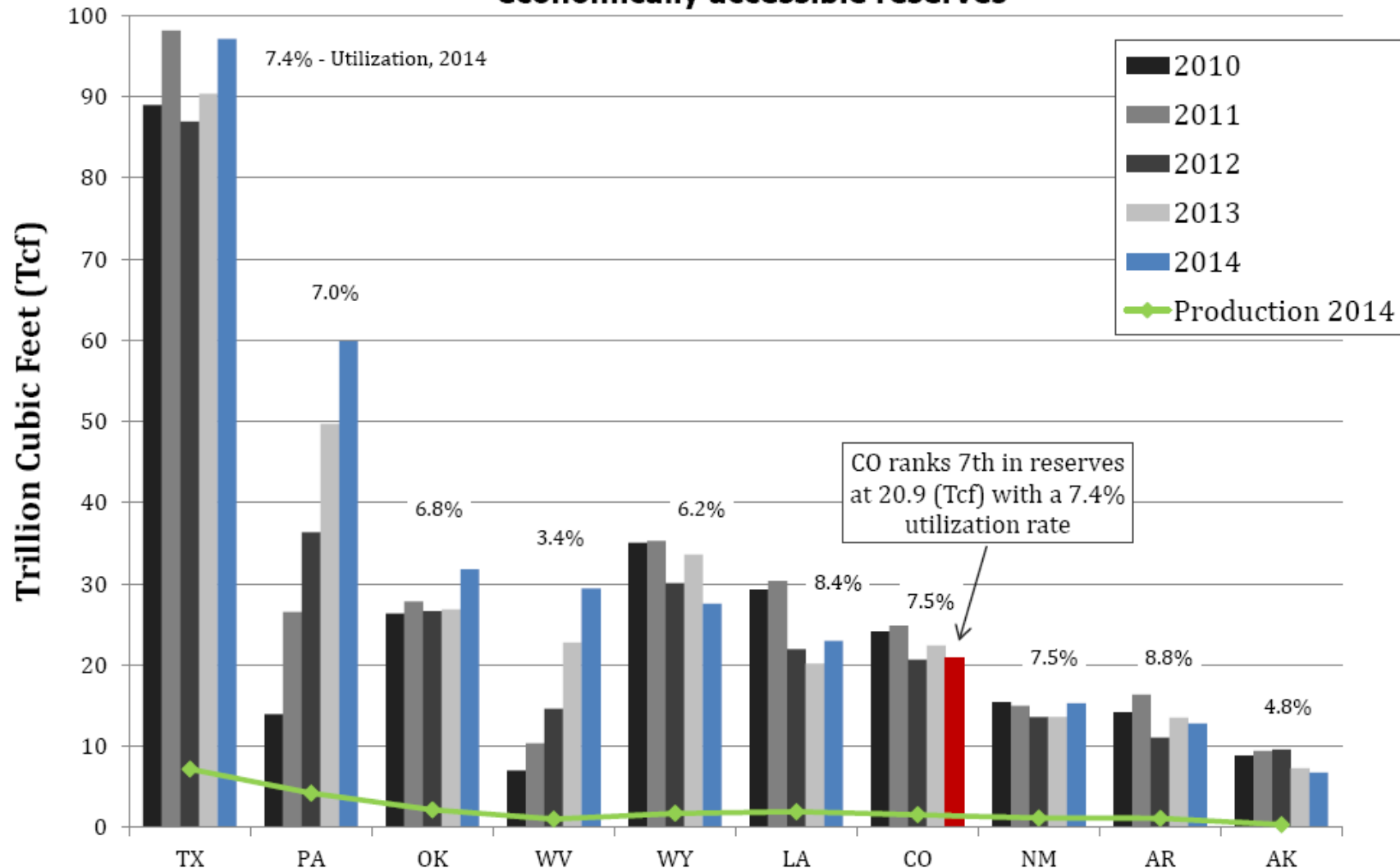


Source: U.S. Department of Energy, Energy Information Administration
Note: The compound annual growth rate (CAGR) reflects the 2011 to 2015 period.

Fig. 13

Natural Gas Reserves & Utilization Rate

Low natural gas prices have reduced the size of economically accessible reserves



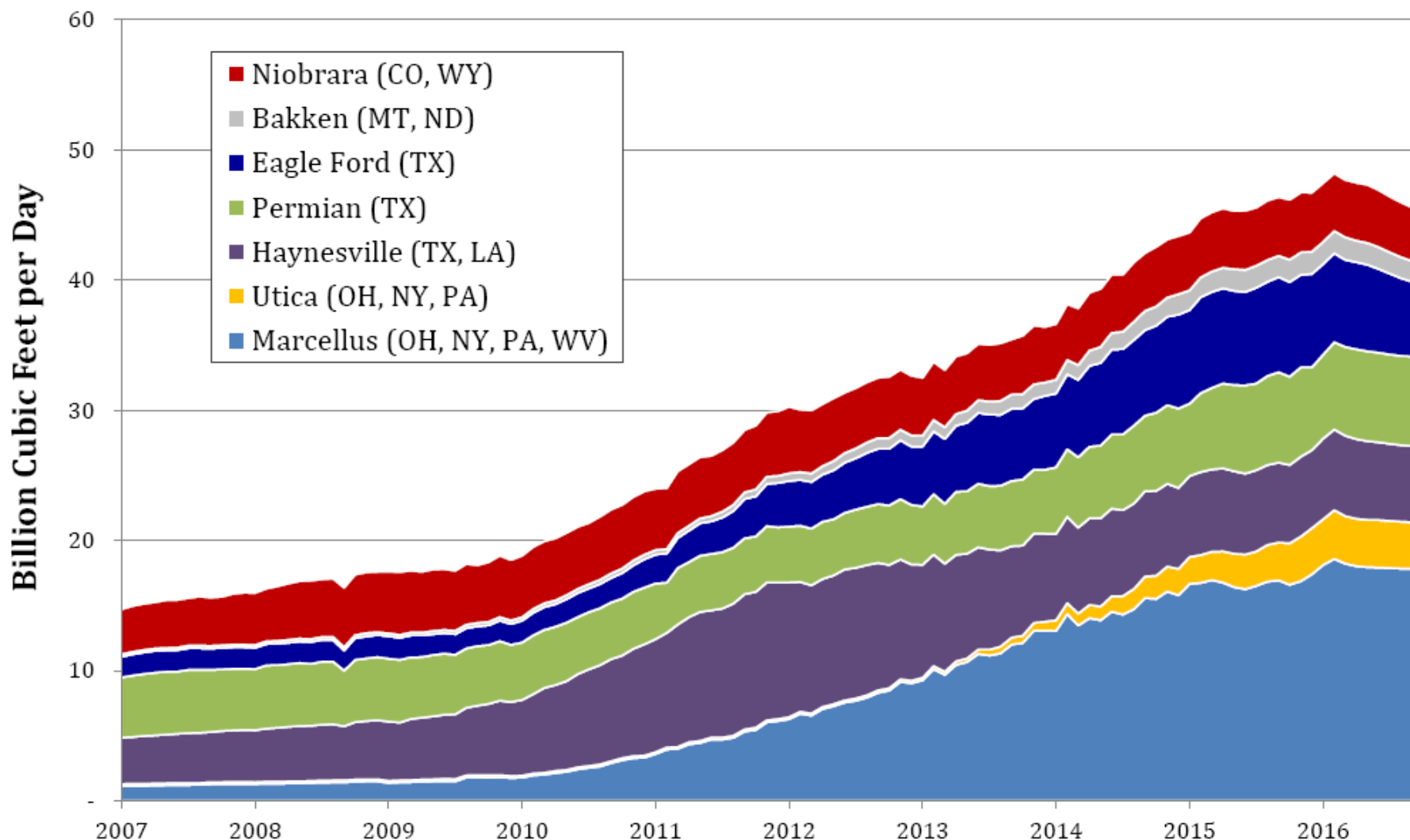
Source: U.S. Department of Energy, Energy Information Administration

Note: Top-10 states including Colorado; utilization rate is the amount of reserves developed/produced annually; reserves are defined as resources that can be recovered with reasonable certainty under existing economic and operating conditions

Fig. 14

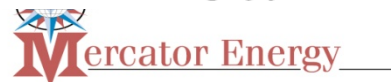
U.S. Shale Gas Production by Major Resource Play

4.1 bcf per day in the Niobrara formation as of October 2016



Source: U.S. Department of Energy, Energy Information Administration, Drilling Productivity Report

Note: Excludes legacy production; 2016 data through October

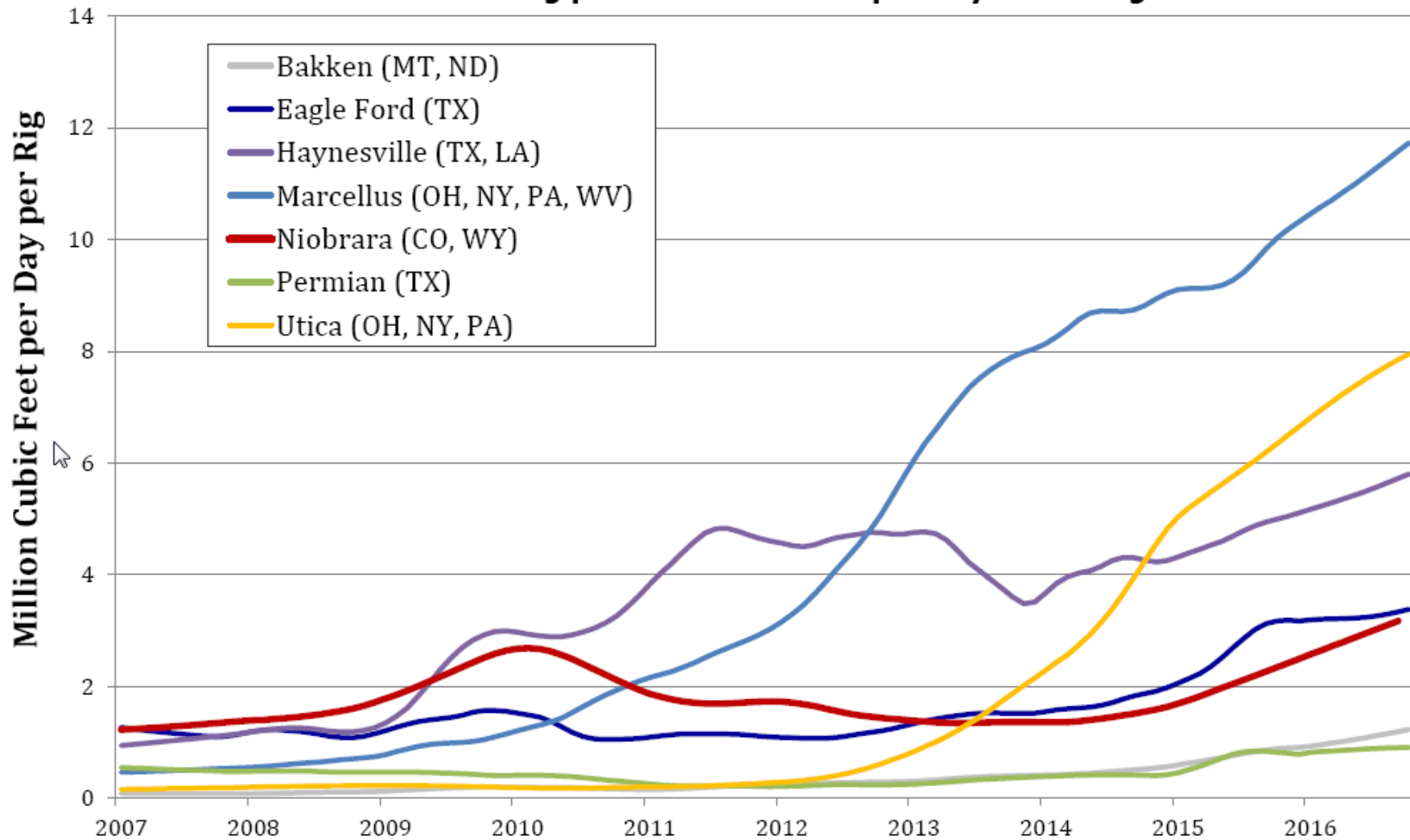


Source: Resource Rich Colorado, Colorado's National And Global Position in the Energy Economy, Eighth Edition December 2016, Colorado Energy Coalition

Fig. 16

U.S. Shale Gas Drilling Efficiency by Major Resource Play

Each Niobrara rig produces 3.2 mmcf per day on average



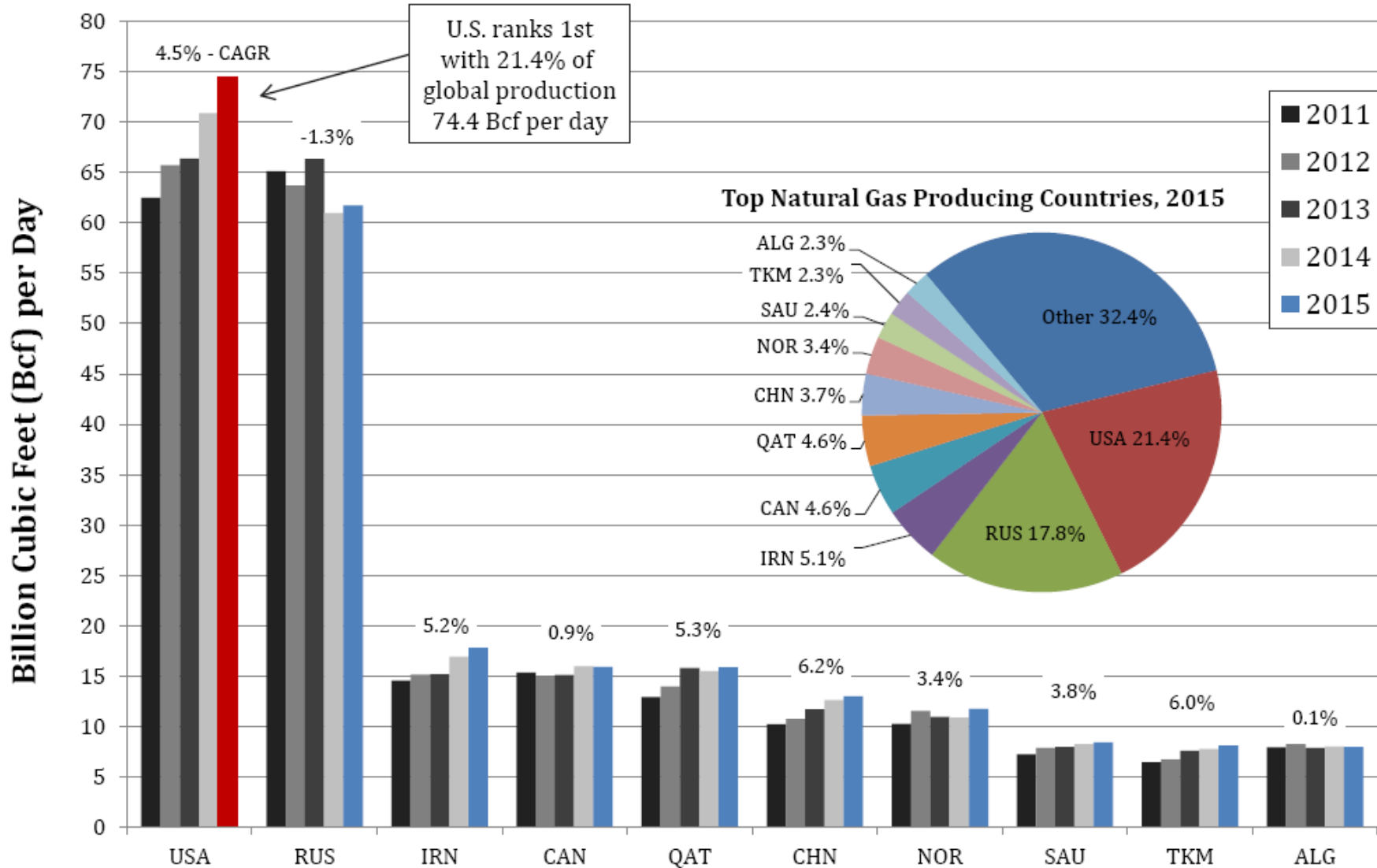
Source: U.S. Department of Energy, Energy Information Administration

Note: Excludes legacy production; 2016 data through October

Fig. 17

Global Natural Gas Production Leaders, 2011-2015

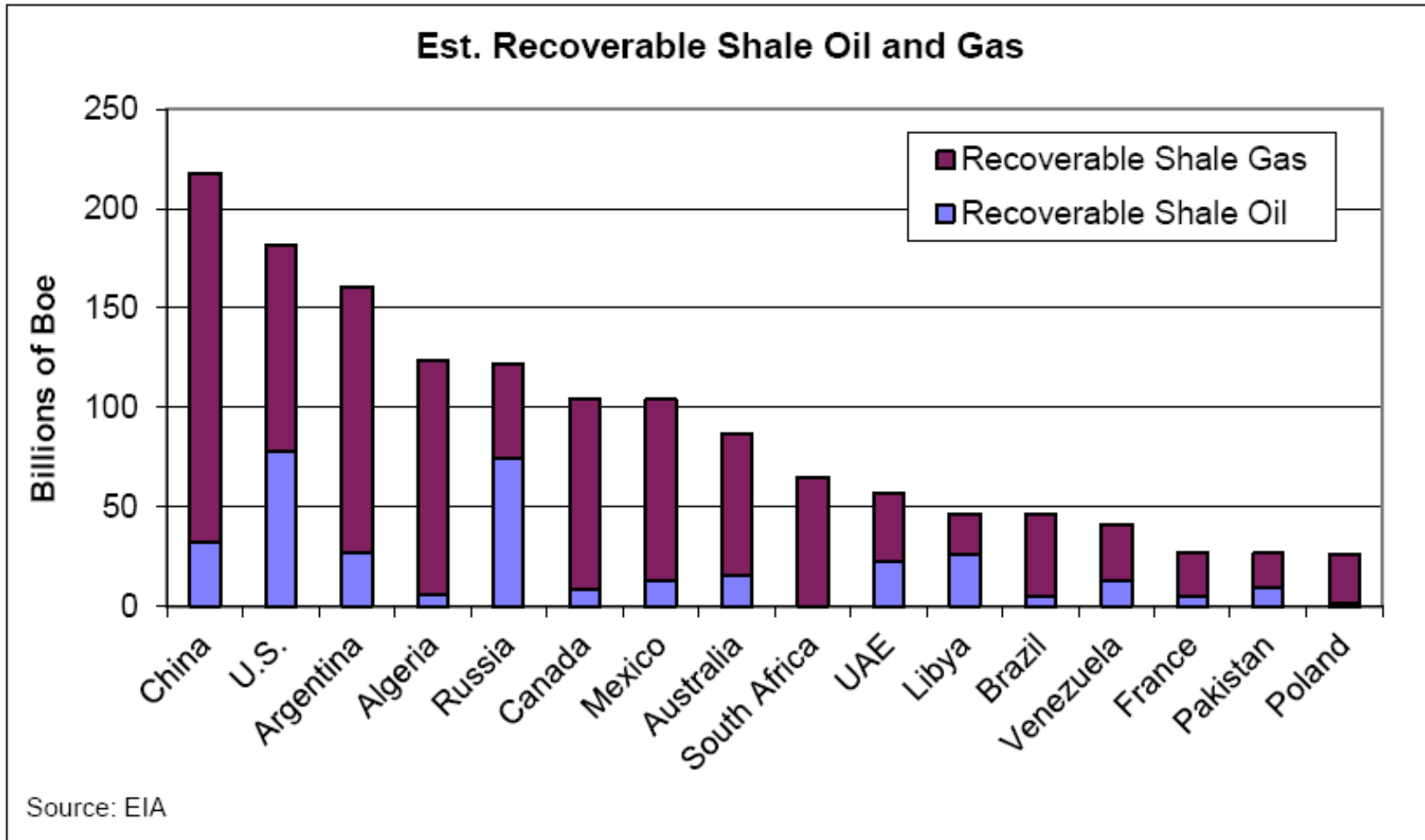
U.S. is 1st and growing; top-10 producers account for 68% of global production



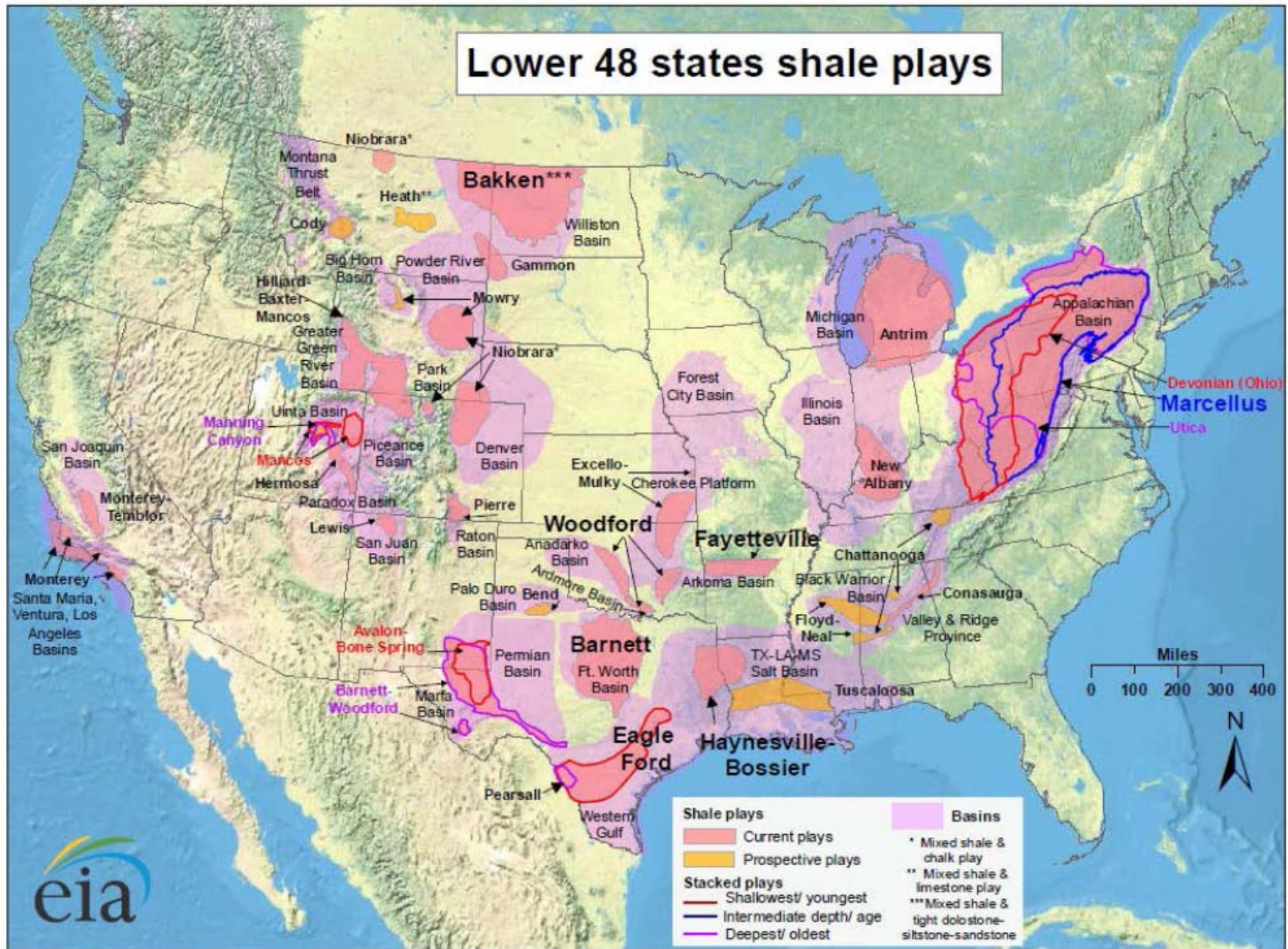
Source: International Energy Agency

Note: 2015 data represents estimates; the compound annual growth rate (CAGR) reflects the 2011 to 2015 period.

Fig. 20



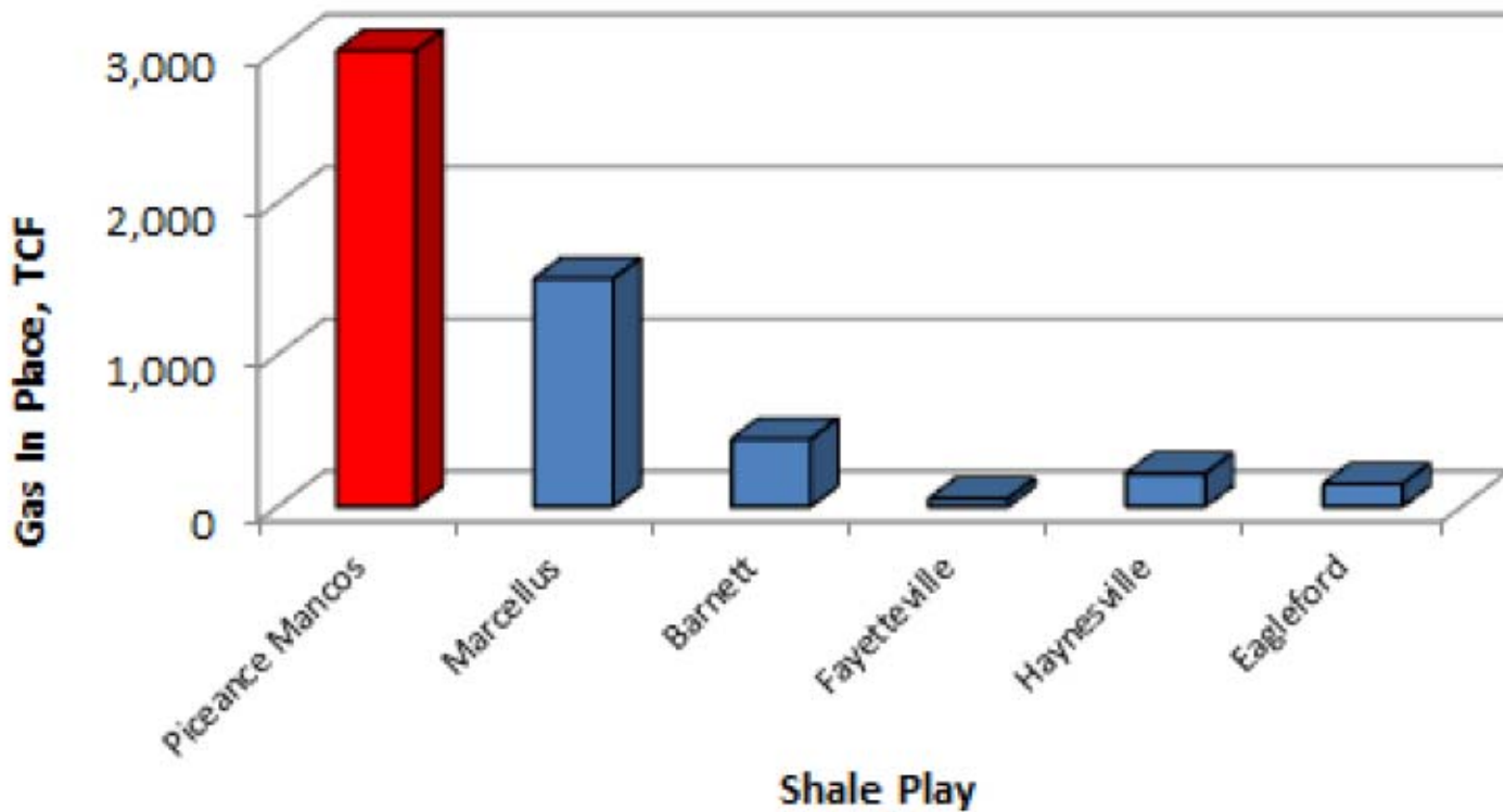
Source: *Energy Stat: 80% of Resource, 2% of Production: Will Shale Outside U.S./Canada Ever Move the Needle?*, Raymond James U.S. Energy Research, January 30, 2017



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

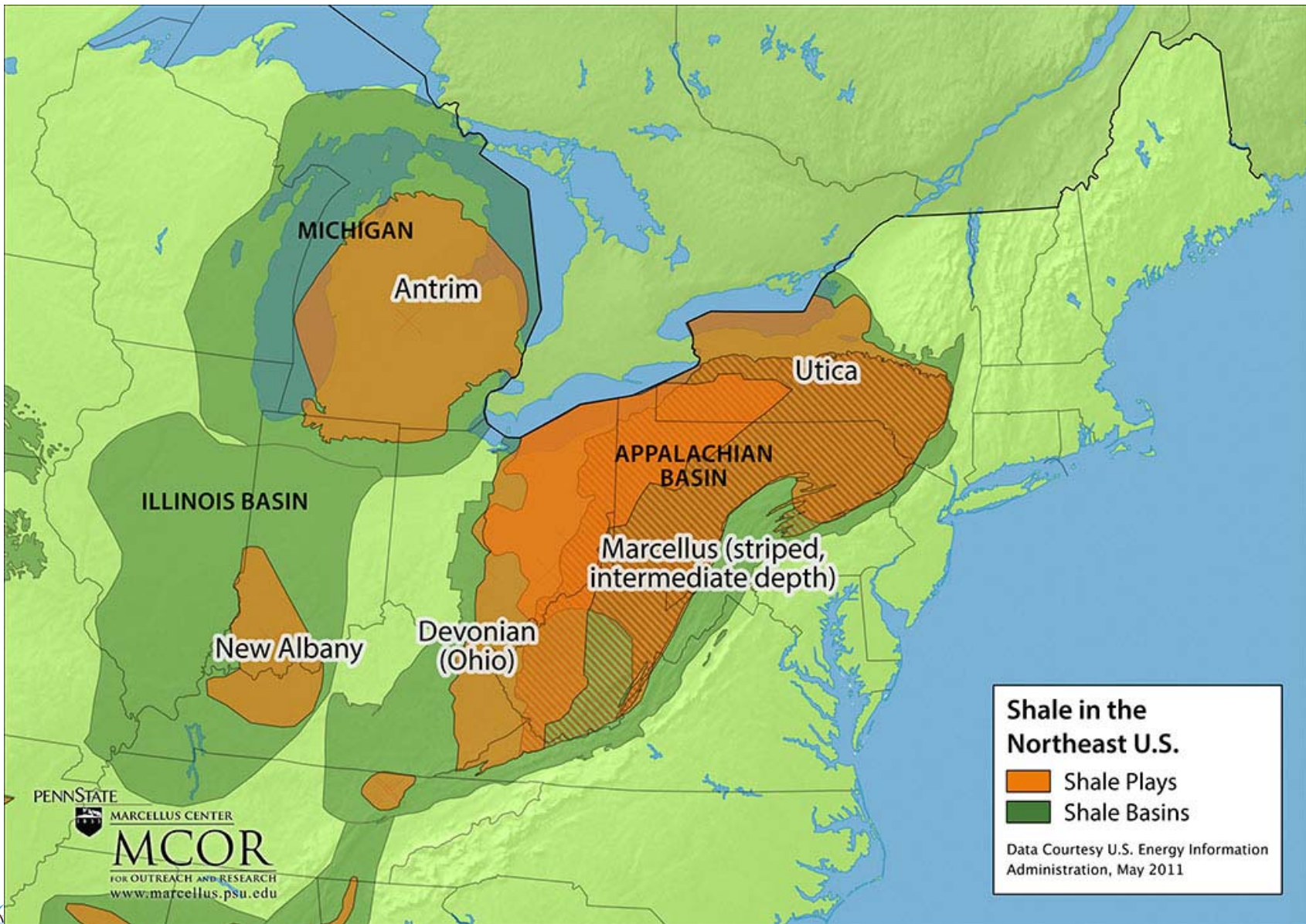
Fig. 15

US Major Shale Plays Gas In Place

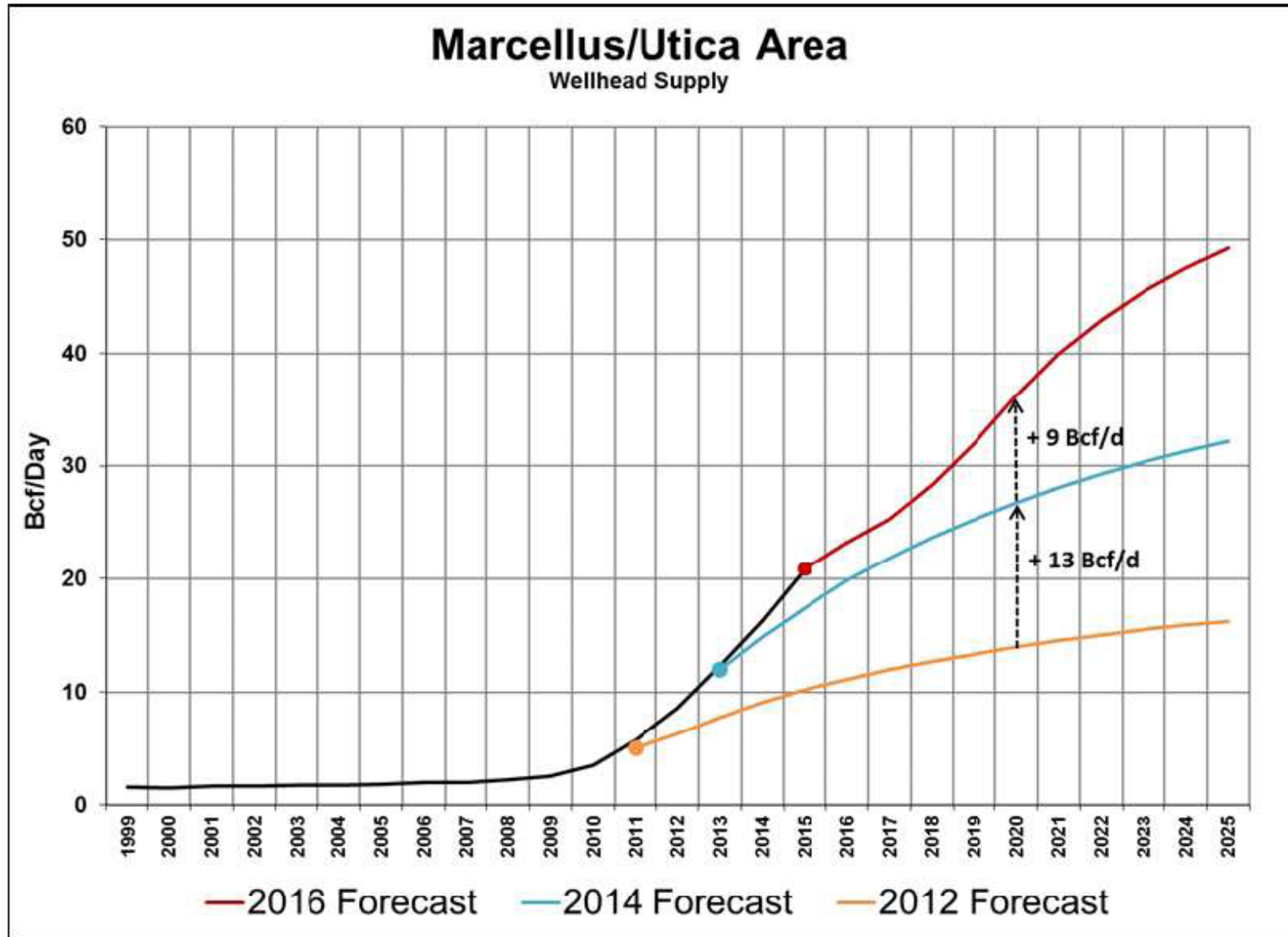


Source: *The Mancos Shale is an Emerging Giant*, Presentation to Garfield County Energy Advisory Board Meeting, December 1, 2016

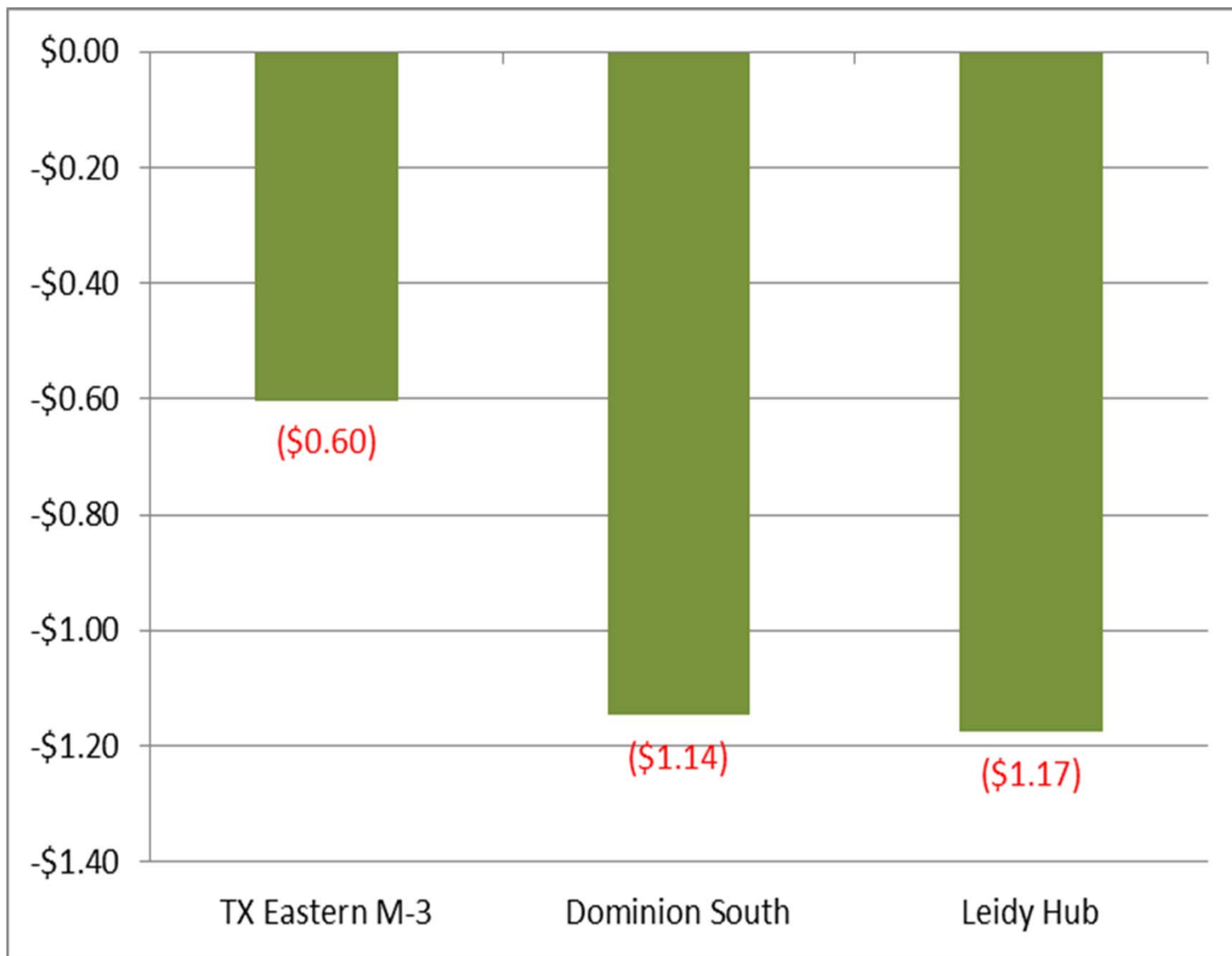
Map of Shale in Northeast U.S.



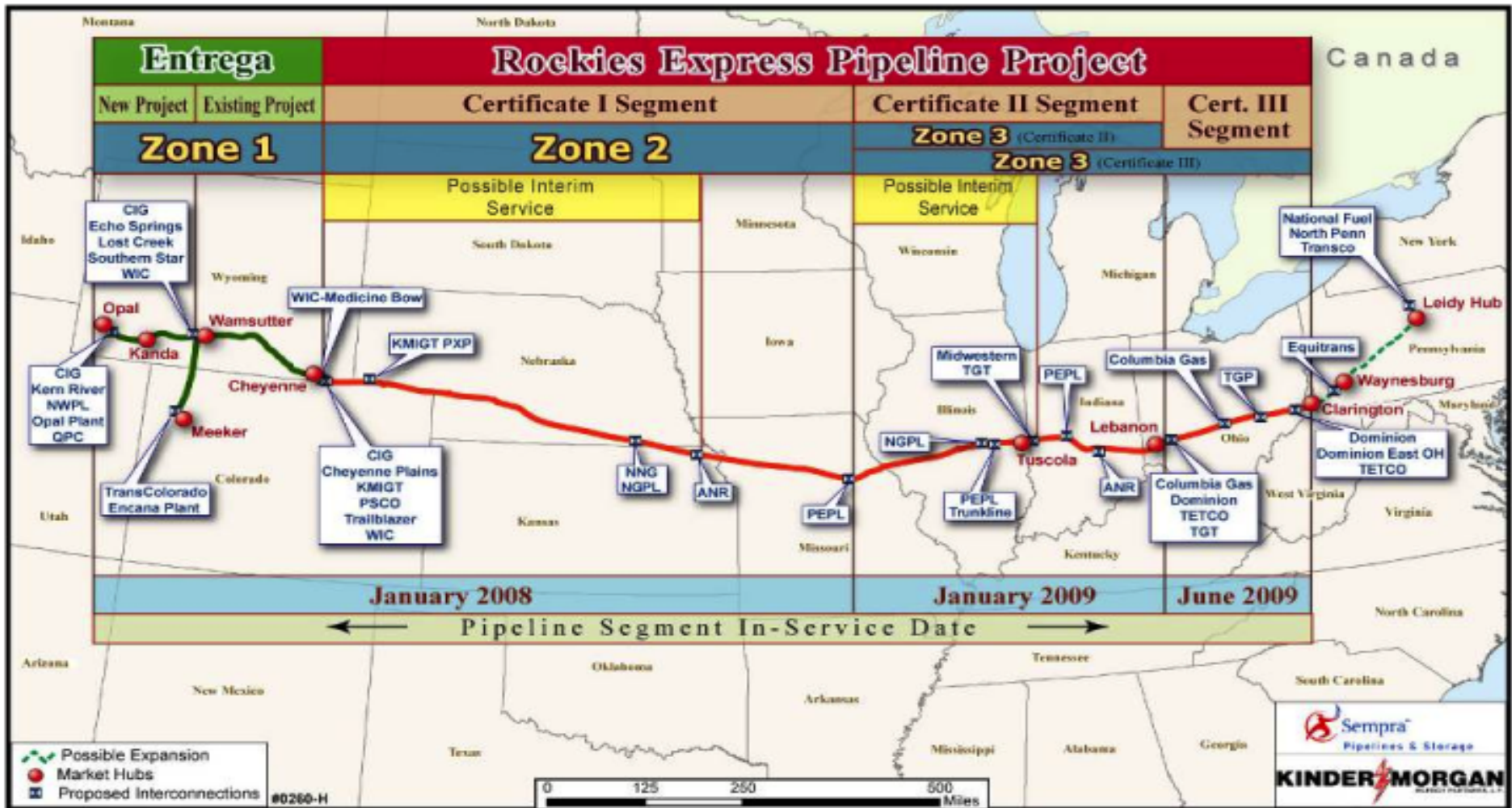
Northeast Supply Forecast



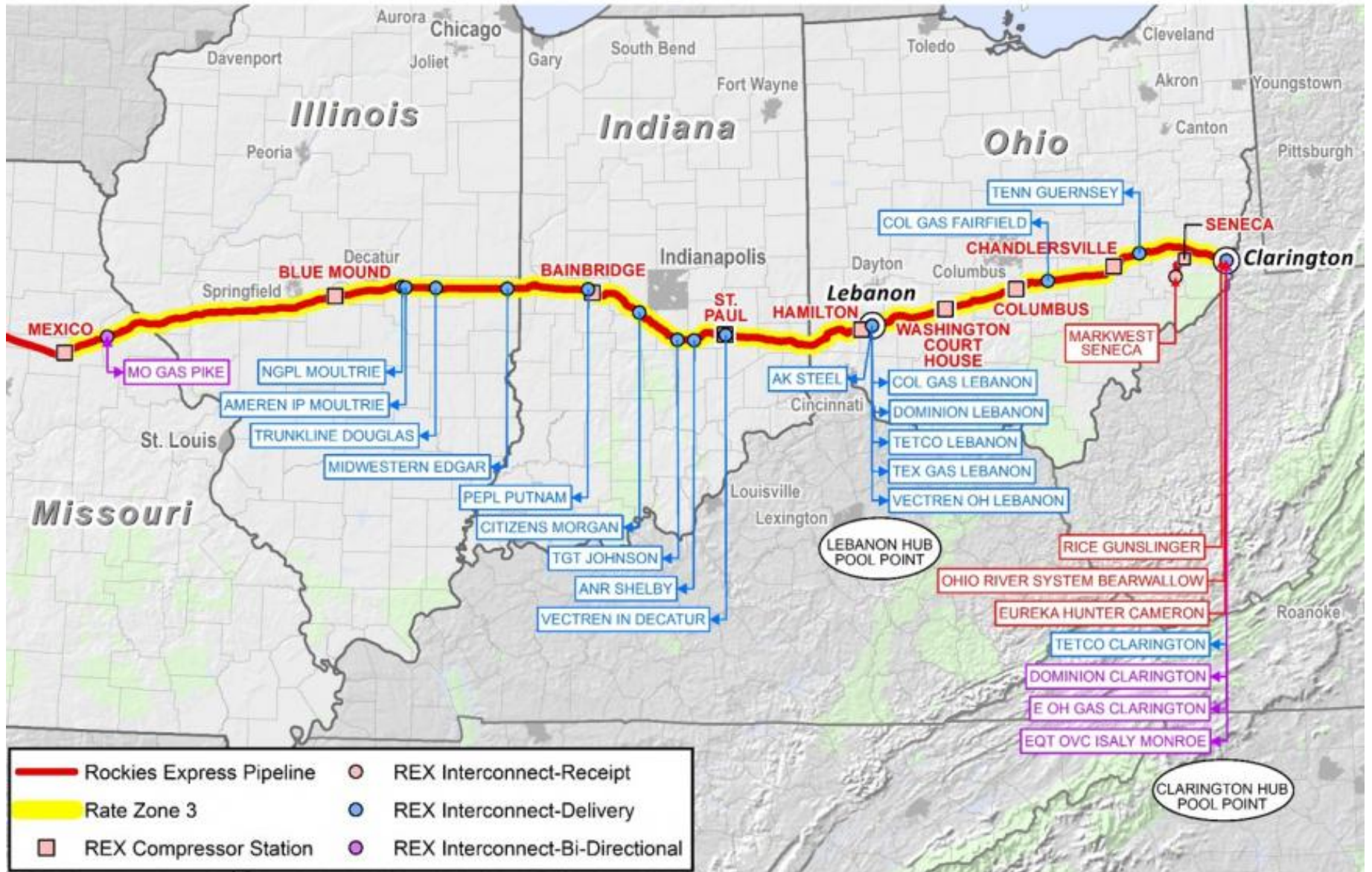
Marcellus Basis Differential – The Haves and Have Nots



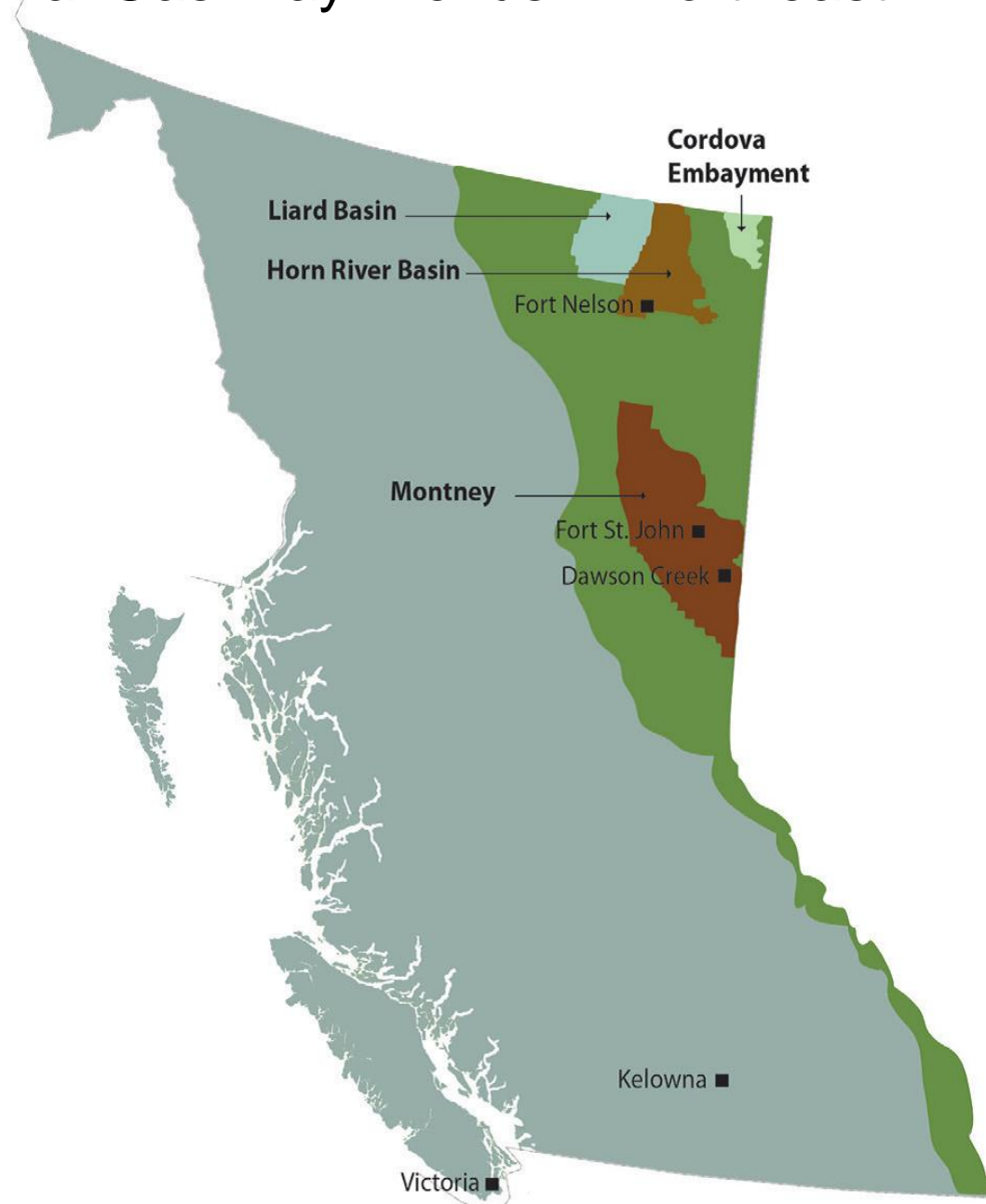
Rockies Express Pipeline



Rockies Express Pipeline – Zone 3



Unconventional Gas Play Trends in Northeast British Columbia



List of Proposed BC LNG Export Projects

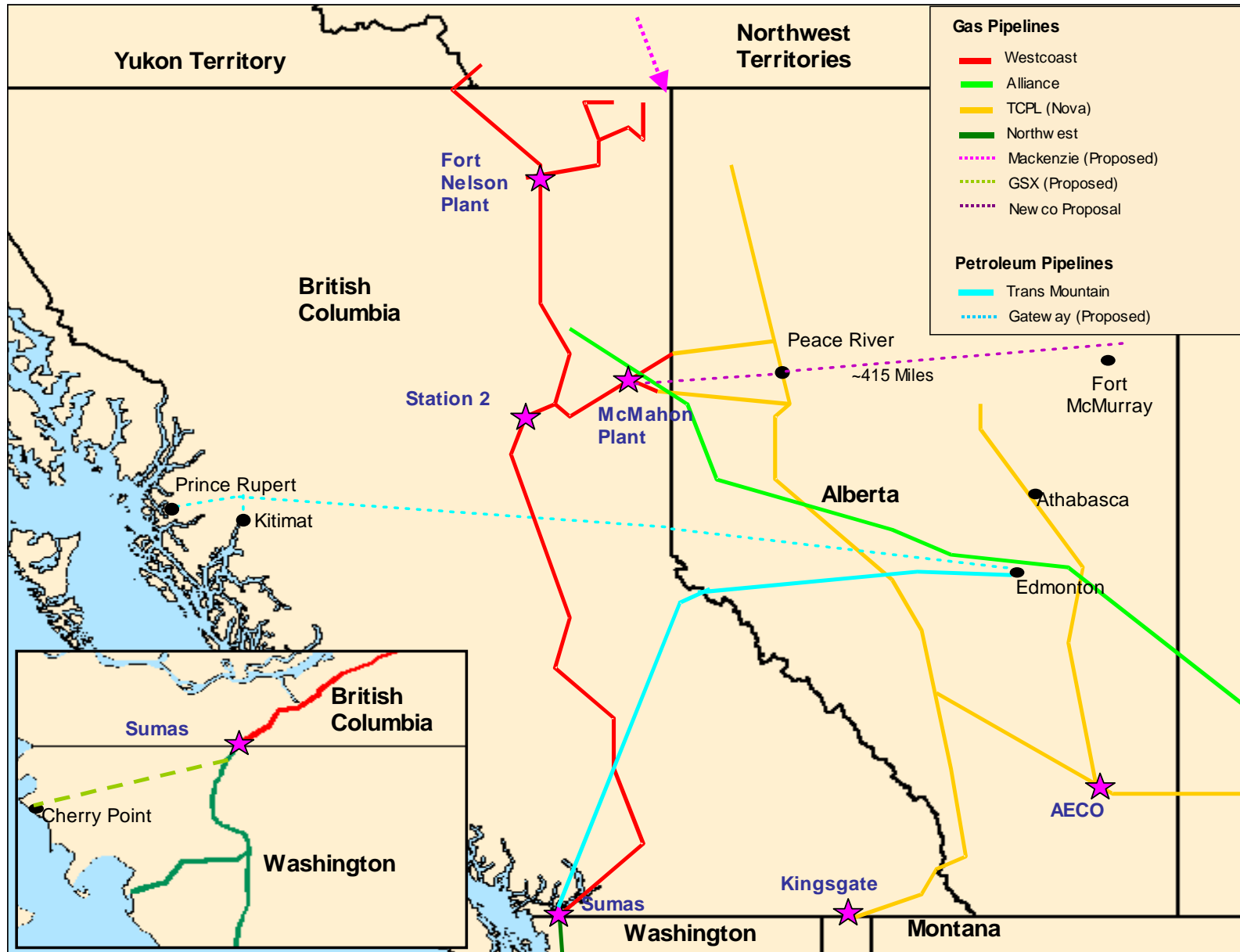
Aurora LNG	LNG Canada	Steelhead LNG: Sarita LNG
Canada Stewart Energy Project	NewTimes Energy Ltd.	Triton LNG
Cedar LNG	Nisga's LNG	Watson Island LNG
Discover LNG	Orca LNG	WCC LNG Ltd.
Grassy Point LNG	Pacific NorthWest LNG	WesPac
Kitimat LNG	Prince Rupert LNG	Woodfibre LNG
Kitsault Energy Project	Steelhead LNG: Malahat LNG	

Source: *Factsheet: LNG project proposals in British Columbia*, BC Gov News

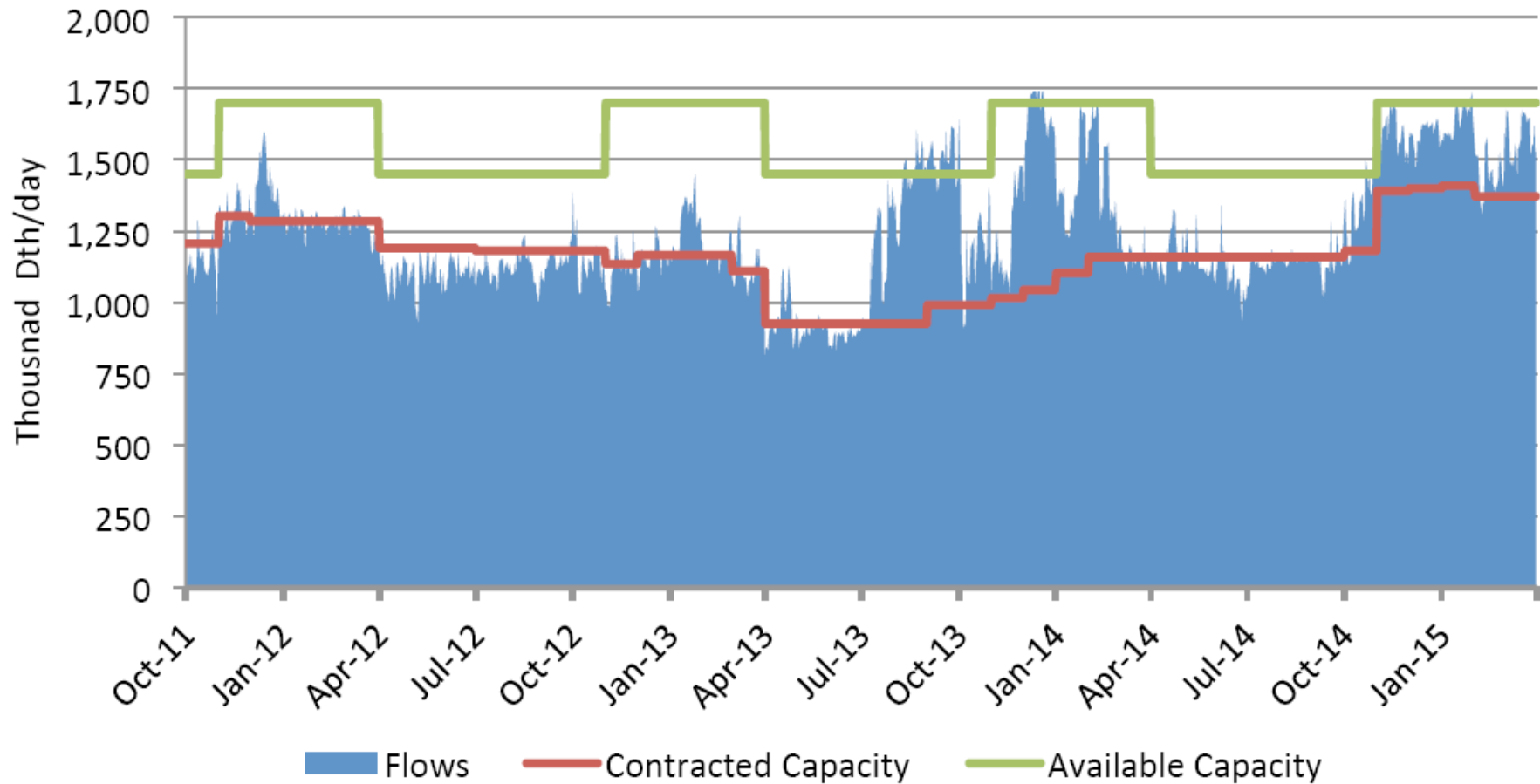
BC LNG Export Projects and Their Upstream Supply Pipelines

LNG Project	Pipeline	Pipeline specs
Prince Rupert LNG (\$16 billion)	Westcoast Connector Gas Transmission Project (\$7.5 billion)	2 – 534-mile, 48” diameter pipelines 4.2 BCF per day
Pacific Northwest (\$11.4 billion)	Prince Rupert Gas Transmission (\$5 billion) and	559-mile pipeline 2.0 BCF per day
	North Montney Mainline (\$1.7 billion)	186-mile pipeline 2.4 BCF per day
Kitimat LNG	Pacific Trail Pipeline (\$1.5 billion)	298-mile, 42” pipeline
LNG Canada (\$40 billion)	Coastal Gas Link (\$4 billion)	416-mile, 48" pipeline 1.7 BCF per day

Western Canada Pipeline Schematic



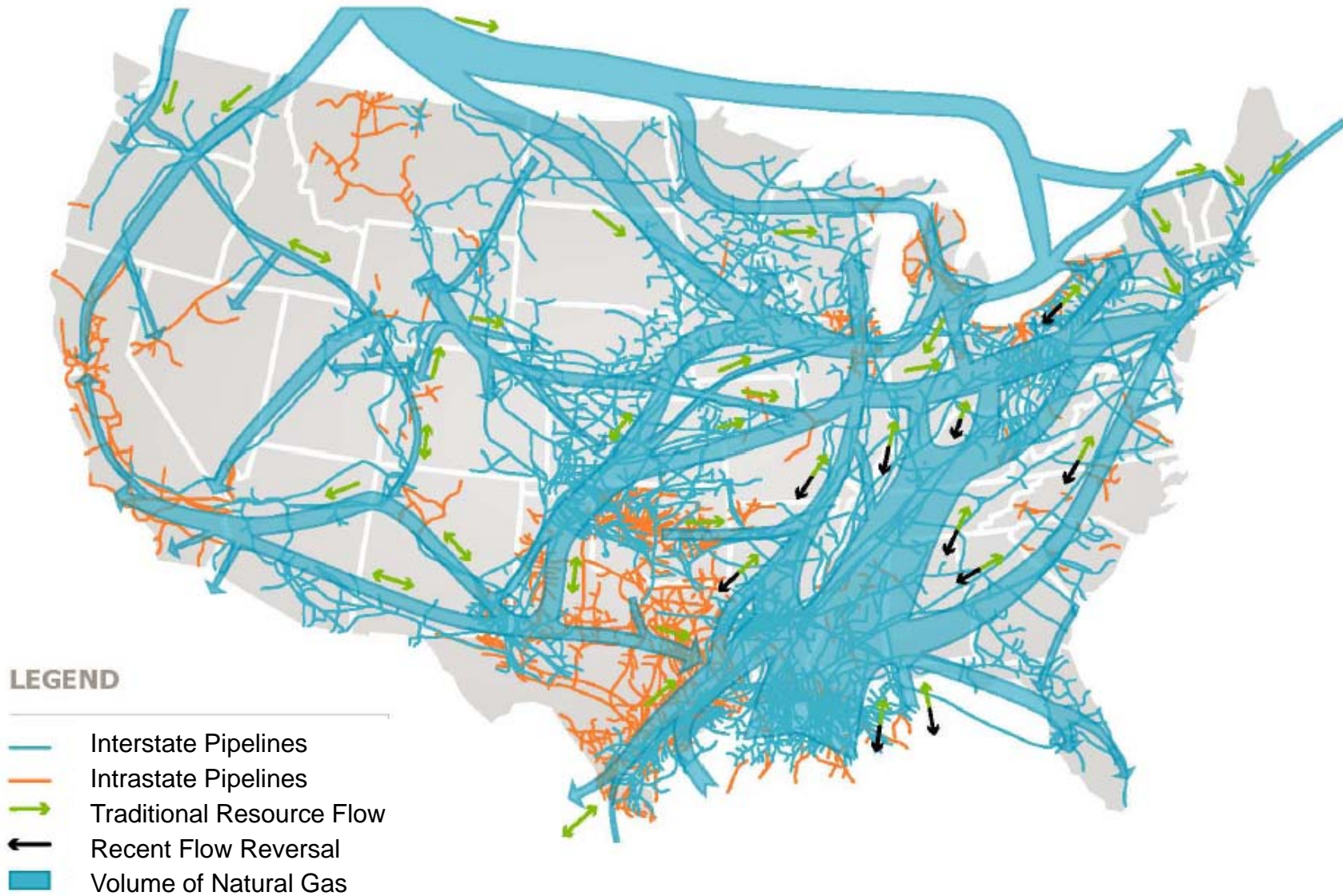
Pipeline Flows (Spectra) from Station 2 to Sumas



Source: *The Northwest Gas Landscape – Looking Forward*, The Power & Natural Gas Planning Taskforce, July 2015

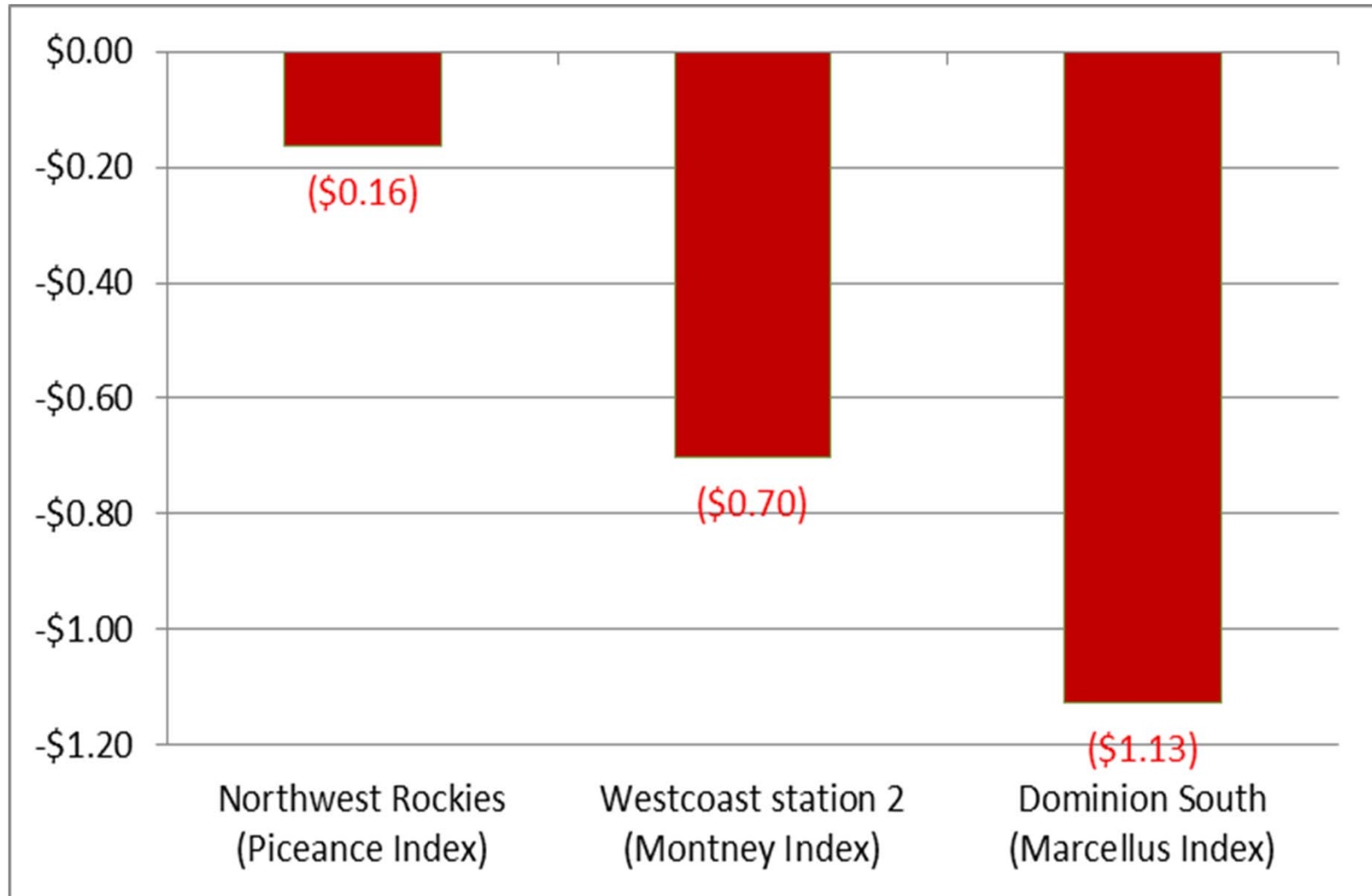


Map of Natural Gas Pipeline Infrastructure



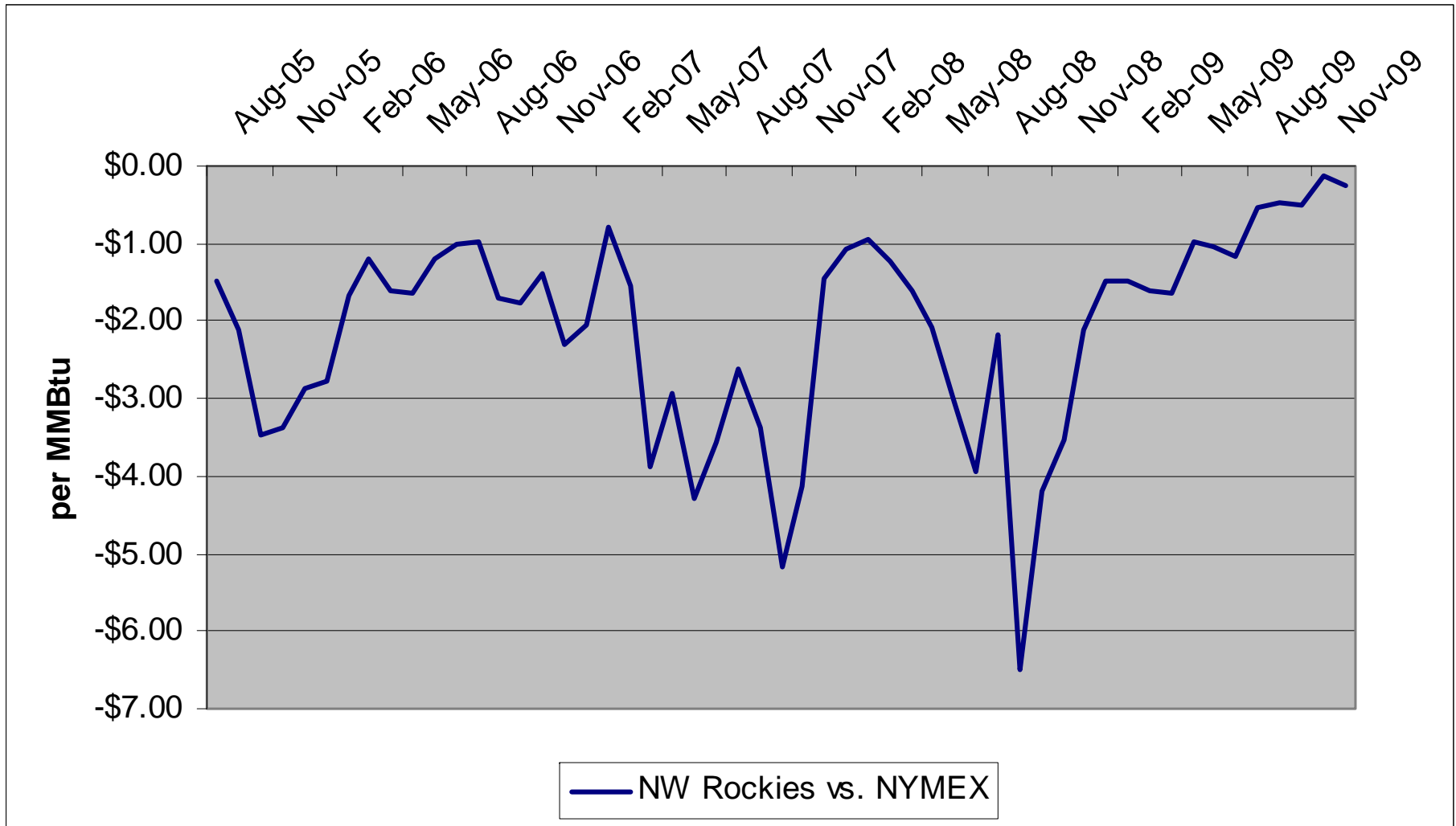
Source: Energy Information Administration, Office of Oil & Gas, Natural Gas Division, Gas Transportation Information System

Piceance Basin Price Superiority

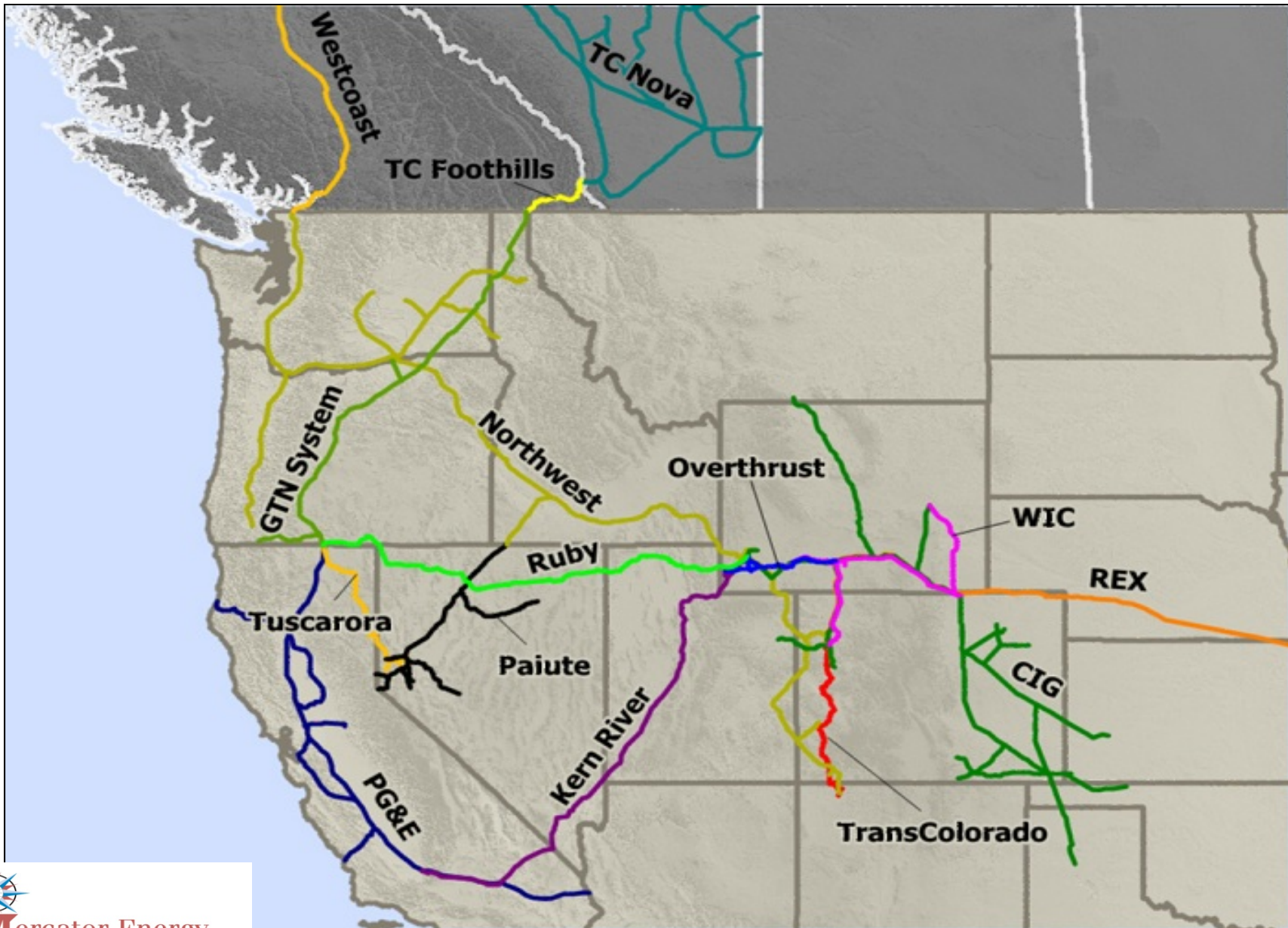


Source: Inside FERC's Gas Marketing Report, S&P Global Platts Publication 2014-2016 information as compared to NYMEX average of last 3 days

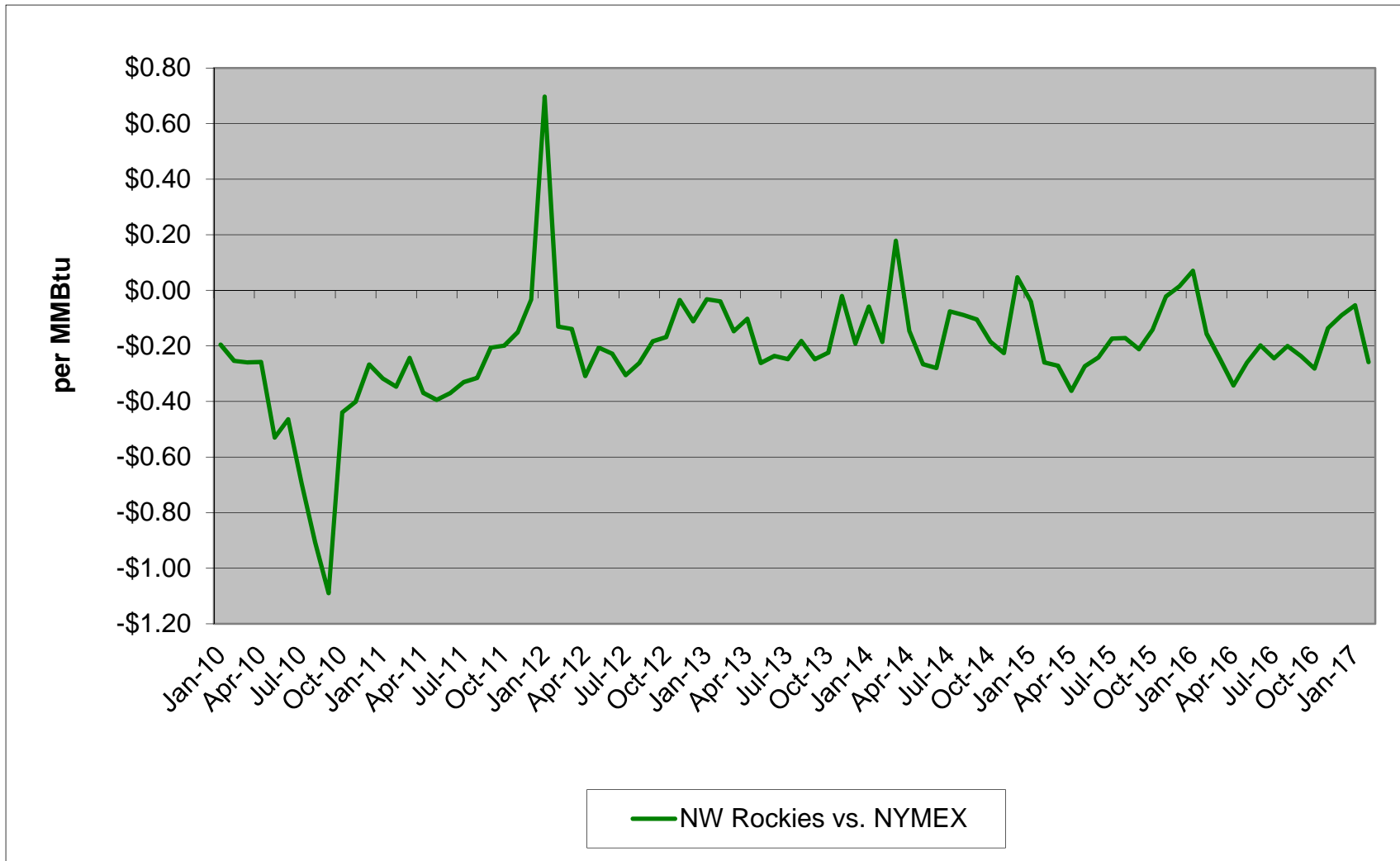
Basis Differential Between Northwest-Rockies and NYMEX 2005-2009



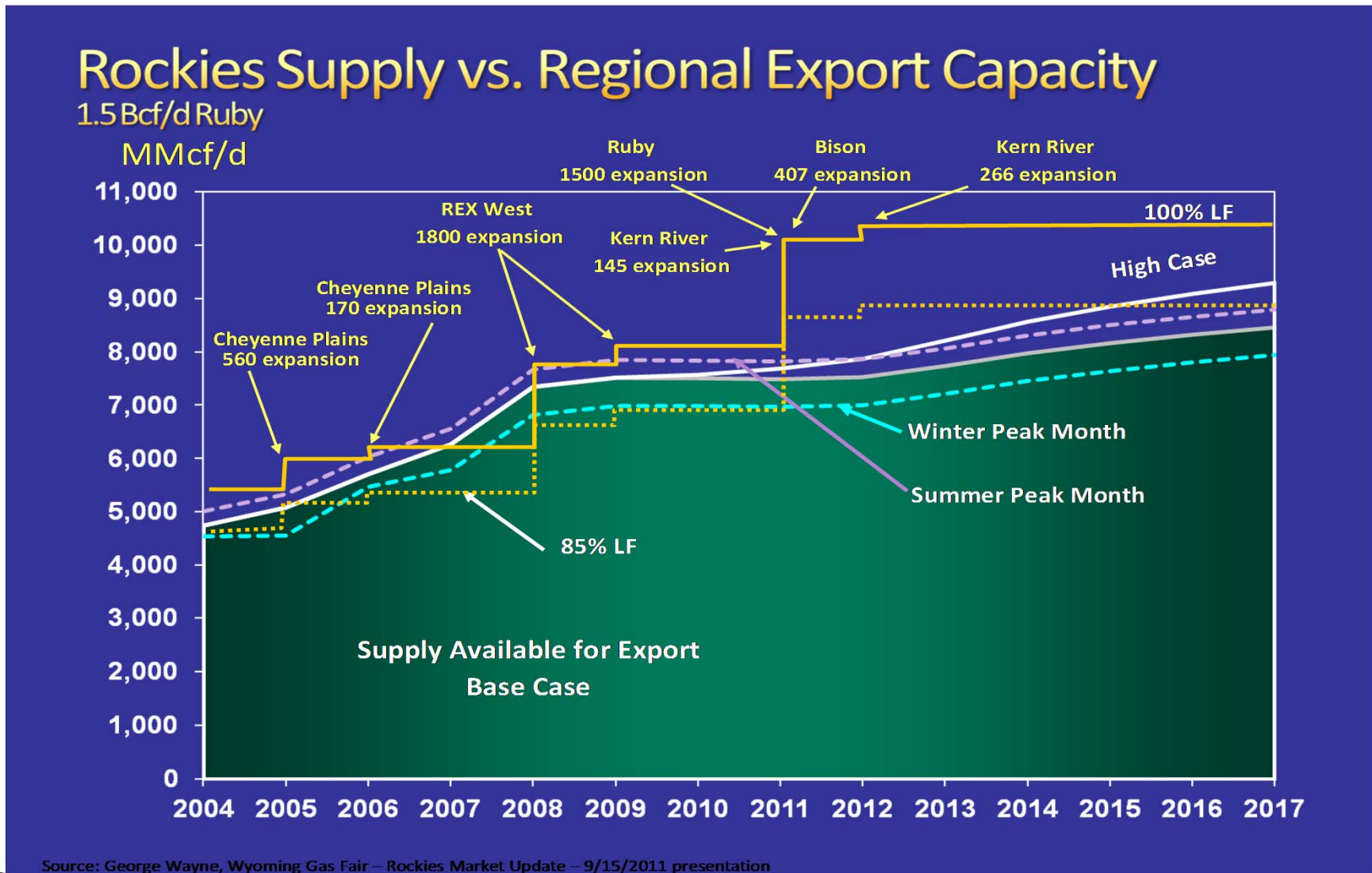
Rockies Pipeline Infrastructure



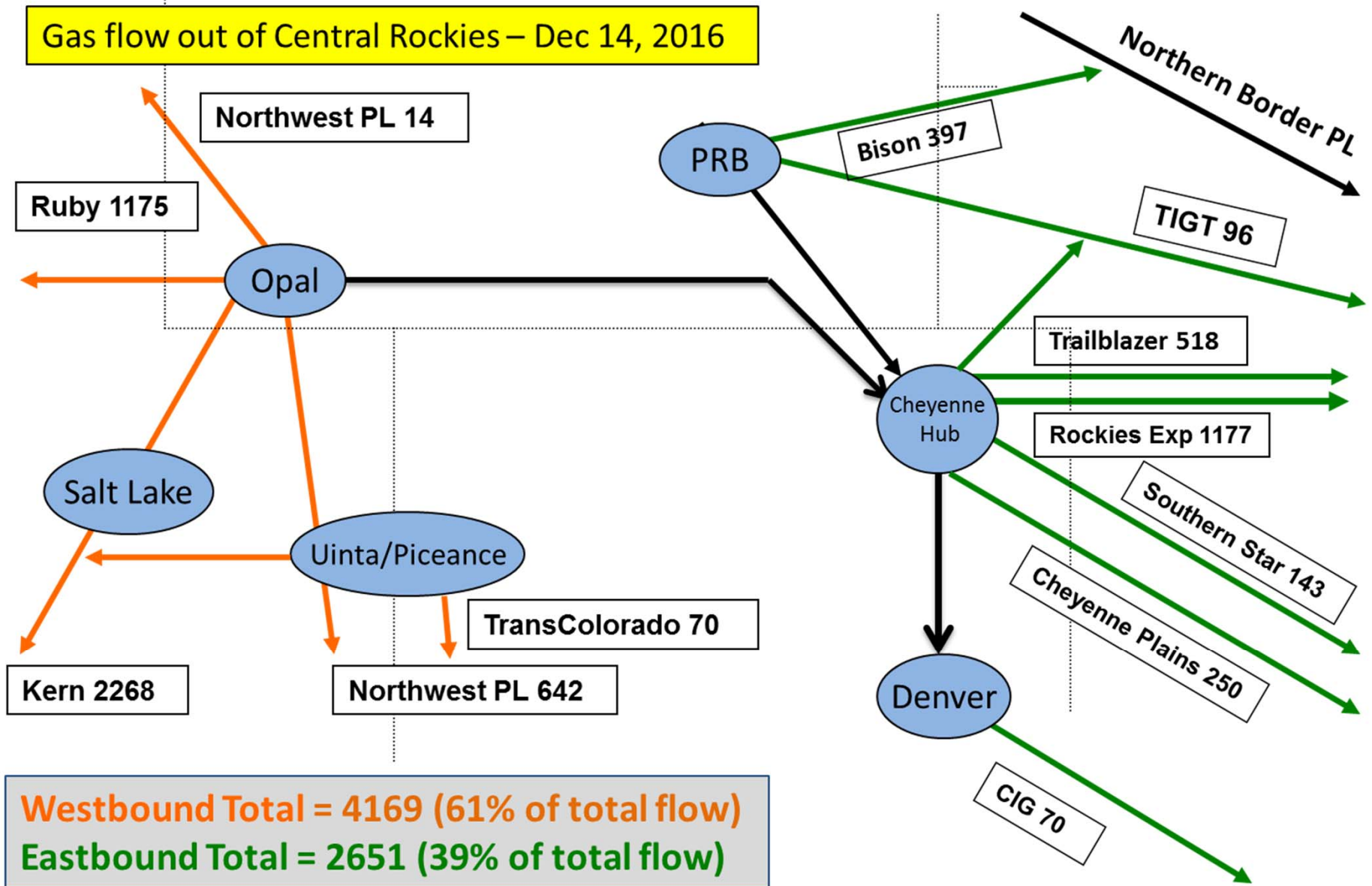
Basis Differential Between Northwest-Rockies and NYMEX 2010-Current



Rockies Supply vs. Regional Export Capacity

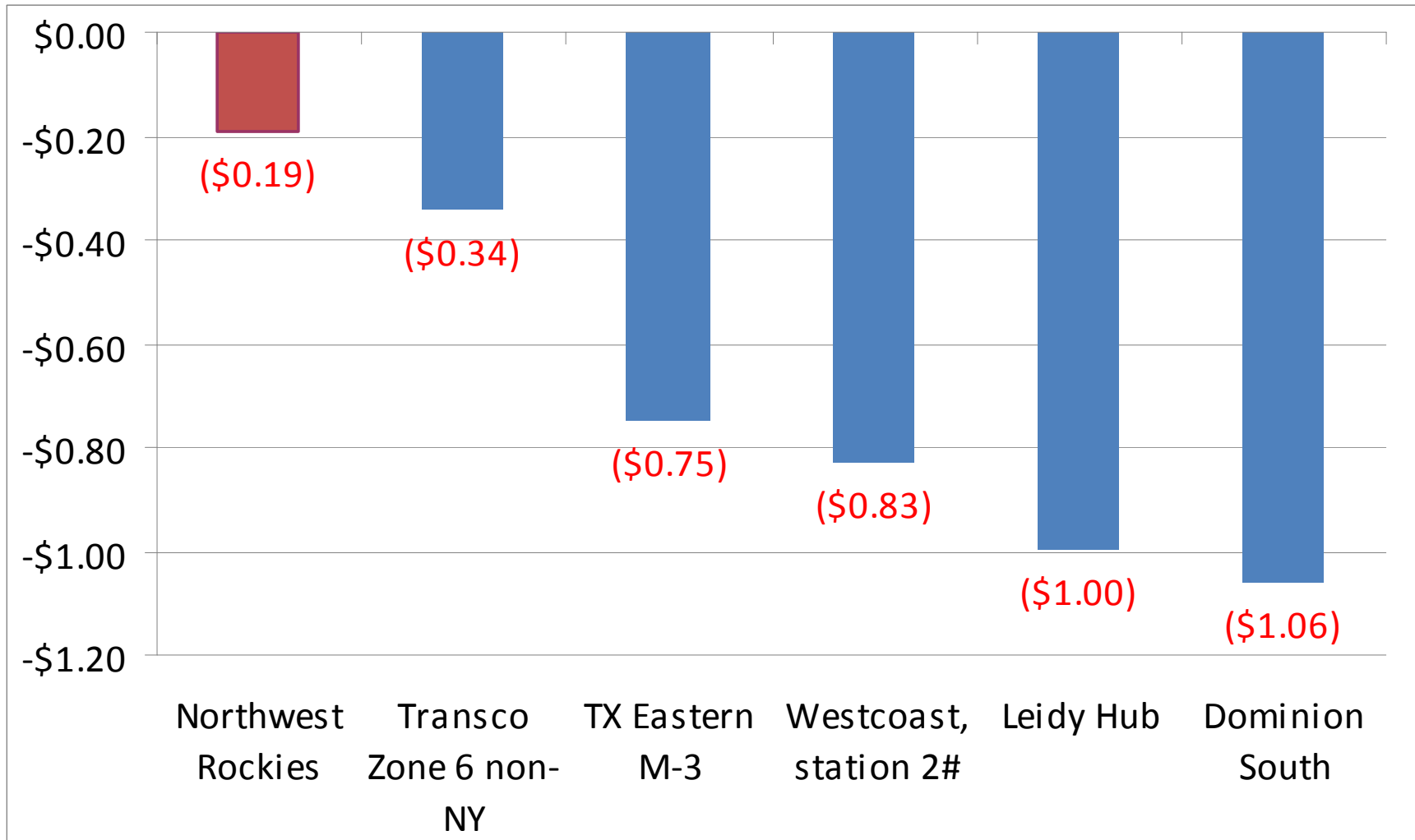


Rockies Pipeline Infrastructure



Source: Brian Jeffries, Wyoming Pipeline Authority (WPA)

Average Basis Differential for 2016



Piceance Basin Design versus Average Utilization

(All numbers in MMBtu per day)

	Design Capacity	Utilization*	Available
CIG (North)	203,000	33,000	170,000
CIG (West)	276,000	30,000	246,000
Northwest Pipeline**	877,000	64,000	813,000
Questar Pipeline (Net)	480,000	91,000	389,000
TransColorado	375,000	80,000	295,000
WIC Piceance Lateral	580,000	290,000	290,000
REX / Entrega (Segment 1)	1,437,000	625,000	812,000
Total Pipeline Export Capacity	4,228,000	1,213,000	3,015,000

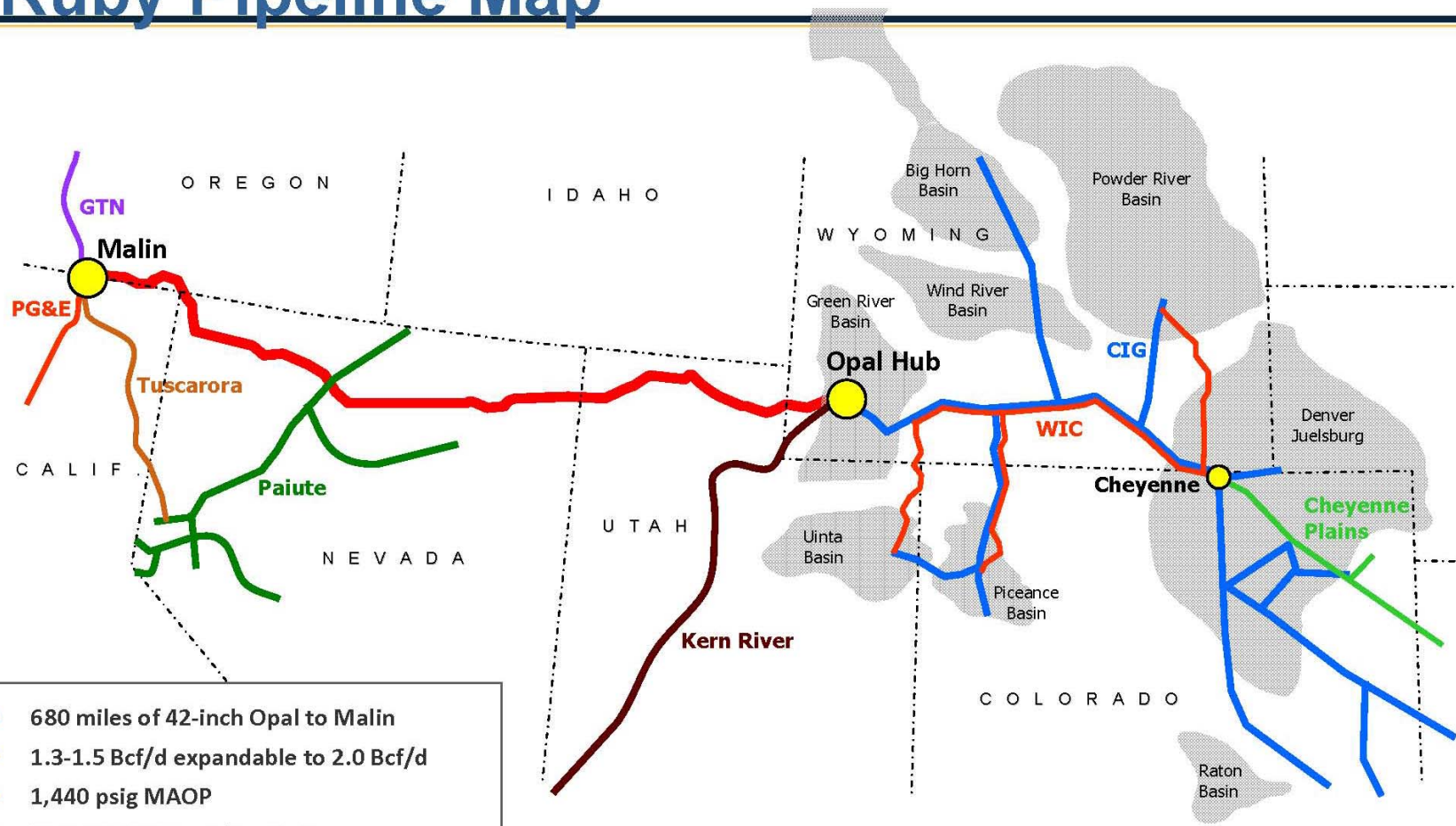
** There are currently six Piceance Basin delivery points into Northwest Pipeline

Growth in Piceance Basin Pipeline Takeaway Design Capacity

	Winter 2005	Winter 2016
CIG (North)	90,000	203,000
CIG (West)	276,000	276,000
Northwest Pipeline	440,000	877,000
Questar Pipeline (Net)	25,000	480,000
TransColorado	350,000	375,000
WIC Piceance Lateral	30,000	580,000
REX / Entrega (Segment 1)		1,437,000
Total Pipeline Export Capacity	1,211,000	4,228,000

* All numbers in MMBtu/day

Ruby Pipeline Map



- 680 miles of 42-inch Opal to Malin
- 1.3-1.5 Bcf/d expandable to 2.0 Bcf/d
- 1,440 psig MAOP
- Measurement – 8 locations
- 64%+/- Public Land
- 2 National Forests – Cache and Fremont

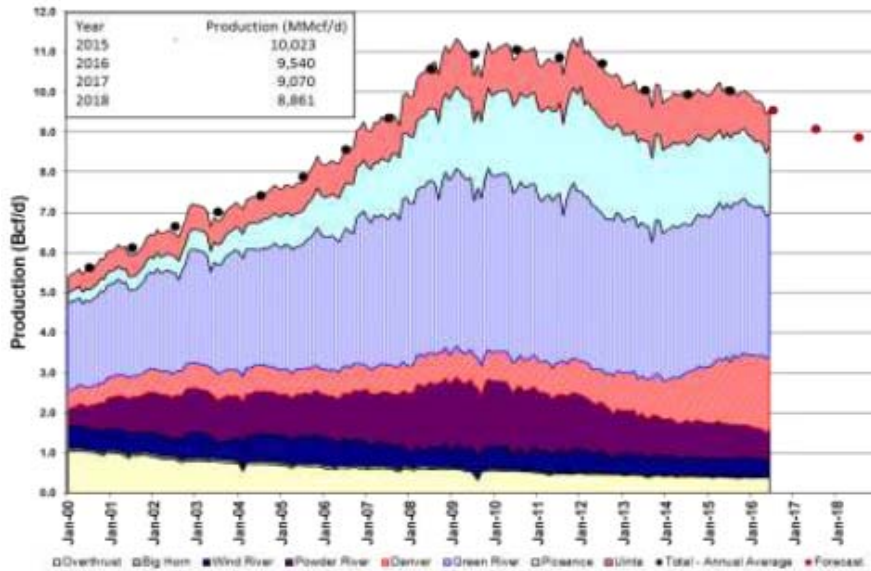


Piceance to Pacific



Rockies Production Trends

Wellhead Production

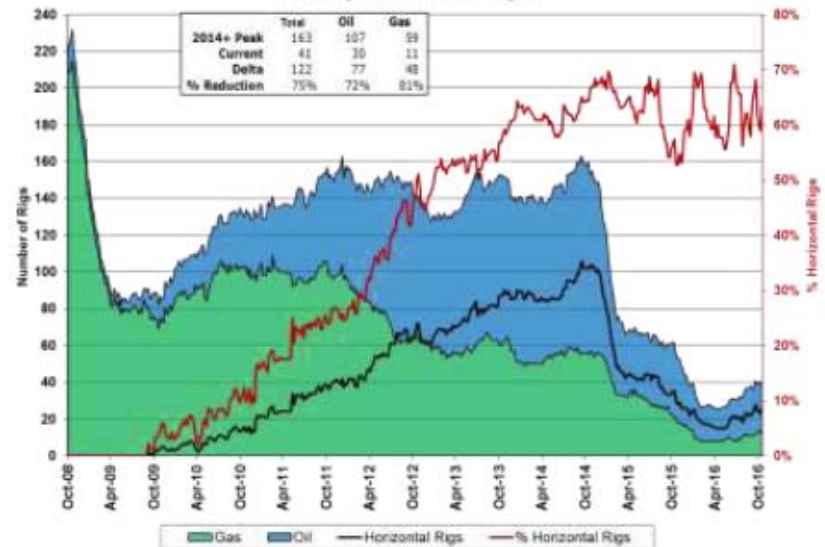


- Wellhead production has declined 0.4 Bcf/d over last year
- Relative to 2015, declines through 2018, followed by growth as gas prices recover. Only basin with material growth over the next decade is the Denver basin.
- Horizontal drilling = 65% of all rigs
- Positive November ballot initiatives

Basin	Current Dry Production MMcf/d	YOY Prod Growth MMcf/d	Current Rigs Gas/Oil
Green River	3,028	(207)	10/1
Piceance	1,455	(192)	4/0
Uinta	711	(102)	0/3
Denver/Julesburg	1,618	225	0/18
Powder River	379	(95)	0/6
Other	102	(24)	0/0
Total	7,293	(395)	14/28

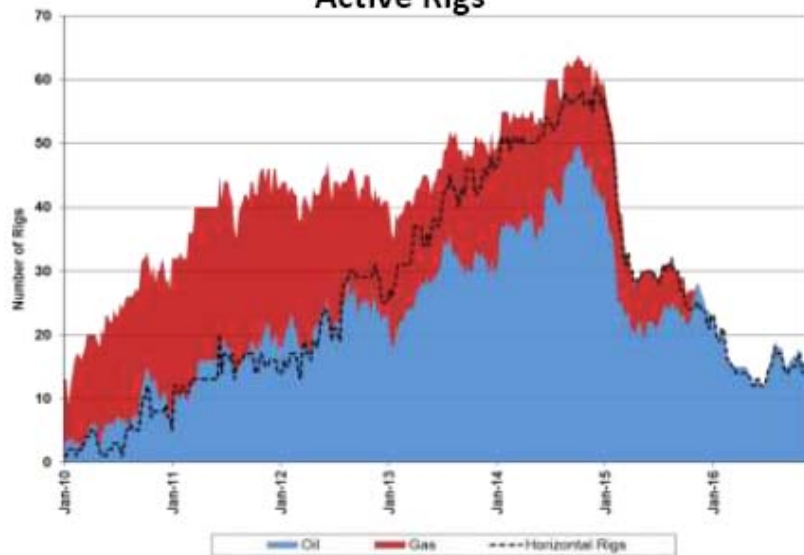
Active Rigs

Rocky Mountain Rigs



DJ Basin Update

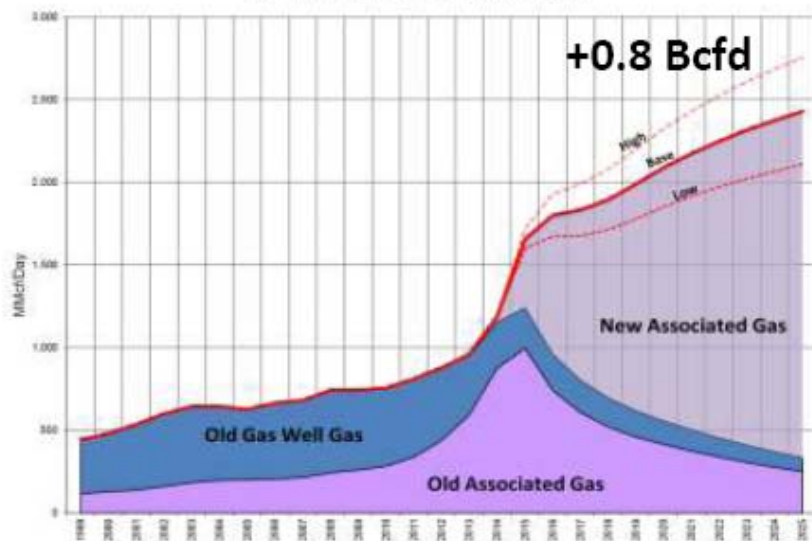
Active Rigs



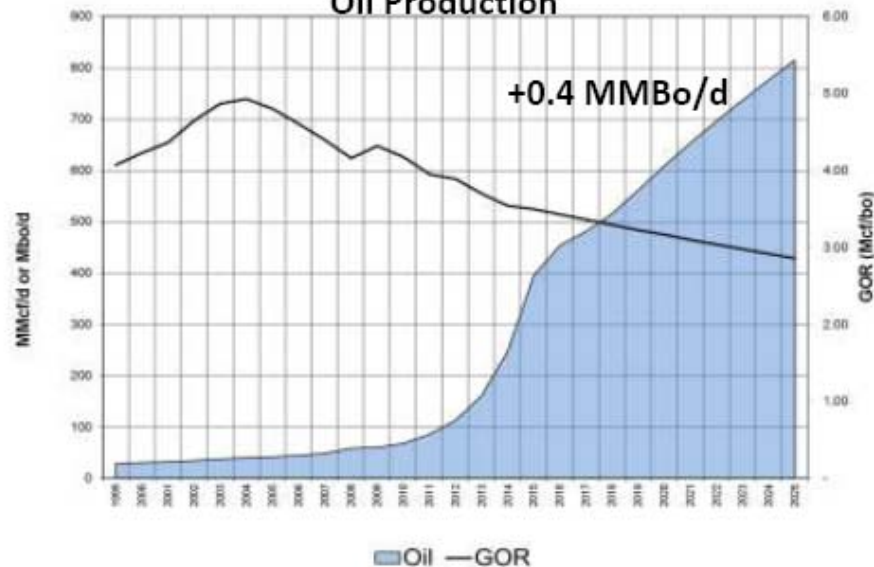
It is anticipated that rigs will return to the Denver Basin as commodity prices stabilize. Anadarko and Noble will more than double their rig activity levels in 2017 compared to 2016.

CIG/High Plains is well positioned to transport most of the growing DJ production output over the long-term, providing delivery into Cheyenne Hub or to Front Range demand.

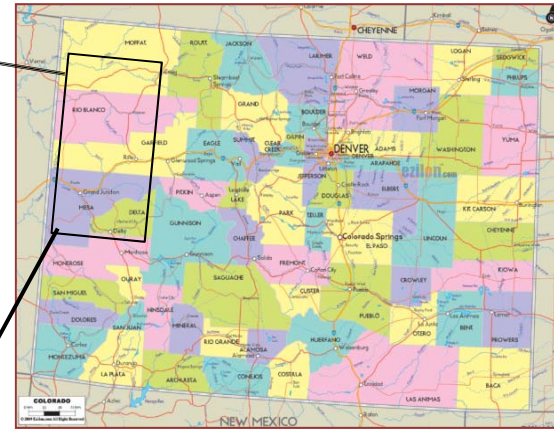
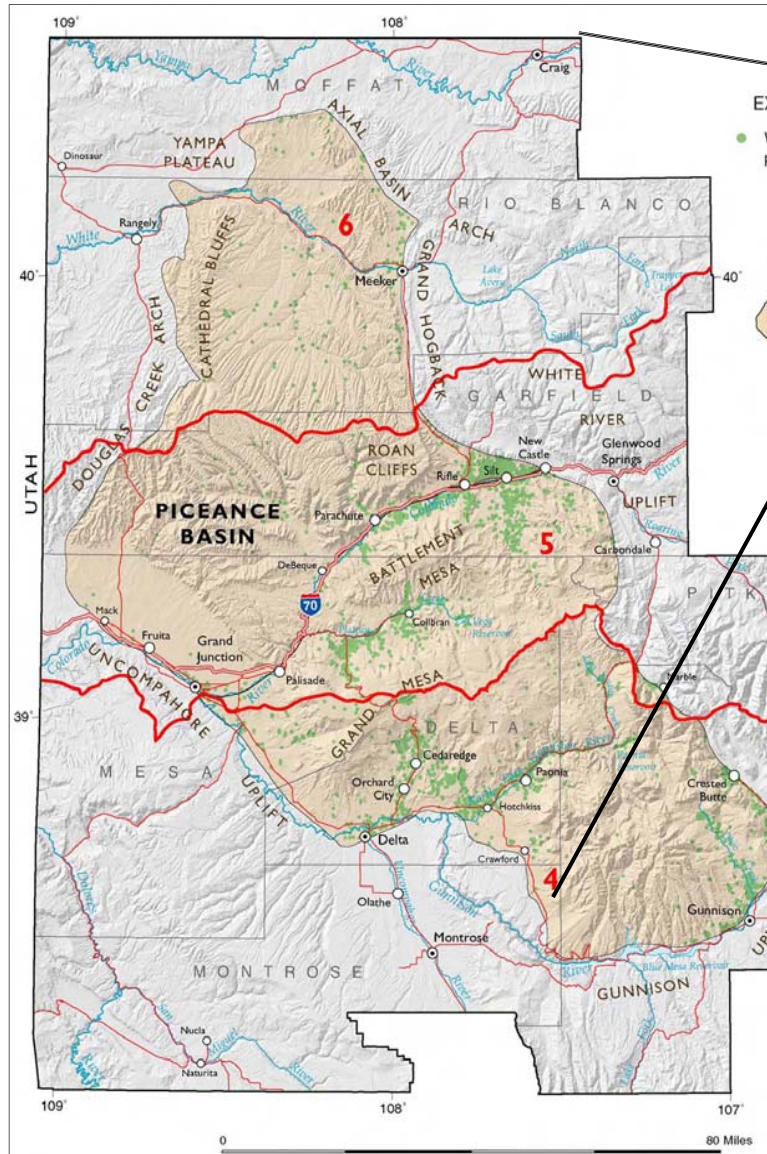
2015 to 2025 Growth



Oil Production



Colorado and Piceance Basin Maps



Annual Natural Gas Production In Counties That Contain the Piceance Basin

<u>County</u>	<u>2001</u>	<u>2002</u>	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>2006</u>	<u>2007</u>
Delta	0.005	0.006	0.002	0.025	0.401	0.065	0.019
Garfield	88.285	116.868	149.824	209.714	270.231	351.613	443.400
Gunnison	0.110	0.040	0.079	0.079	0.007	0.556	1.183
Mesa	5.027	7.695	9.345	7.807	10.755	15.478	30.651
Moffat	17.489	19.178	18.527	19.557	19.521	19.742	16.150
Pitkin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rio Blanco	31.414	35.936	34.159	33.622	37.579	48.159	48.119
TOTAL (Bcf)	142.330	179.723	211.935	270.804	338.495	435.612	539.522
TOTAL (MMcf/d)	389.9	492.4	580.6	739.9	927.4	1193.5	1478.1
Y/Y % Change	12.5%	26.3%	17.9%	27.4%	25.3%	28.7%	23.9%

<u>County</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>2014</u>
Delta	0.026	0.010	0.009	0.015	0.061	0.153	0.301
Garfield	565.152	610.868	648.453	676.333	701.963	653.584	609.125
Gunnison	1.475	1.410	2.078	1.901	1.965	1.477	3.609
Mesa	42.788	38.476	37.992	41.662	47.211	37.283	36.317
Moffat	20.169	17.082	19.345	18.252	17.090	17.097	16.303
Pitkin	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Rio Blanco	54.468	76.041	99.841	106.274	94.906	76.363	81.244
TOTAL (Bcf)	684.079	743.887	807.718	844.436	863.196	785.957	746.899
TOTAL (MMcf/d)	1869.1	2038.0	2212.9	2313.5	2358.5	2153.3	2046.3
Y/Y % Change	26.4%	9.0%	8.6%	4.5%	1.9%	-8.7%	-5.0%

Note: These figures are largely driven by Piceance production, but may contain some production from other formations.

Source: Colorado Oil & Gas Conservation Commission data, NGL's Shale Daily calculations

Comparative Rockies Rig Count

	2014 Average	Quarter 1, 2015	Quarter 2, 2015	Quarter 2, 2016	Quarter 1, 2017
DJ Niobrara	54	44	34	12	23
Piceance Basin	12	10	9	3	5
Uinta Basin	28	14	8	3	5
Powder River Basin	34	23	12	1	12
Greater Green River Basin	17	13	12	6	9
Williston Basin	186	135	95	25	36



Wyoming and Colorado Crude Oil Pricing Comparison

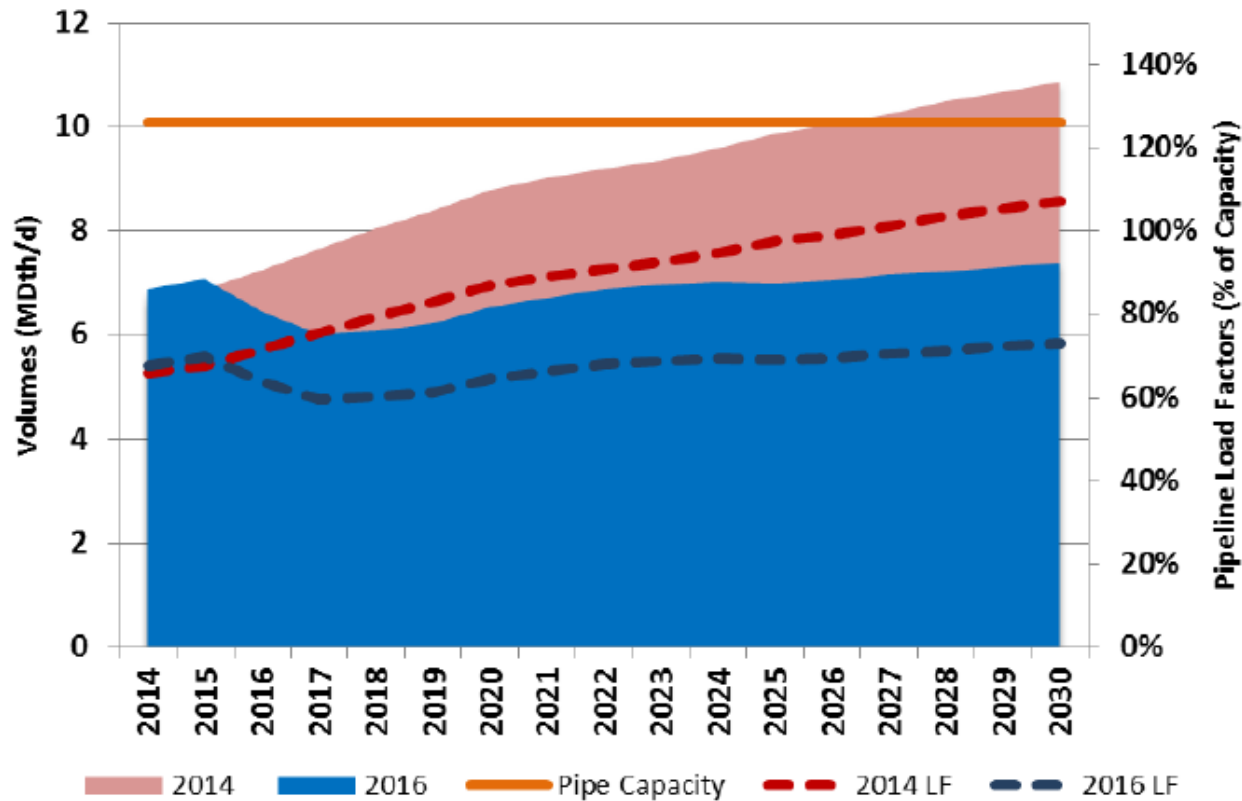
	August 1, 2014 (price per barrel)	April 8, 2015 (price per barrel)	February 6, 2017 (price per barrel)
WY Asphalt Sour	\$68.50	\$26.50	\$34.50
WY General Sour	\$69.50	\$27.50	\$35.50
WY Heavy Sour	\$74.34	\$32.38	\$34.93
WY Medium Sour	\$75.59	\$33.28	\$35.93
WY Southwest	\$85.88	\$40.42	\$44.76
WY Sweet (Other)	\$82.88	\$38.57	\$45.71
CO Eastern Sweet	\$82.38	\$38.07	\$45.21



Source: Shell Energy Connect, Shell Trading (US) Company posted prices

Mercator Energy

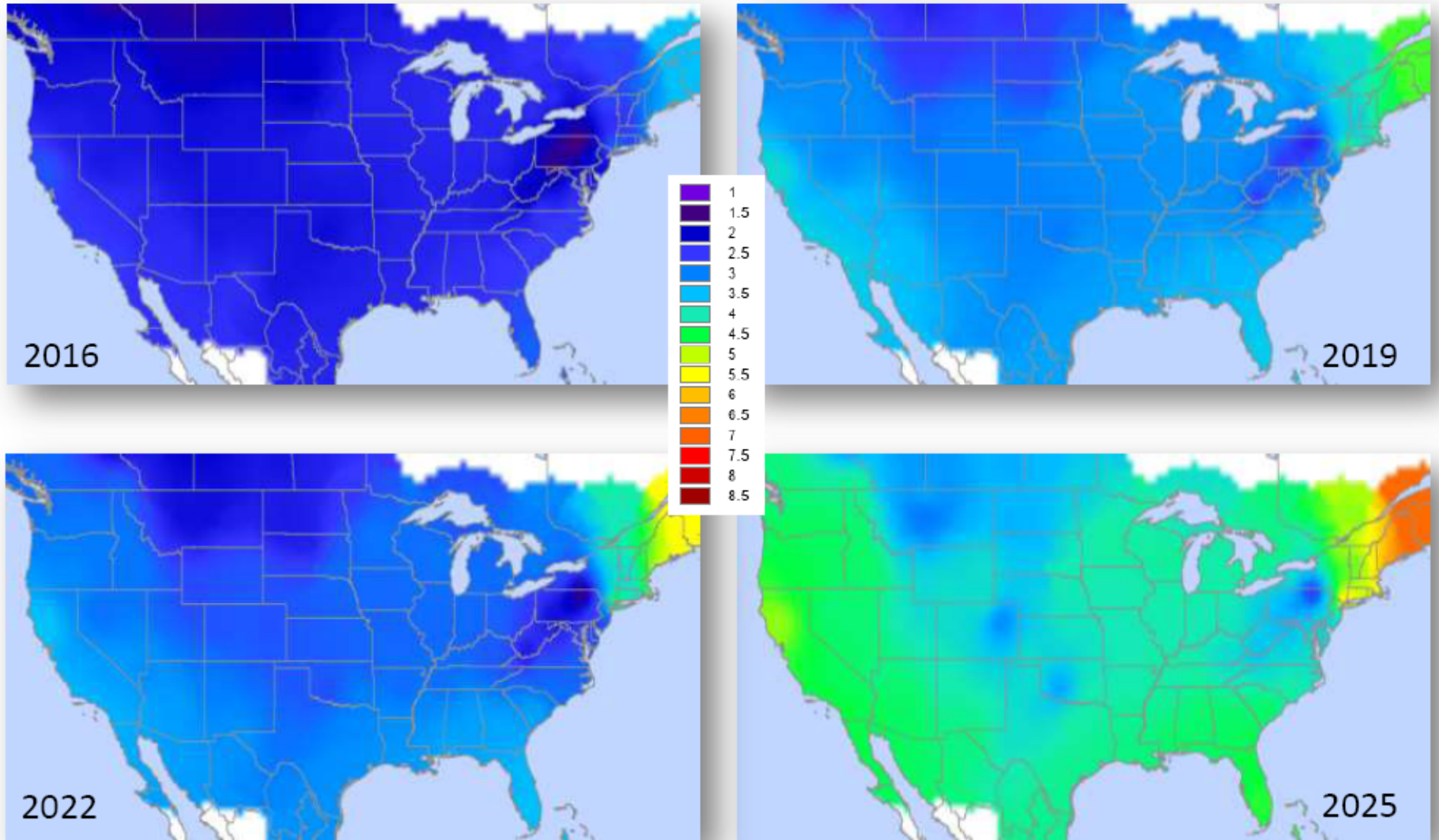
Rockies Supply (Net of Local Demand)



In 2014, the projections estimated Rockies supply (less local demand) to approach 75% of pipeline capacity exiting the Rockies by 2019, 89% by 2021, and eclipsing Rockies capacity by 2026.

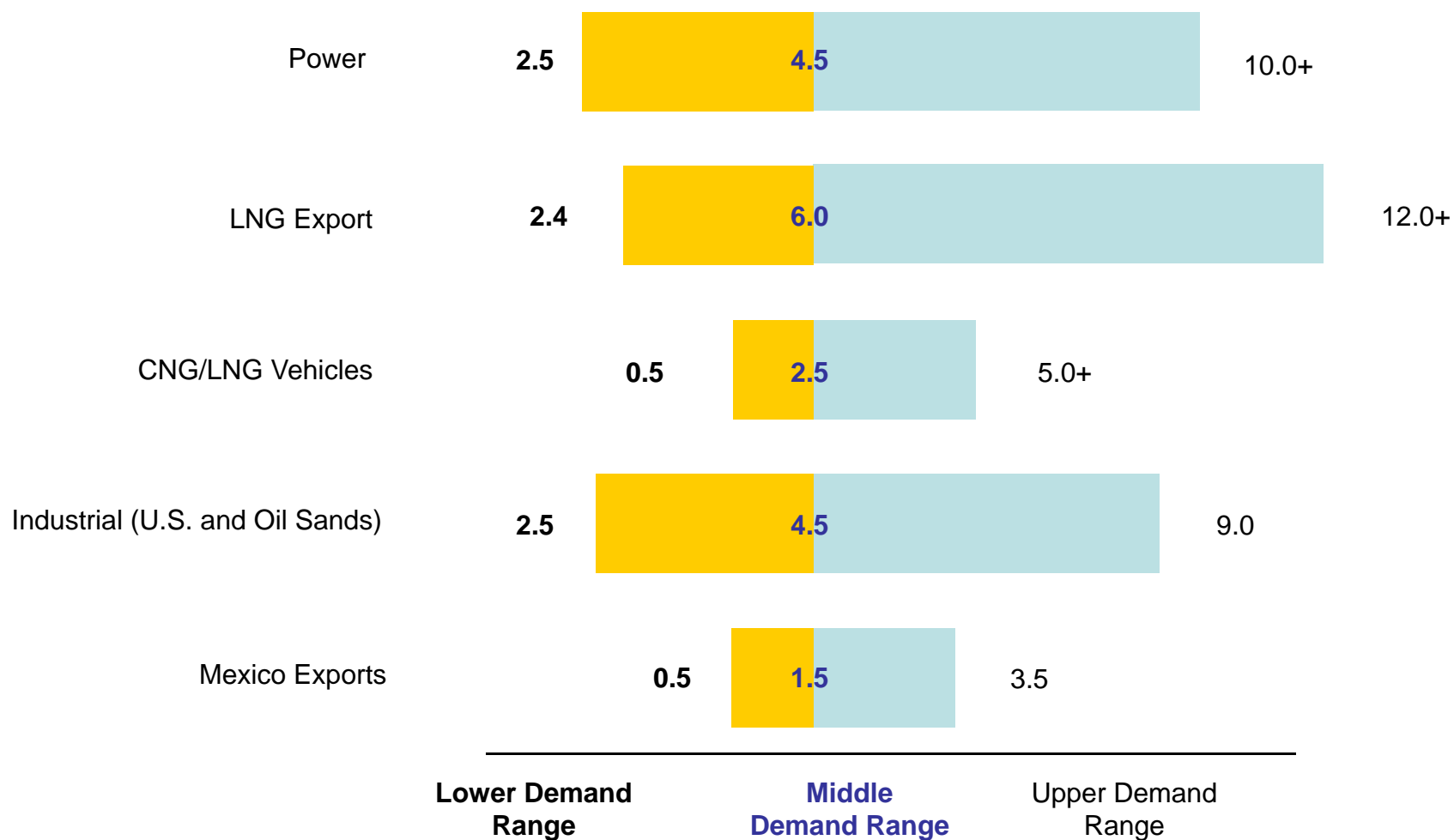
Current projections estimate Rockies supply (less local demand) to be 61% of pipeline capacity by 2019, 66% by 2021, and not exceeding 72% through 2030

Natural Gas Price Outlook



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.



World LNG Estimated October 2014 Landed Prices (\$U.S./MMBtu)



Source: Waterborne Energy, Inc. Data in \$US/MMBtu. Landed prices are based on a netback calculation.

Note: Includes information and Data supplied by IHS Global Inc. and its affiliates ("IHS"); Copyright (publication year) all rights reserved.

Prices are the monthly average of the weekly landed prices for the listed month.

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



Source: Waterborne Energy, Inc. Data in \$US/MMBtu. Landed prices are based on a netback calculation.

Note: Includes information and Data supplied by IHS Global Inc. and its affiliates ("IHS"); Copyright (publication year) all rights reserved.

Prices are the monthly average of the weekly landed prices for the listed month.

World LNG Estimated December 2016 Landed Prices (\$U.S./MMBtu)



Source: Waterborne Energy, Inc. Data in \$US/MMBtu. Landed prices are based on a netback calculation. Updated: January 2017
 Note: Includes information and Data supplied by IHS Global Inc. and its affiliates ("IHS"); Copyright (publication year) all rights reserved.
 Prices are the monthly average of the weekly landed prices for the listed month.

Predictions from 2 Years Ago

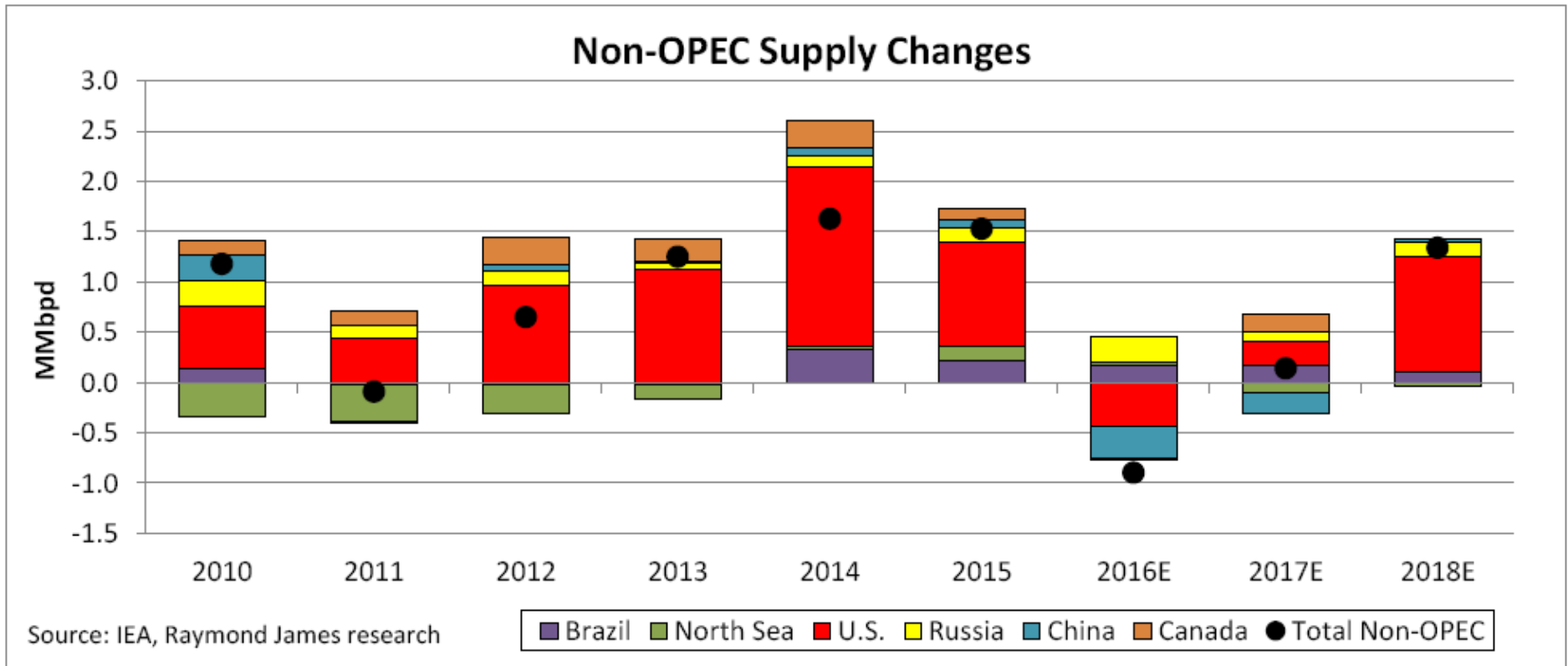
Winners

- China/Asia
- Consumer growth; consumer spending
- U.S. nitrogen fertilizer industry
- Steel producers
- Refiners
- Chemical producers
- Aluminum smelters
- Natural gas fired electric generators

Losers

- U.S. Energy Security
- State and local governments in oil & gas producing states
- Oil & gas E&P's
- Oil & gas employment
- Oil & gas service companies
- U.S. LNG exporters who have not made an FID
- MLP's
- Retirement funds
- Renewable energy sector – cheap energy will destroy the “Green Revolution”
- Russia, Iran, Venezuela

Russian Surprise



Source: *Energy Stat: Why Is Russian Oil Production Growing as Consistently as Putin's Approval Ratings?*, Raymond James U.S. Research, December 12, 2016

Conclusions – 2 Years Ago

- Crude and NGL prices won't recover for at least 2 years
- U.S. crude, NGL & natural gas production won't decline as quickly as OPEC expects
- U.S. producers will allocate capital to their highest IRR projects
- Low NGL prices create a problem for MLP's
- U.S. "short cycle" drilling (dependent on near term quarter cash flow) will result in U.S. drillers feeling most of the pain
- The "recovery time" will exceed any hedge terms

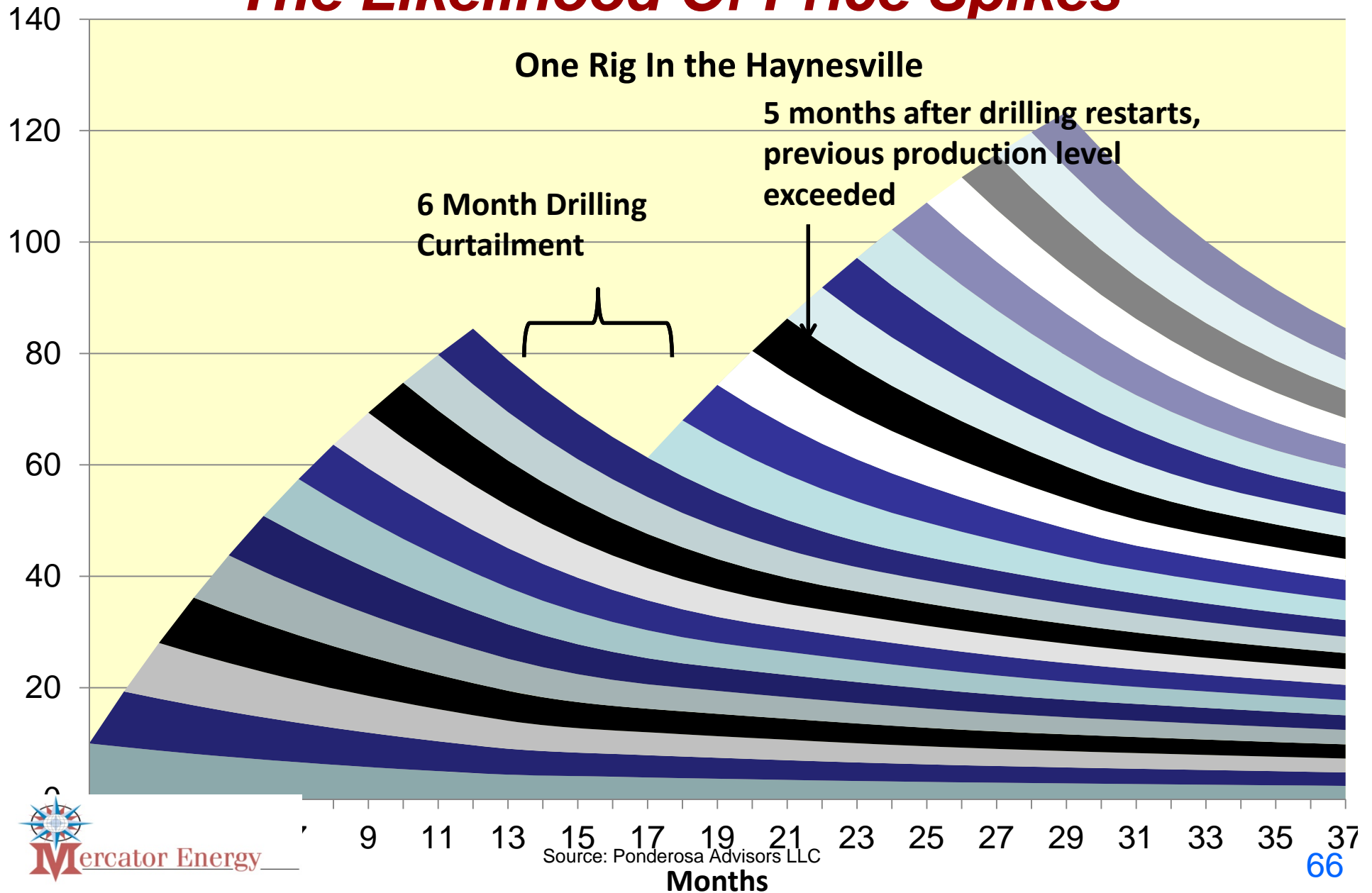
Conclusions – 2 Years Ago

- The supply response will eventually materialize but it will take longer than expected
- The DJ basin is disadvantaged in terms of geography (high transport costs to market) and crude-quality (light, lower value crude) ... and will experience a significant slowdown in drilling.
 - State & Local revenues will be impacted
 - The lower crude price is more significant to tax revenue in the 1-3 year timeframe than a slowdown in drilling

Conclusions – Current

- With regard to energy, most of our lives have been spent considering all forms of energy as a scarce resource
- Thanks to the Shale Revolution, that will not be the case in the future
- That reality will have many, many geopolitical consequences

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



Cardboard cut-out?



Here's proof.



Ike and Detective Tom Golden



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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PennState Marcellus Center for Outreach and Research

BC Oil & Gas Commission

Kinder Morgan, George Wayne

Shell Energy Connect

Tudor Pickering Holt & Co.

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