

The Geopolitical Impact of the U.S. Shale Revolution

Presentation to:

Montana Petroleum Association

By:

John Harpole



August 30, 2017





Harp's Bakery
Deer Lodge, MT
circa 1932

Circa 2007

Let's discuss your cost of natural gas.



U.S expected to import 35% of its natural gas needs by 2020

Circa 2007

Russia's Energy Muscle

- Energy Used Over 55 times Against Former Soviet Nations Since 1990



Circa 2007

Energy Security?

- By the year 2020, Gazprom will supply nearly 70% of the European Union's natural gas.
- Would you pursue a conflict with a country that you depend on for the majority of your energy needs?

Circa 2007

Gazprom's Current Near-Monopoly Supply Position

% of Supply from Gazprom/Russia

Slovakia	100%
Macedonia	100%
Finland	99%
Bulgaria	97%
Serbia & Montenegro	87%
Lithuania*	84%
Hungary	80%
Czech Republic	79%
Greece	76%

*Remember



Source: "Domestic Consumption" EIA International Energy Annual, 2007; "Exports 2006 and 2007" Gazexport as cited by Energy Intelligence, March 2008

Circa 2007

Gazprom's Current Near-Monopoly Supply Position (cont'd)

<u>% of Supply from Gazprom/Russia</u>	
Austria	74%
Slovenia	64%
Poland	62%
Turkey	60%
Germany	40%
Croatia	37%
Italy	30%
Romania	28%
France	25%



Source: "Domestic Consumption" EIA International Energy Annual, 2007; "Exports 2006 and 2007" Gazexport as cited by Energy Intelligence, March 2008

10/21/2008 in Tehran, Iran

Russia, Iran and Qatar form natural gas cartel

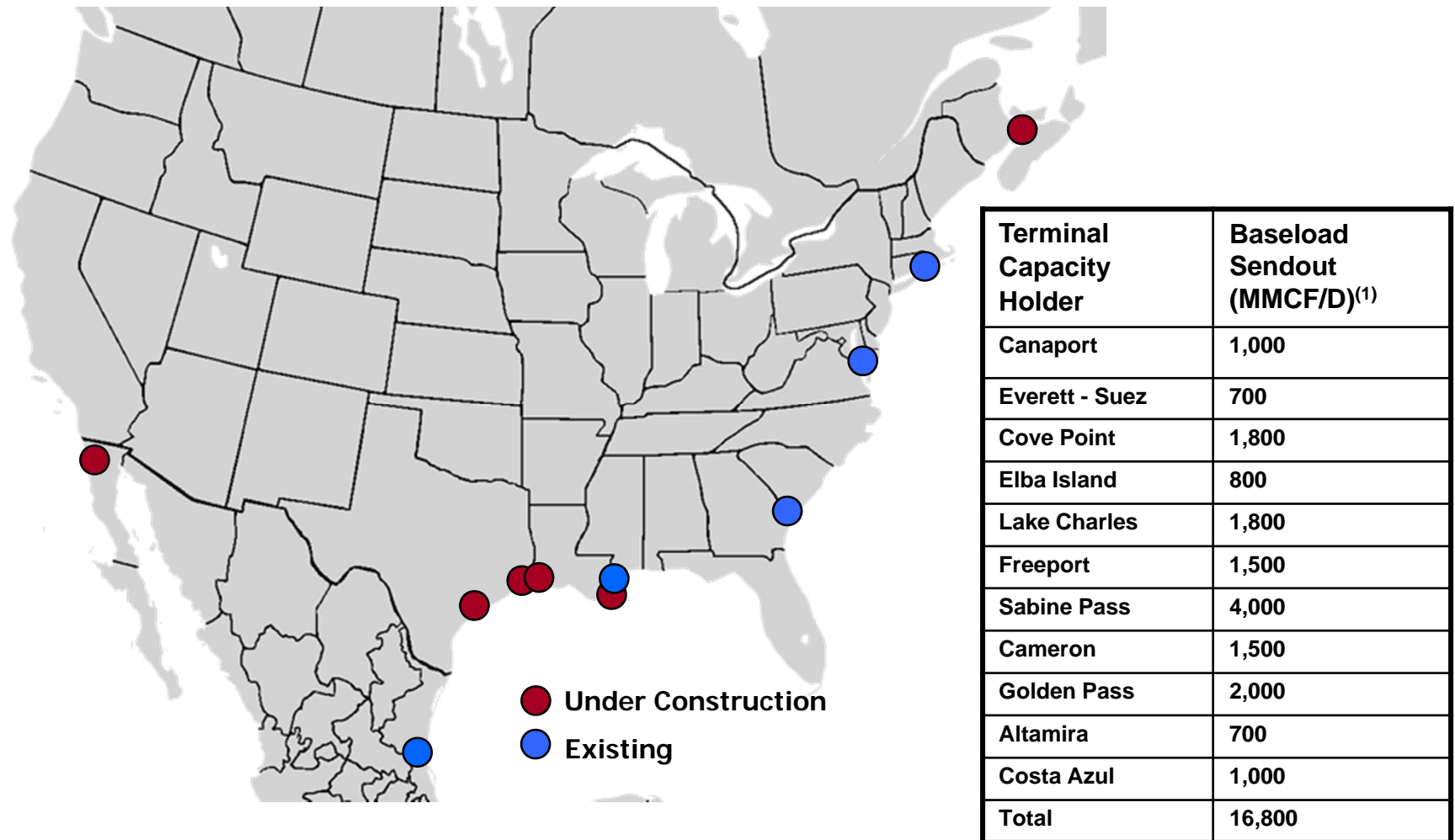


Qatar's Deputy Premier and
Minister of Energy and Industry,
Abdullah bin Hamad Al-Attiya

Iranian Oil Minister,
Gholam Hossein Nozari

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

Global LNG Available to Supplement U.S. Supplies As Needed, November 2007



U.S. regasification capacity is on track for a four fold increase to over 16 bcf/day of capacity

Circa 2007

U.S. Shale Gas Development Could be Slowed by LNG Imports

- “Importing LNG to the U.S. would be economical at an average gas price as low as \$3.50/MMBtu.”
- “Whereas shale gas requires an average gas price of at least \$6.50/MMBtu to be economical.”

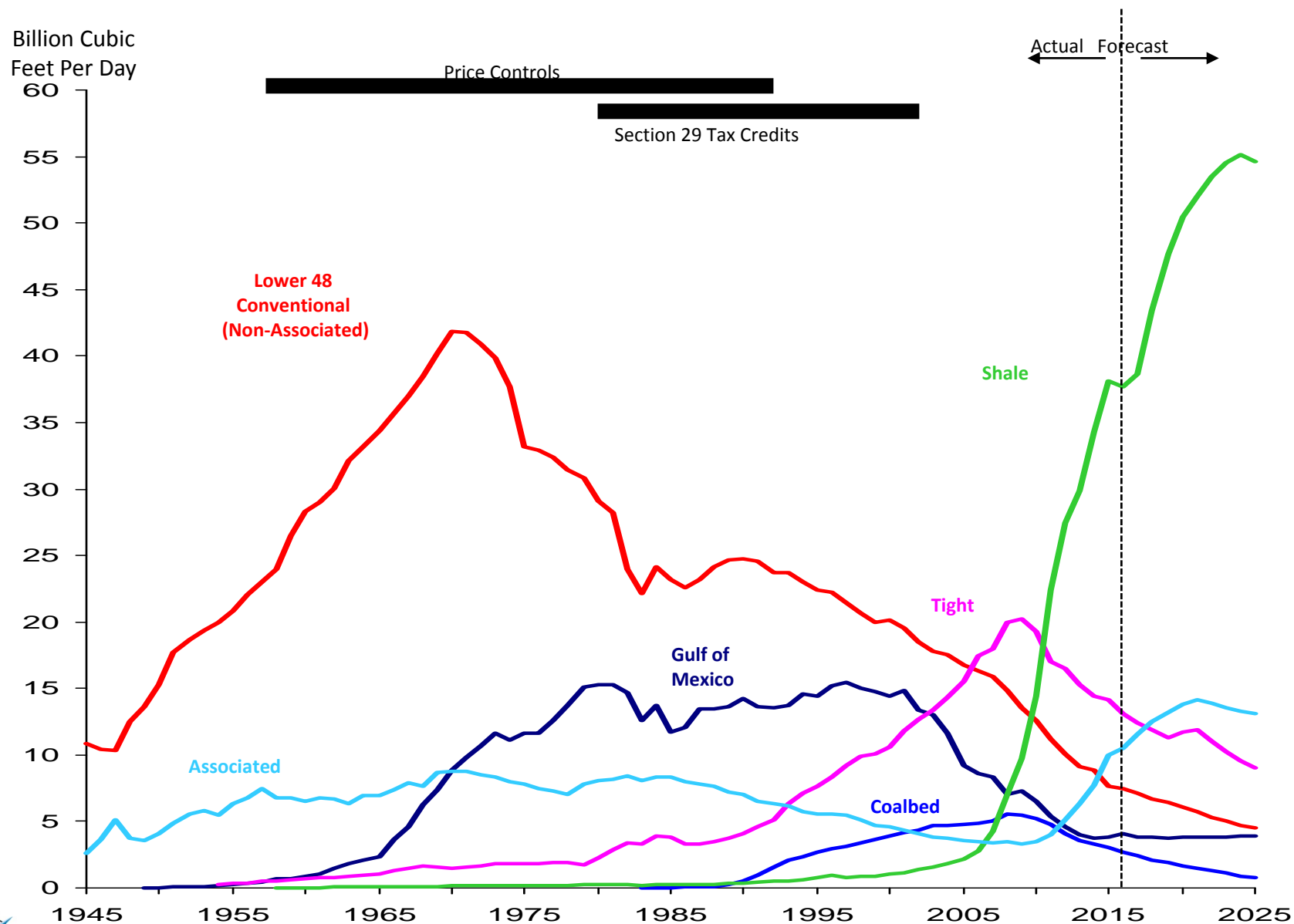
Source: Scott Thetford, VP of Pace Global Energy Services, LLC

Wrong!

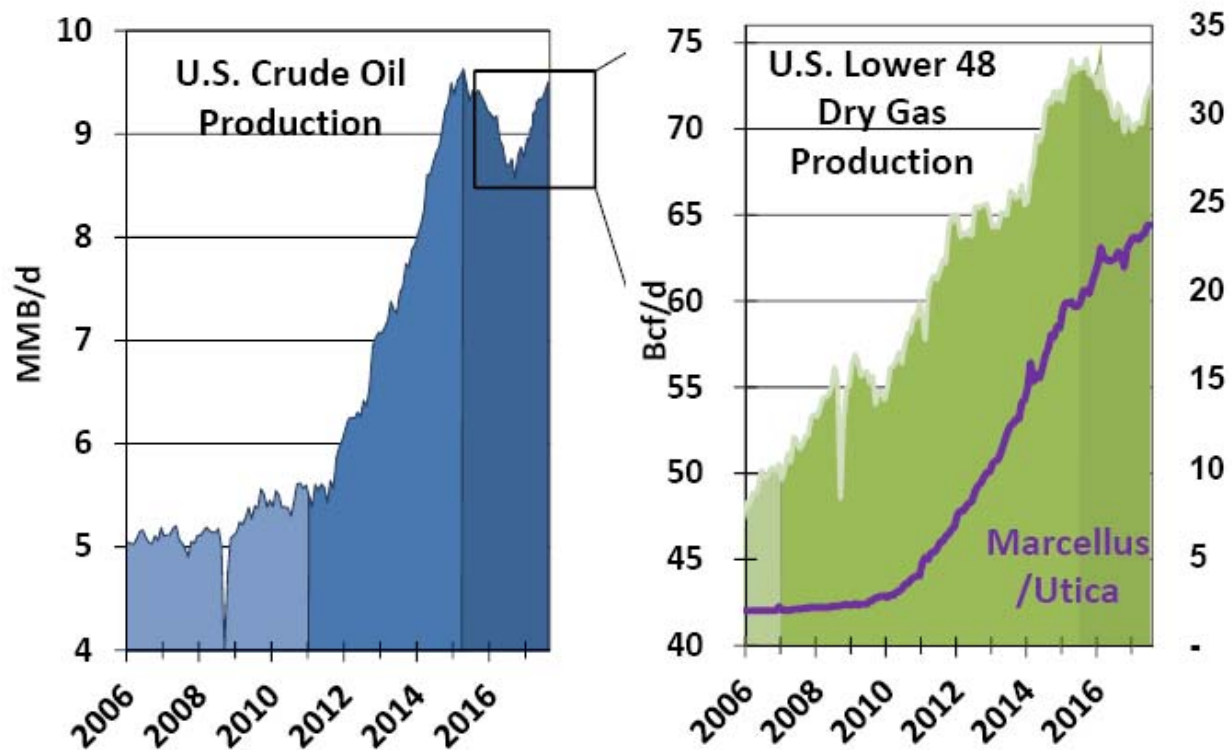


... and then the U.S. Shale Revolution happened... and the world will never be the same again.

FIGURE 3
UNITED STATES NATURAL GAS PRODUCTION



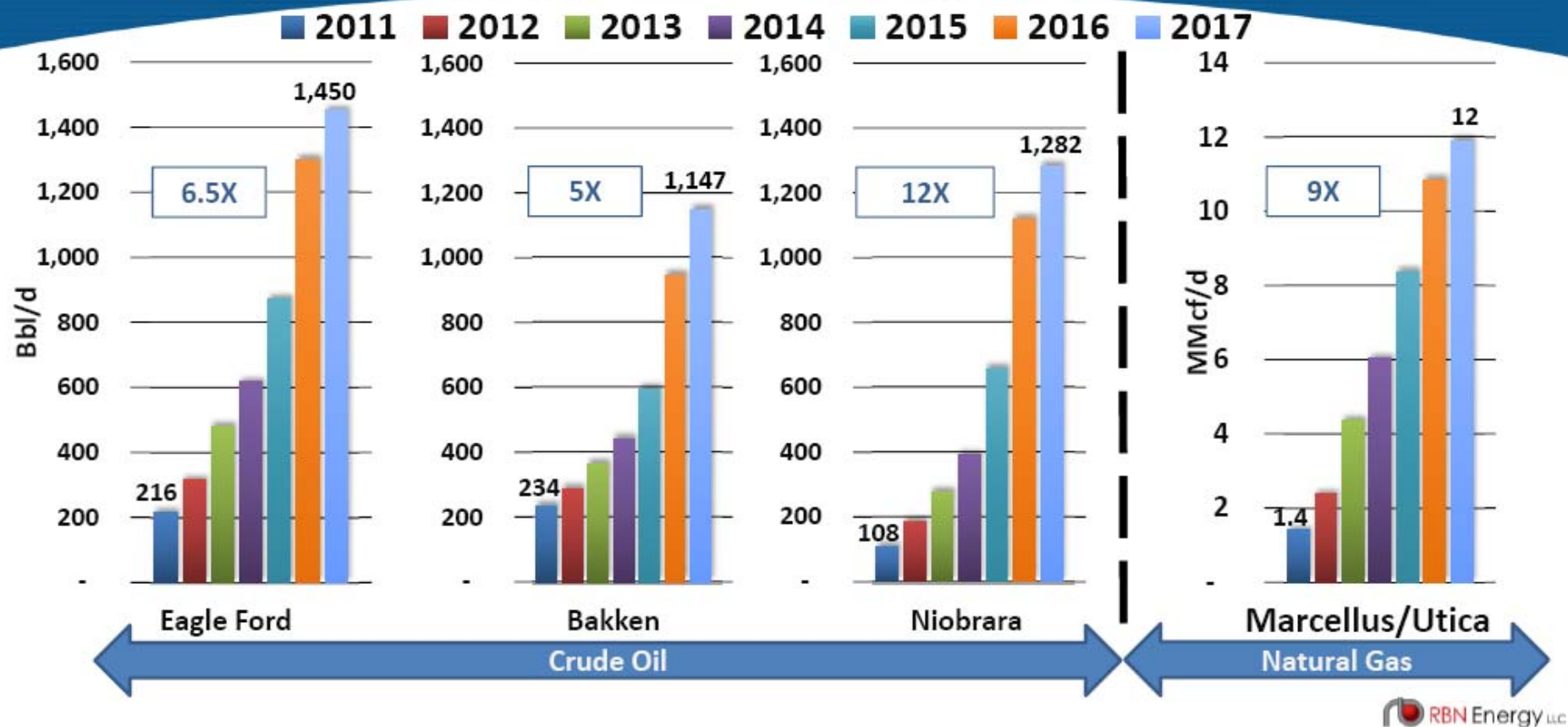
Production of Crude Oil and Natural Gas



RBN Energy LLC

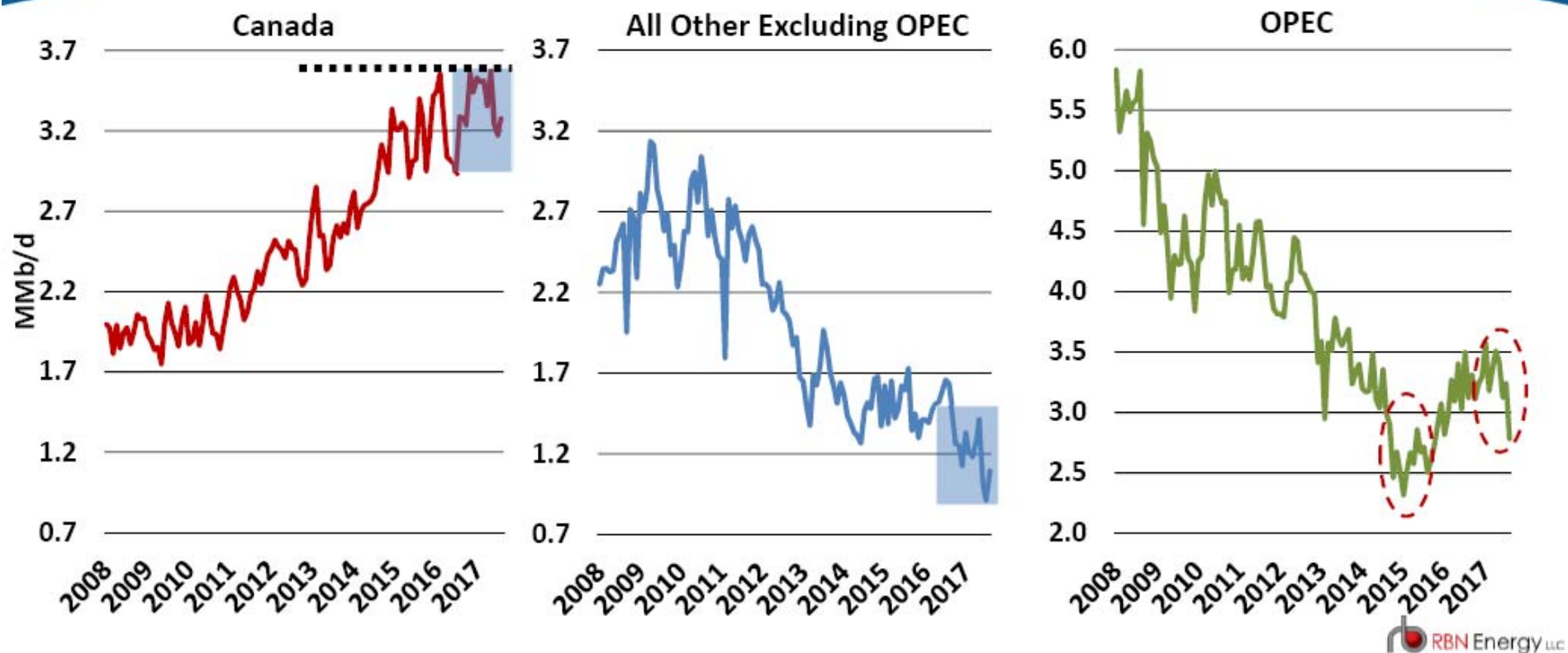
Source: *Midstream to Markets: Oil Markets: Out of the Woods?*, RBN Energy, The Energy Summit, August 23, 2017

Oil and Gas Production Added Per Rig



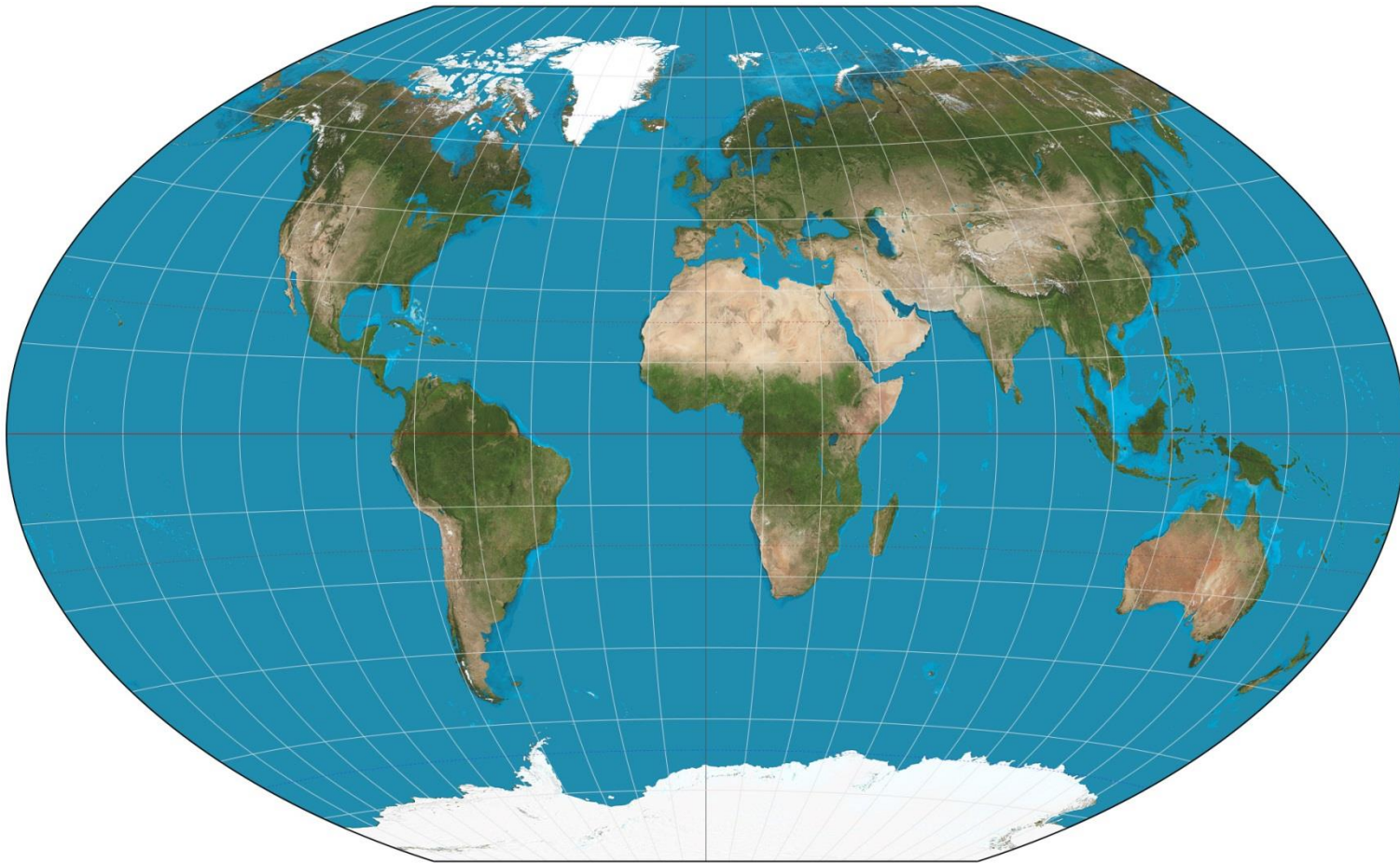
Source: *Midstream to Markets: Oil Markets: Out of the Woods?*, RBN Energy, The Energy Summit, August 23, 2017

U.S. Crude Oil Imports



Source: *Midstream to Markets: Oil Markets: Out of the Woods?*, RBN Energy, The Energy Summit, August 23, 2017

An Assessment of the Geopolitical Backdrop



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

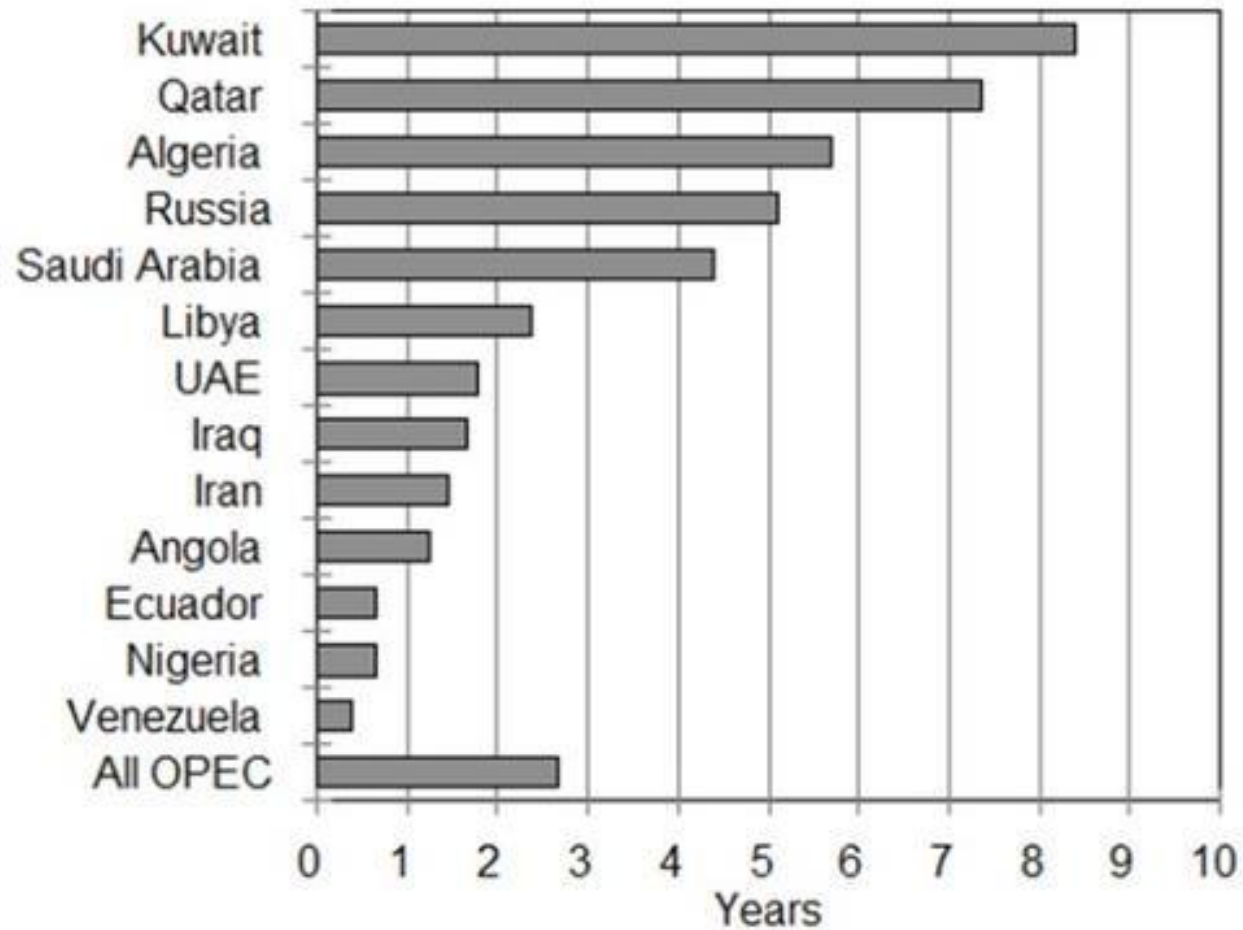
According to data compiled by Bloomberg, *“prices have dropped below the level needed by at least 9 OPEC member states to balance their budgets.”*

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

Mercator Energy_____

North Korea

An unavoidable war?



North Korea

KOGAS – One of the largest U.S. LNG Buyers

- 10% of South Korea's total demand will be met by LNG from Cheniere Energy's Sabine Pass Liquefaction facility in Louisiana.
- 20 year Sales and Purchase Agreement (SPA) officially commenced June 1, 2017
- 3.5 million tonnes of LNG per year (roughly 50 BCF per year)



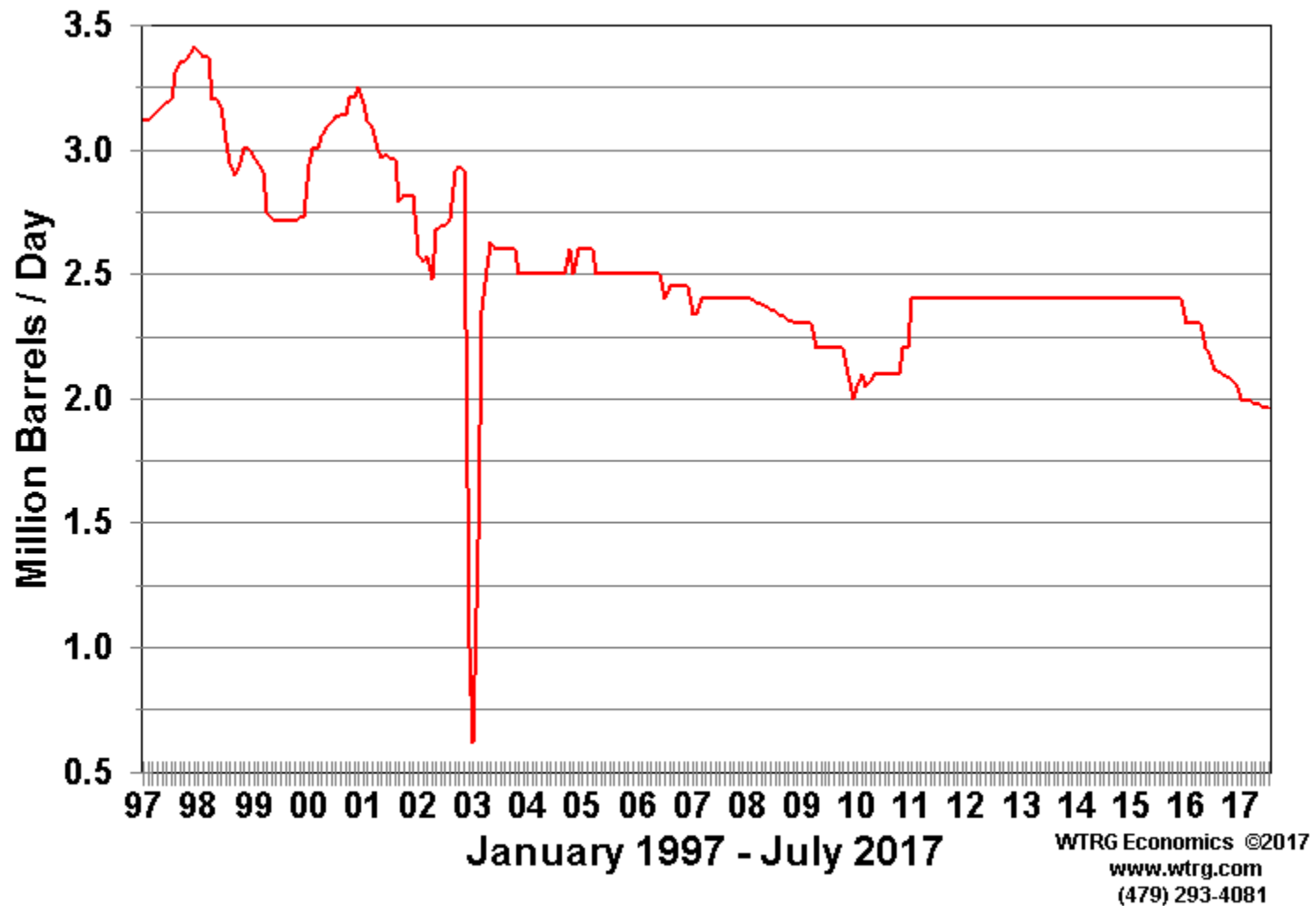
Venezuela



- Population of 30 million people
- One of the largest oil producers in the world with \$6.5 billion dollars in debt repayment due soon
- China is subsidizing them as a challenge to the U.S.

Venezuela

Crude Oil Production



Venezuela

Caught in a squeeze of their own making

- Venezuela, due to its quality of crude, is a price taker as foreign refiners control them
- Refiners are gradually walking the price down



SOURCE: TRADINGECONOMICS.COM | ORGANIZATION OF THE PETROLEUM EXPORTING COUNTRIES

Venezuela

200,000 March Against President Maduro

(May 20, 2017)



Venezuela

Trump: U.S. will not 'rule out military option' in Venezuela

“Venezuela is not very far away... people are suffering and dying” President Trump, August 11, 2017



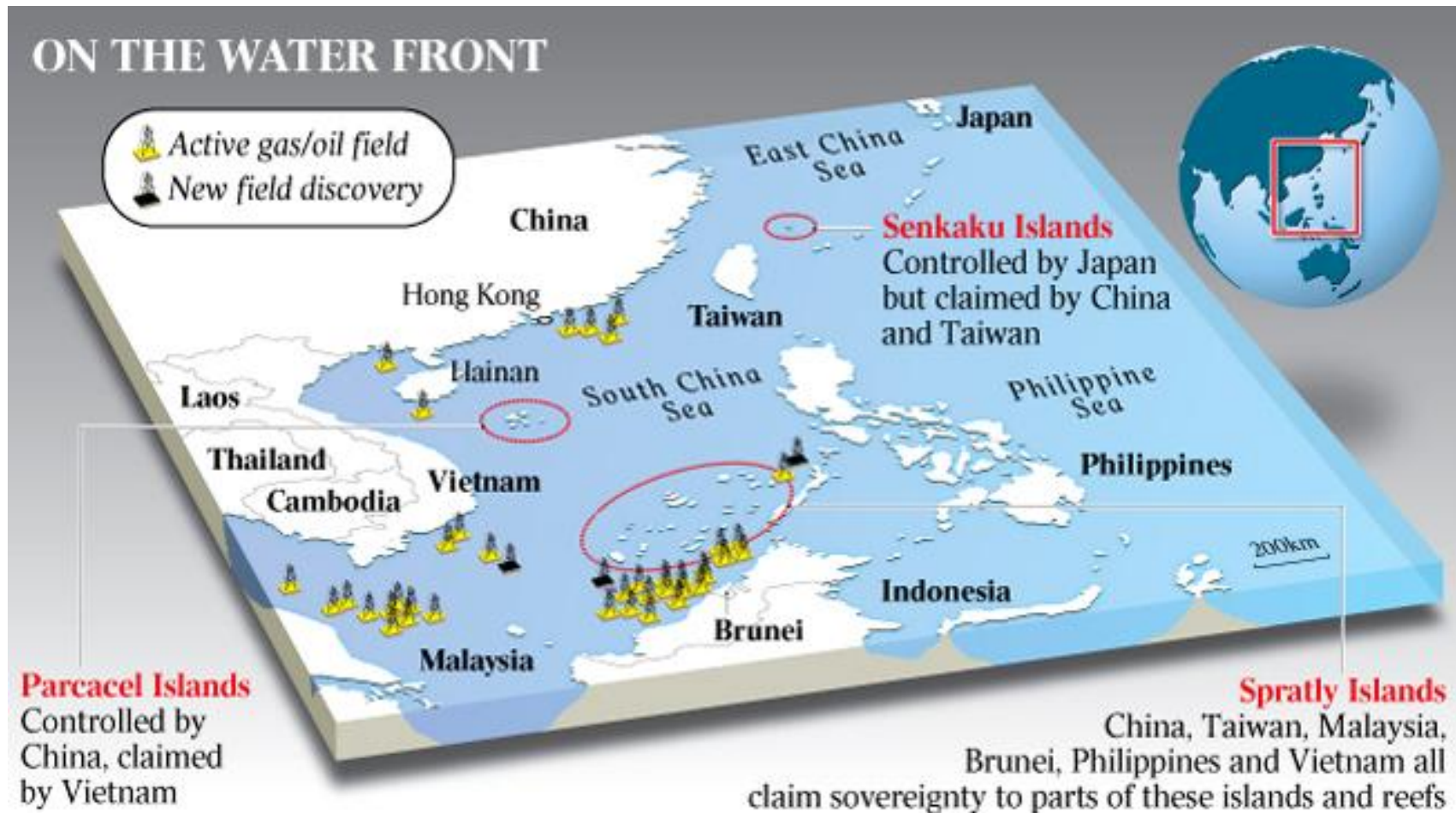
China

Man made islands are a game changer



China

What's at stake?



China's claim encompasses roughly 90% of the South China Sea and all the resources that may exist within it.

China

What's at stake?

“The South China Sea is one of the most important energy trade routes in the world” with “almost a third of global crude oil and over half of global liquefied natural gas (LNG)” passing through it each year.

- US Energy Information Authority (EIA), 2013

Source: *South China Sea headbutting of nations is about energy security*, South China Morning Post, April 5, 2016

China

A Sign of Energy Insecurity?

Two-fold motivation

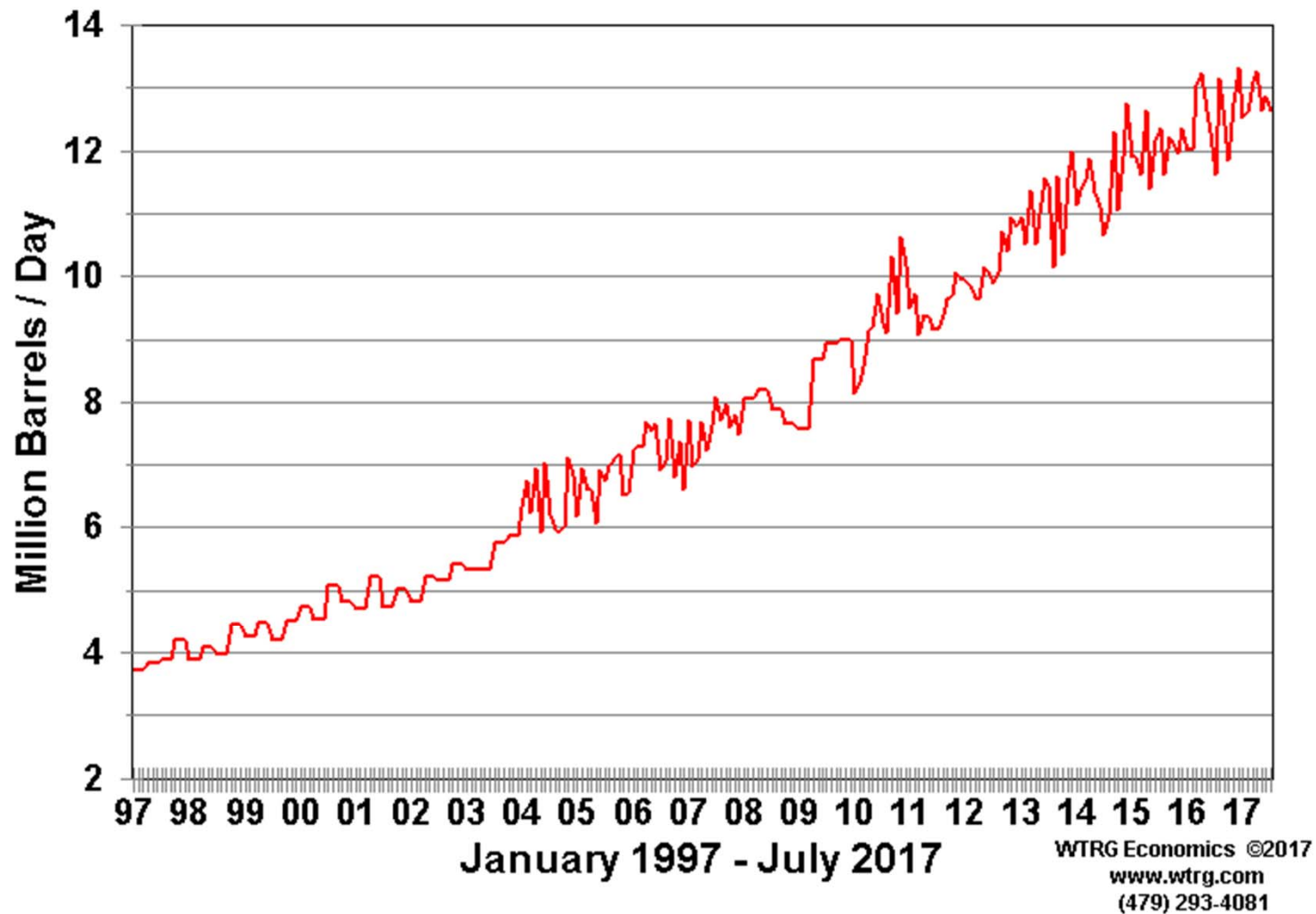
- The South China Sea is believed to have 11 billion proved or probable barrels of oil in reserves and about 190 TCF of natural gas.
- China is the world's largest importer of crude; importing approximately 7.5 million barrels per day or 2.7 billion barrels per year.
- 82% of China's oil imports pass through the South China Sea.

Source: *What's at stake in China's claims to the South China Sea?*, The Conversation, July 14, 2016; *China Morning and China's Energy Insecurity Glaring In South China Sea Dispute*, Forbes, September 2, 2016



China

Petroleum Consumption



Middle East Arab Spring

Hope for democracy was wrong and misplaced



Middle East

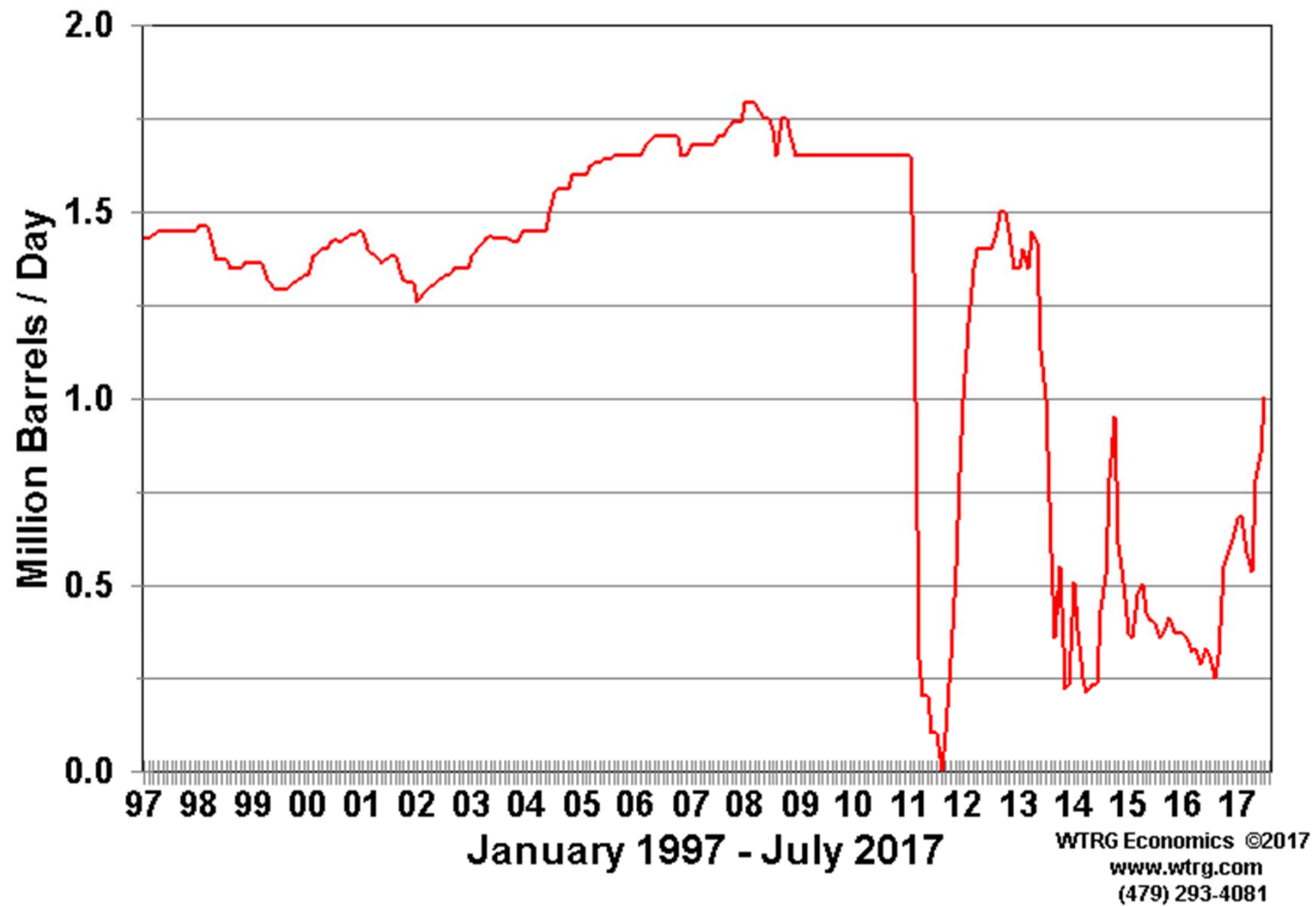
Arab Spring Aftermath?

- 3 failed states: Syria, Yemen, Libya
- No orderly transition resulting in a “Cold War” type standoff between Iran and Saudi Arabia



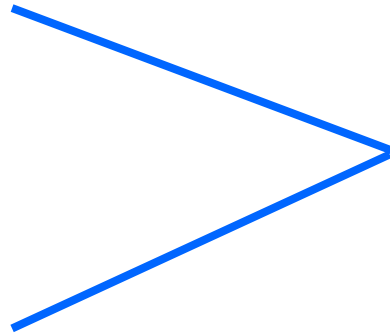
Libya

Crude Oil Production



The Problem?

Iran
China
Russia

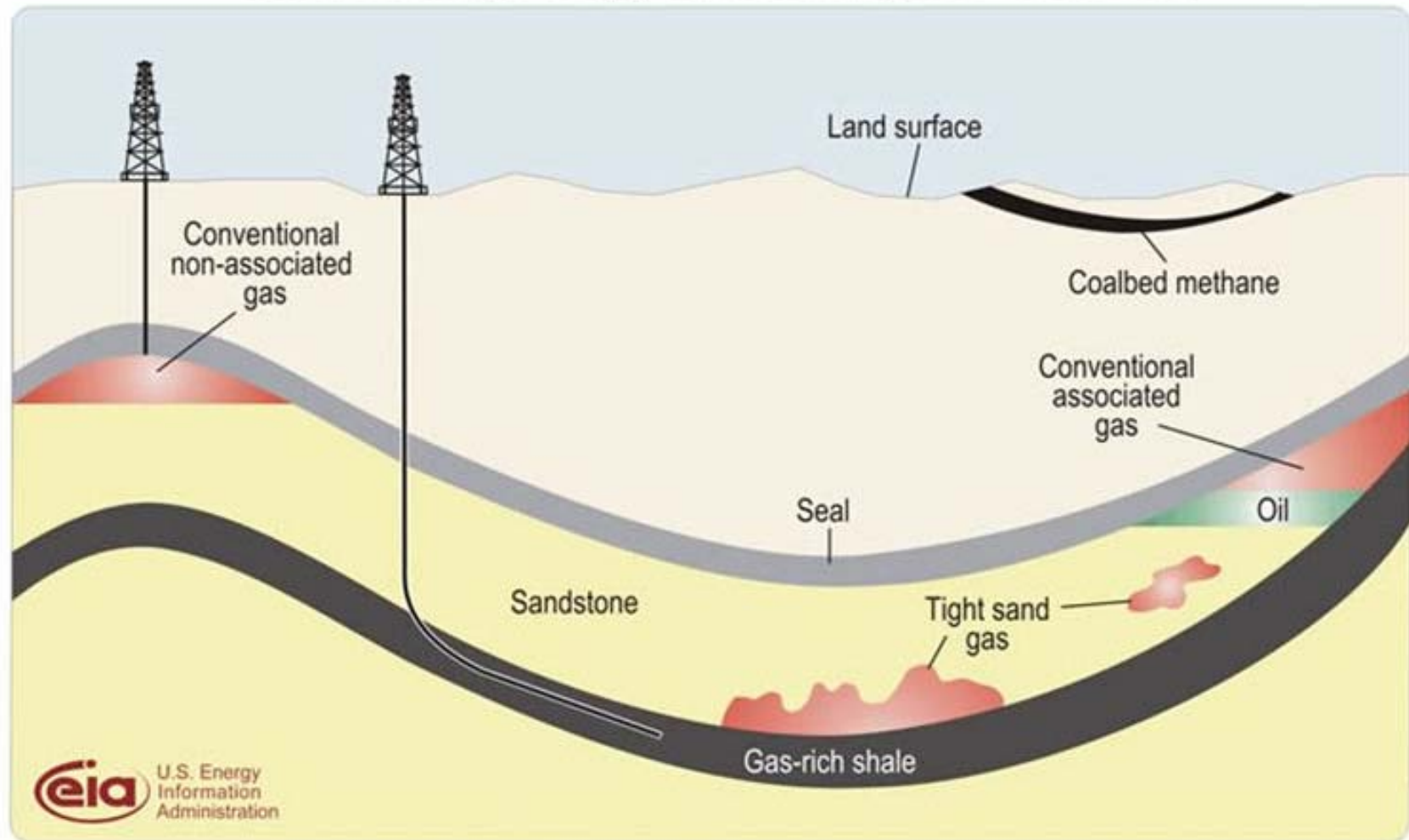


Are playing
for the
long- term



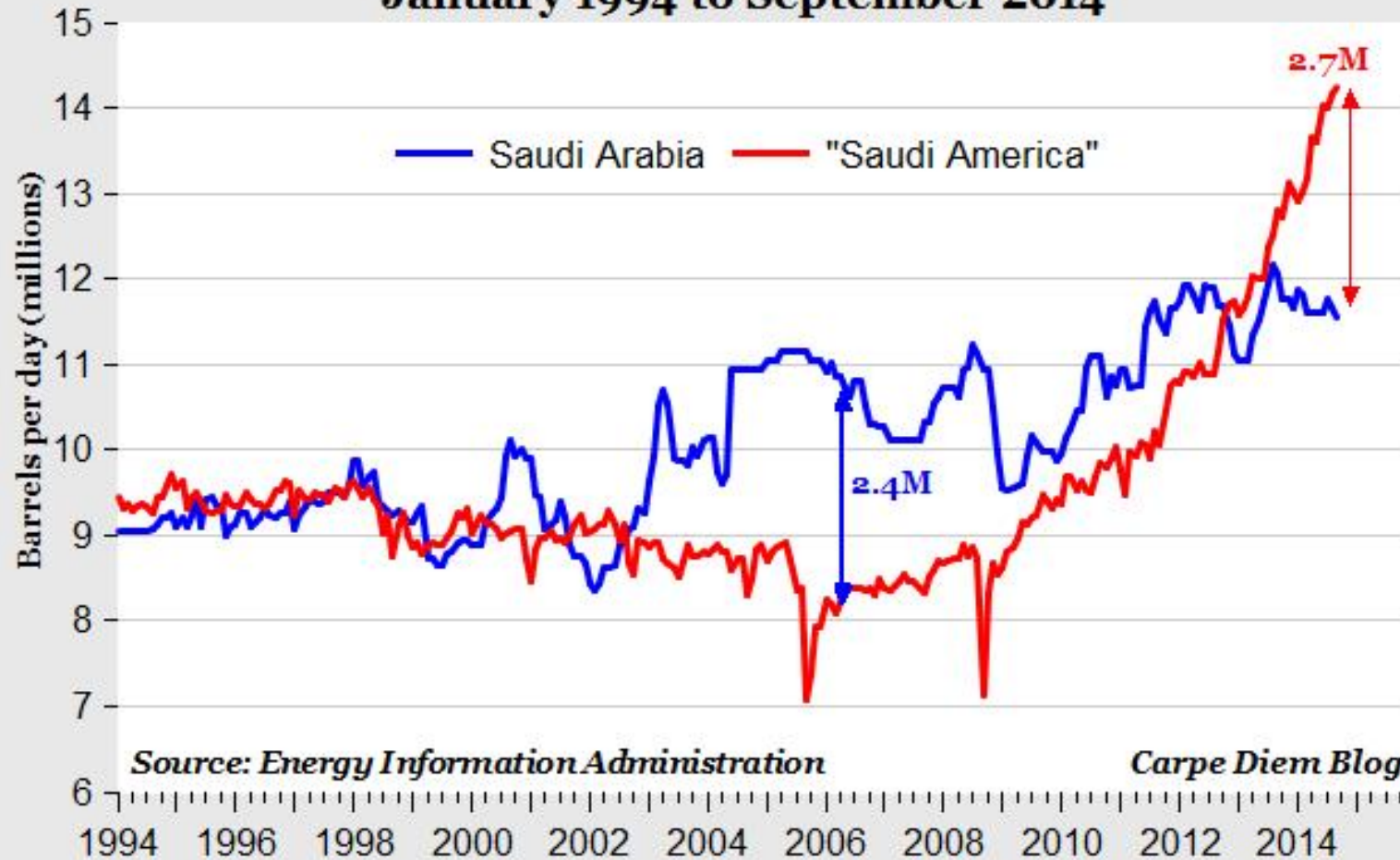
It is not a scarce resource anymore

Schematic geology of natural gas resources



Source: US Energy Information Administration

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



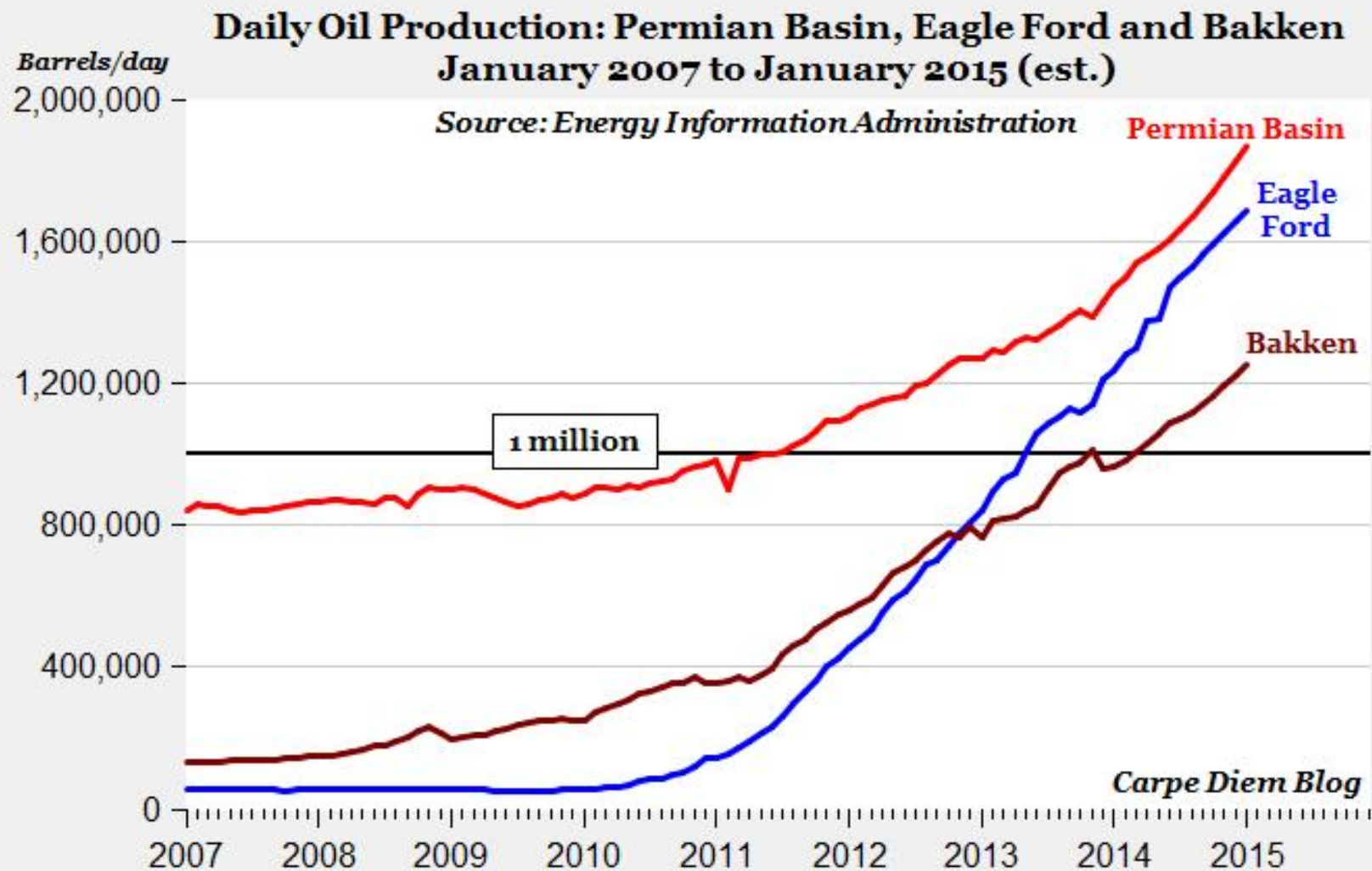
Source: My top ten energy charts of the year for 2014, Mark J. Perry, American Enterprise Institute, January 5, 2015

US Crude Oil Production, January 1986 to December 2014



Source: My top ten energy charts of the year for 2014, Mark J. Perry, American Enterprise Institute, January 5, 2015

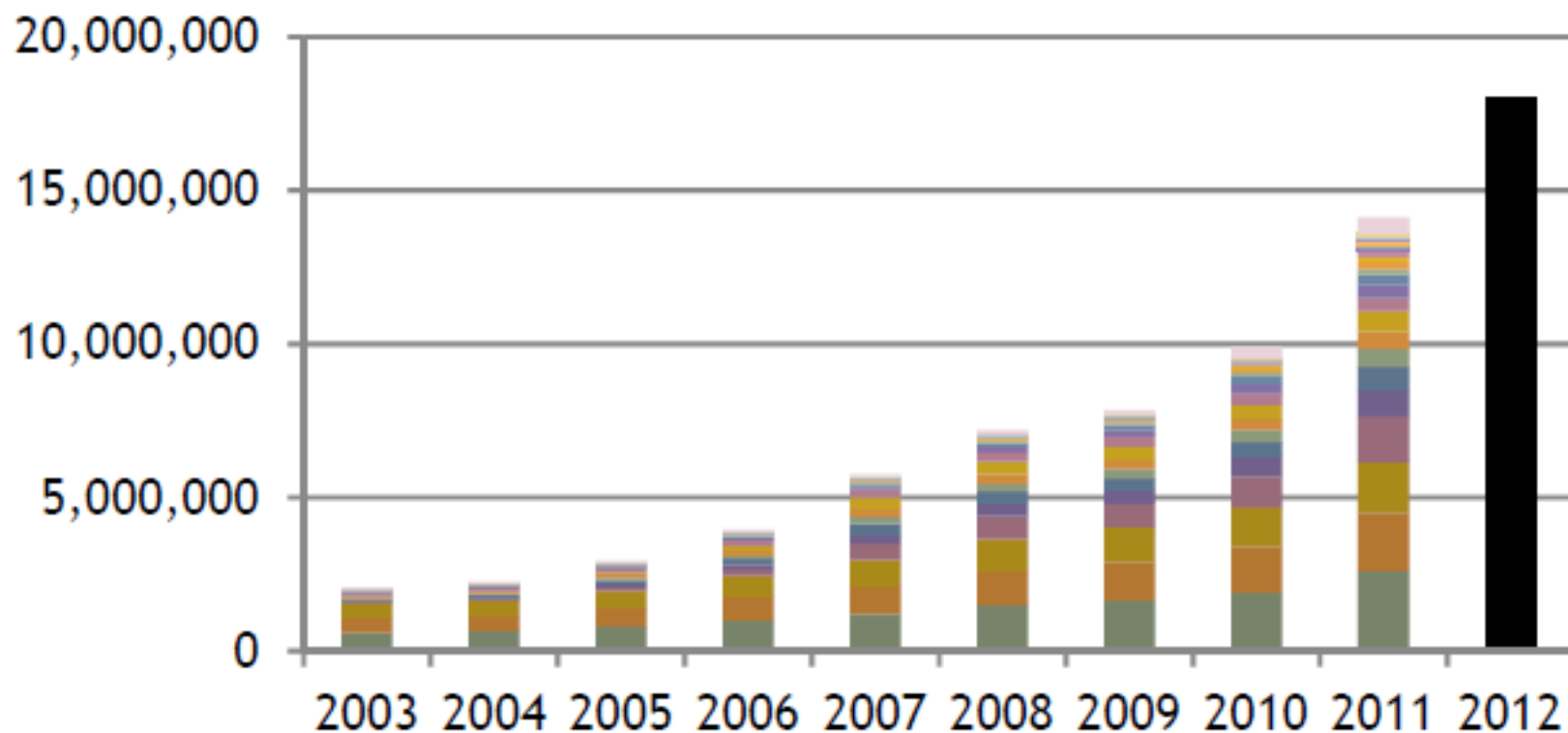
Mercator Energy



Source: My top ten energy charts of the year for 2014, Mark J. Perry, American Enterprise Institute, January 5, 2015

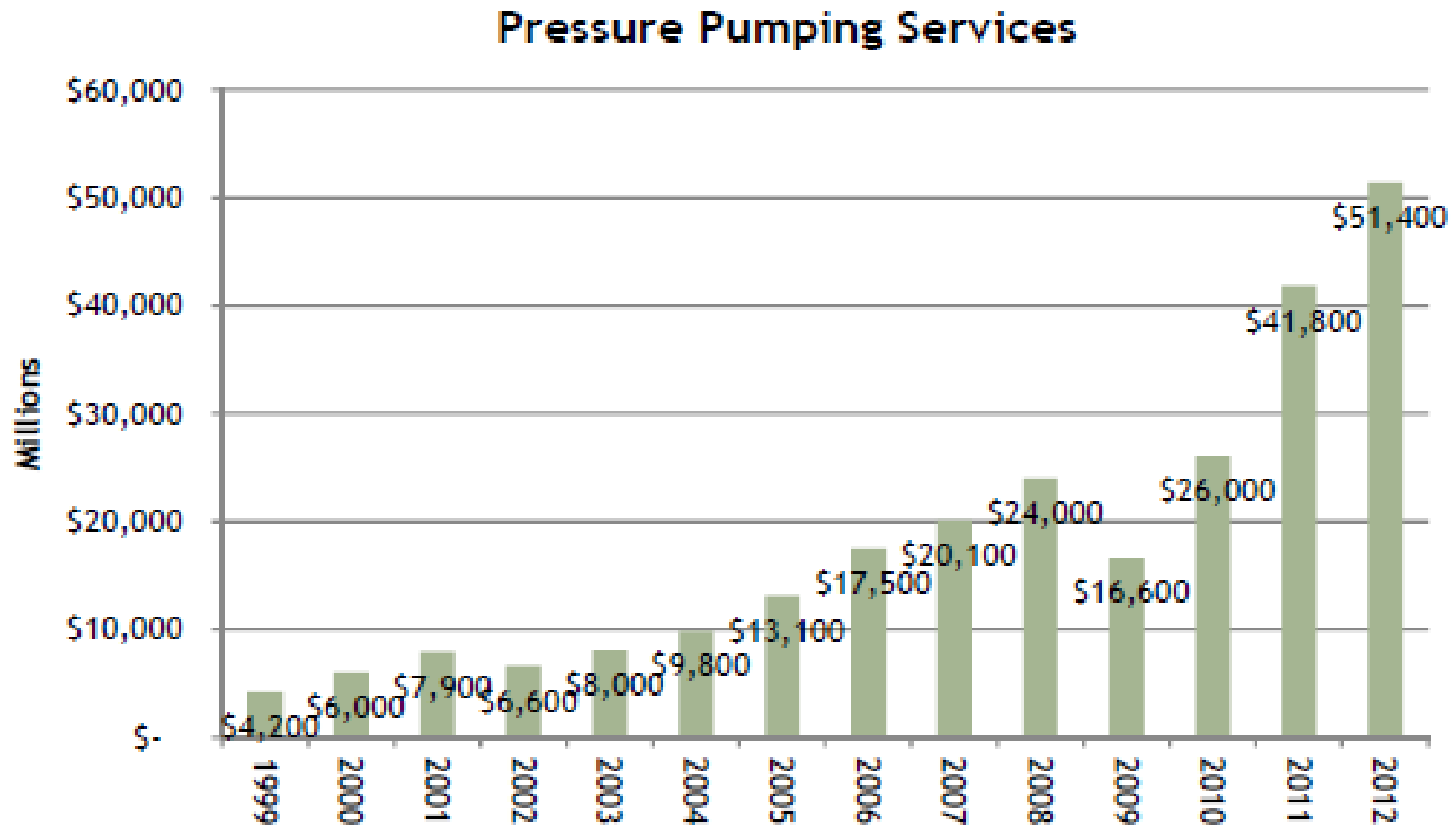
Fracturing Application Exploded

North American Frac Horsepower



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

10-fold growth in 10 years



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

Russia

Are Putin and Gazprom behind U.S. anti-fracking efforts?

Putin is Funding Green Groups to Discredit
Natural Gas Fracking

- Newsweek headline, July 11, 2017

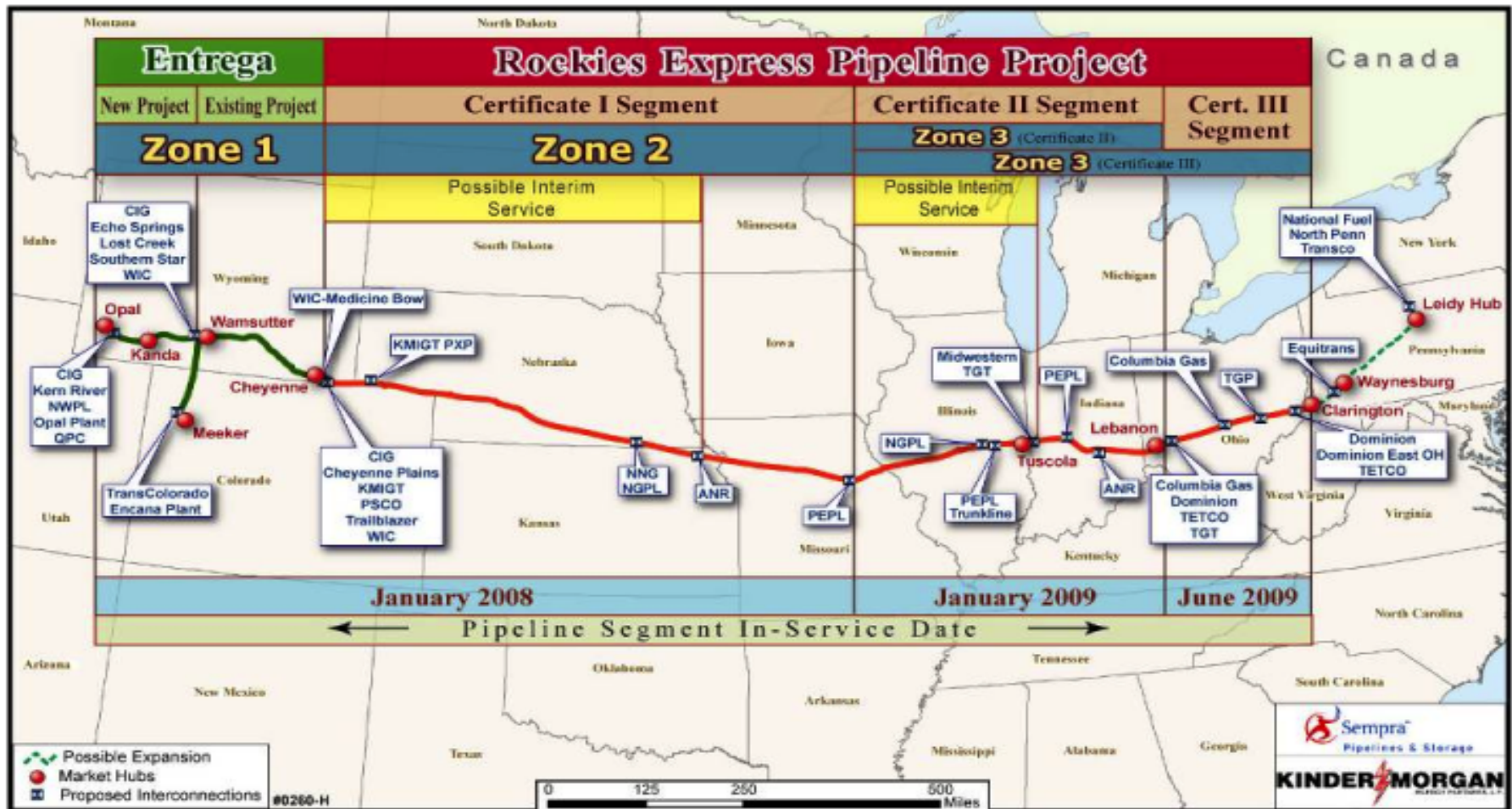
“If you connect the dots, it is clear that Russia is funding U.S. environmental groups in an effort to suppress our domestic oil and gas industry, specifically hydraulic fracking.”*

- U.S. House Science, Space, and Technology Committee
Chairman Lamar Smith (R-Texas), July 10, 2017



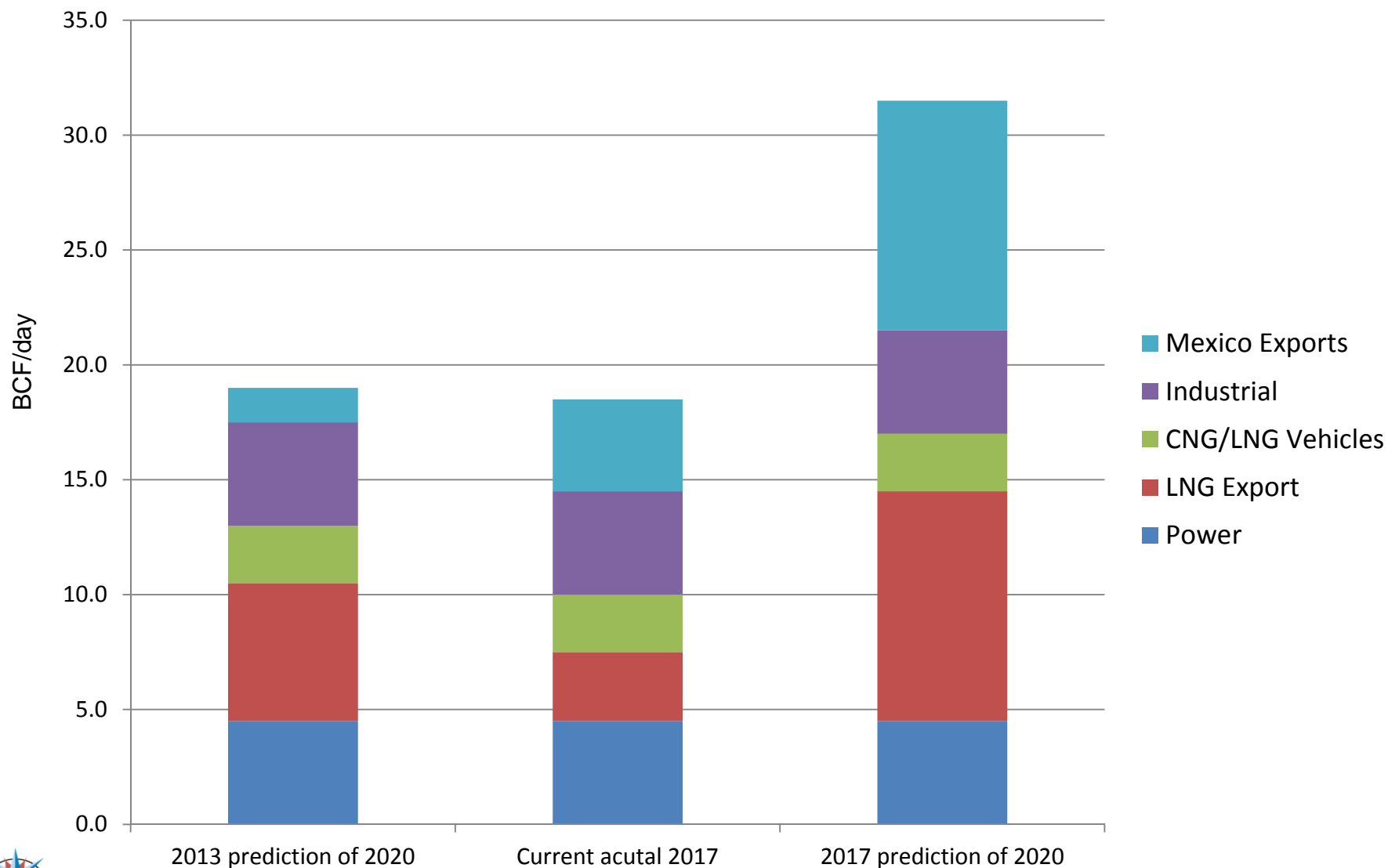
*Source: *Lawmakers Ask For Probe Into Alleged Russian Funding of Anti-Fracking Groups*, Energy in Depth, Seth Whitehead

The Reversal



- Prediction 2007: 4 BCF/d of anticipated demand in Northeast U.S.
- Reality 2017: 12 BCF/d of new supply

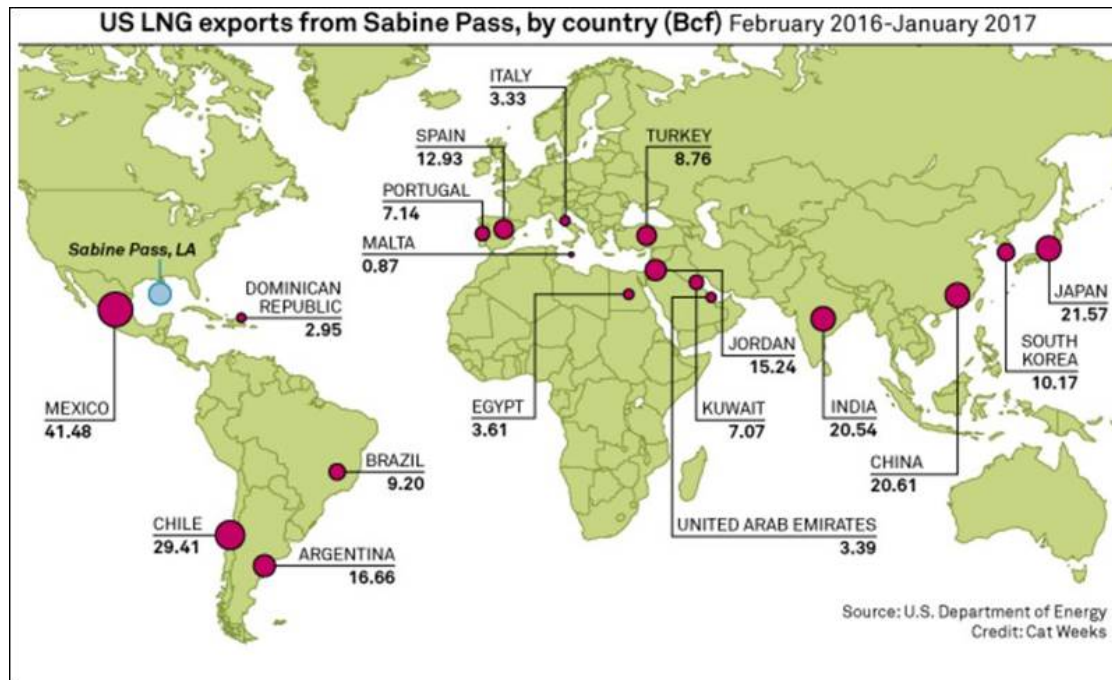
North American Natural Gas Demand Ranges by Selected Sector



Two Significant Growth Areas for Demand

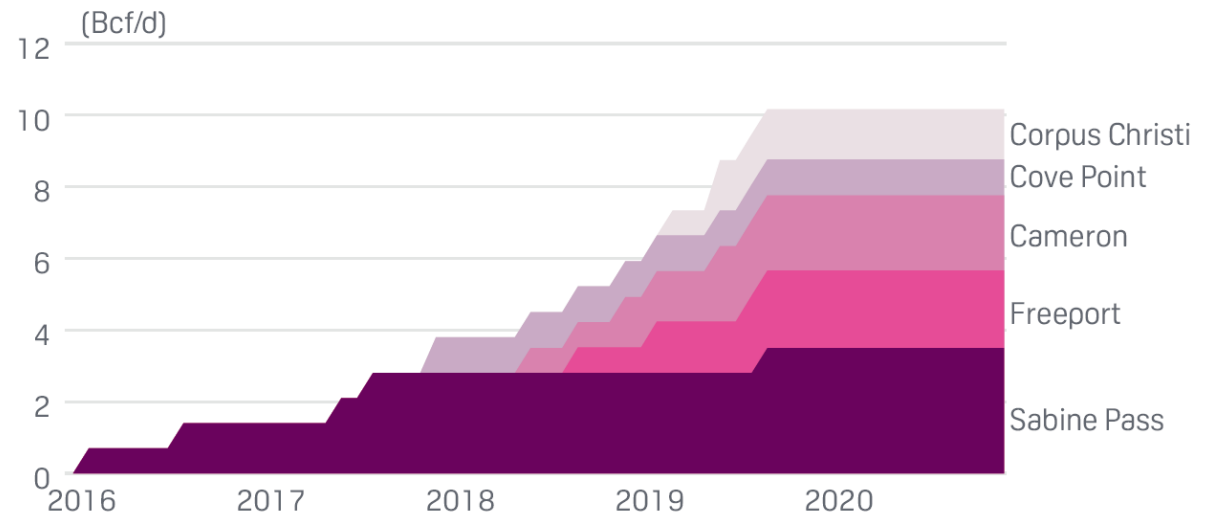
- U.S. LNG Exports
- Pipeline exports to Mexico





Cheniere
Energy exports
100th LNG
cargo

BENTEK LNG CAPACITY BUILD



Source: Platts Analytics' Bentek Energy



Mercator Energy

Source: LNG buyers pushing US exporters to be flexible, Harry Weber, Grant Gunter, Gas Daily, S&P Global Platts Publication, February 10, 2017

Lithuania

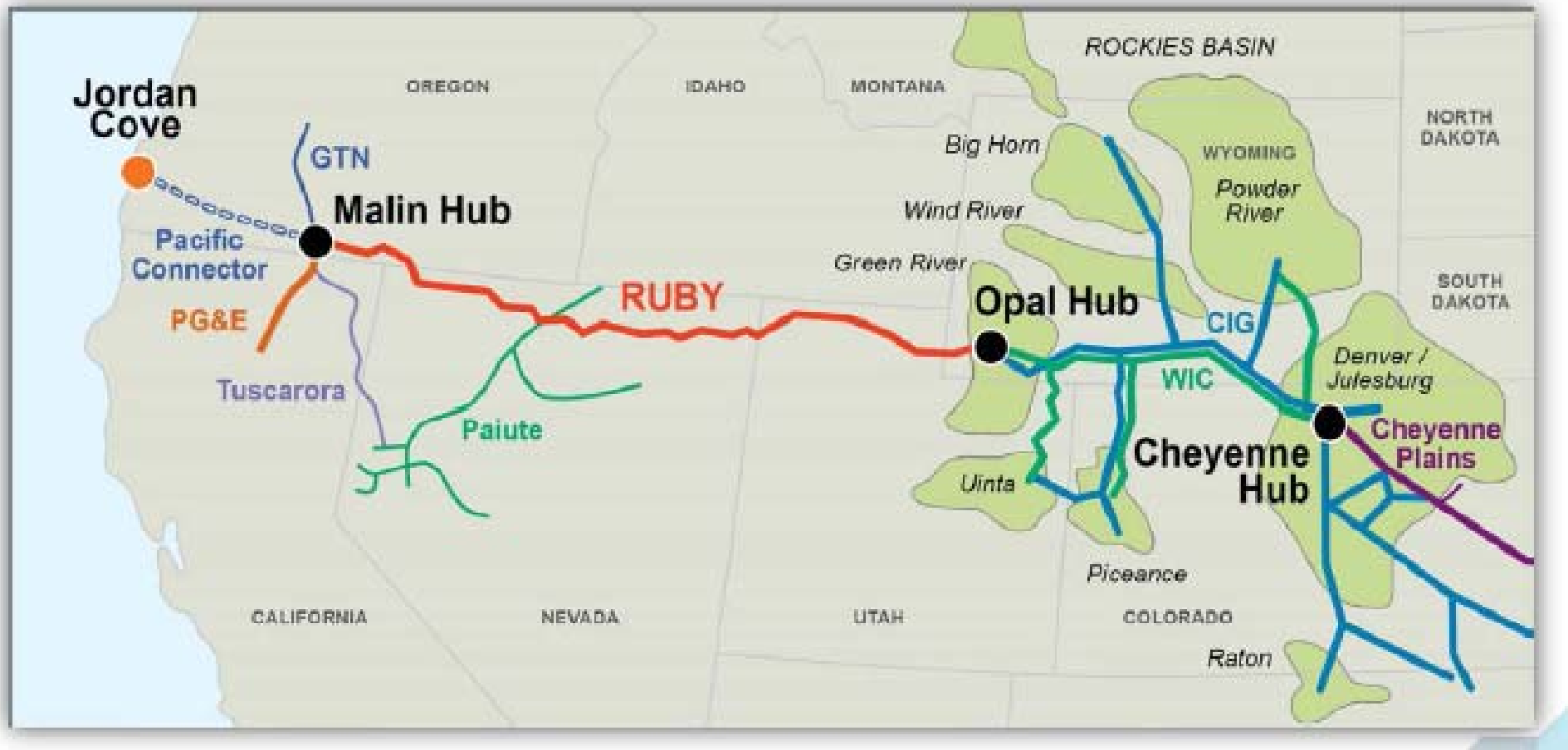
Becomes first ex-Soviet state to buy US natural gas

- “Lithuania became the first former Soviet state to import a shipment of US natural gas on Monday, at a time when Washington has promised to help weaken Europe’s reliance on gas supplies from Russia.”
- “The liquefied natural gas cargo aboard the Clean Ocean tanker is highly symbolic, as Lithuania looks to cement ties and backing from Washington following Moscow’s annexation of Crimea in 2014.”



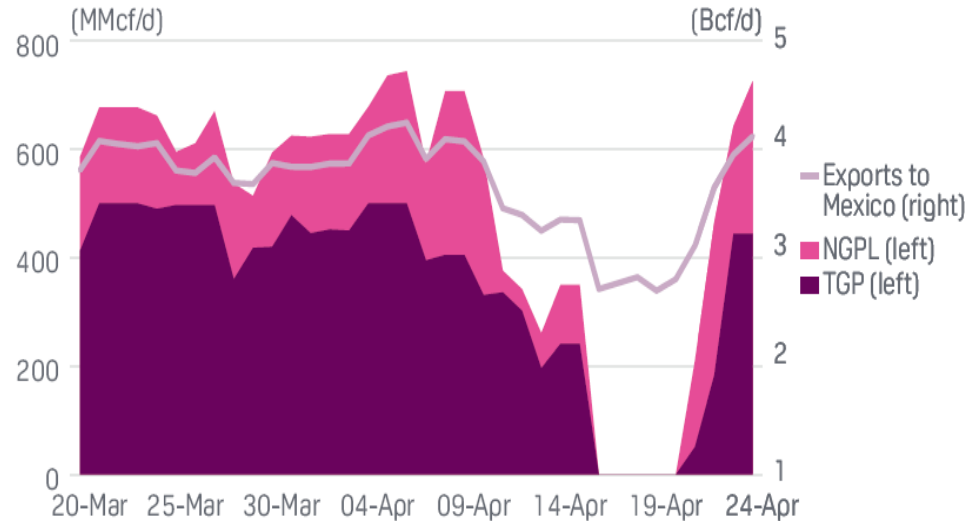
Source: Financial Times, David Sheppard, Energy Markets Editor, August 21, 2017

Rockies Access to Asia



South to the Border

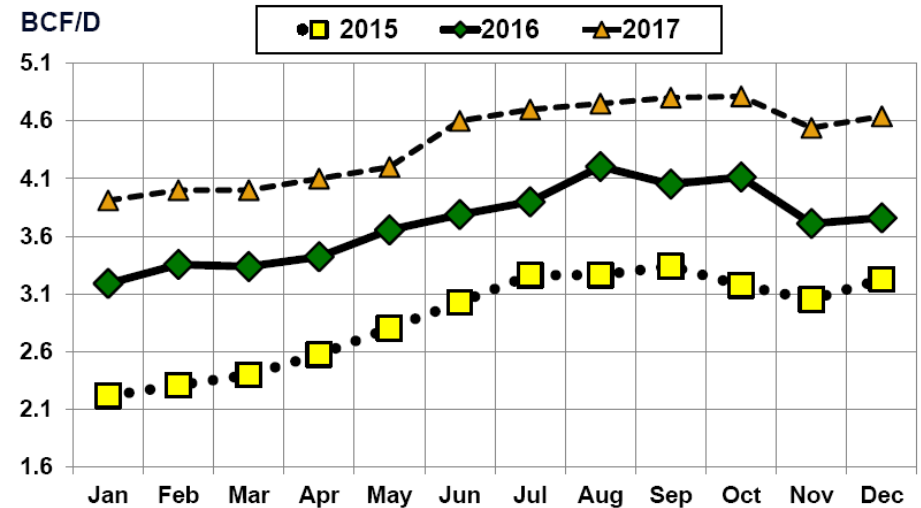
NET MEXICO SAMPLE VS US-MEXICO EXPORTS



Source: Platts Analytics' Bentek Energy

U.S. Net Gas Exports to Mexico by Month

PIRA
ENERGY GROUP



PIRA forecast post-October 2016.

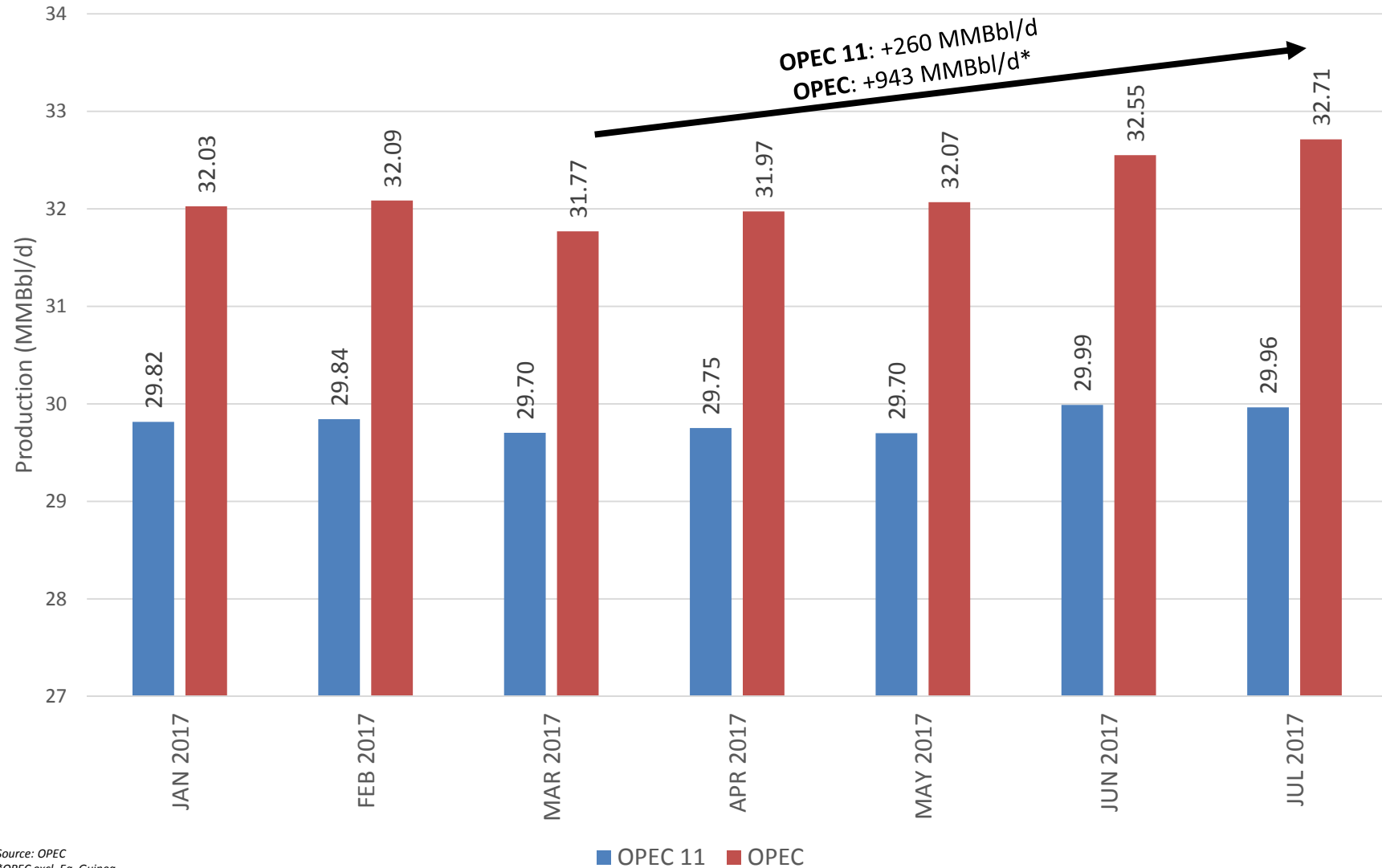
Sources: *US-Mexico exports hit pre-maintenance levels*, J. Robinson and Thad Walker, S&P Global Platts Gas Daily, April 25, 2017
North American Gas Forecast Monthly, PIRA, January 30, 2017

The Future?



OPEC Production: Frustrating for Quota Carrying Countries

OPEC Production: Growing Despite Quotas

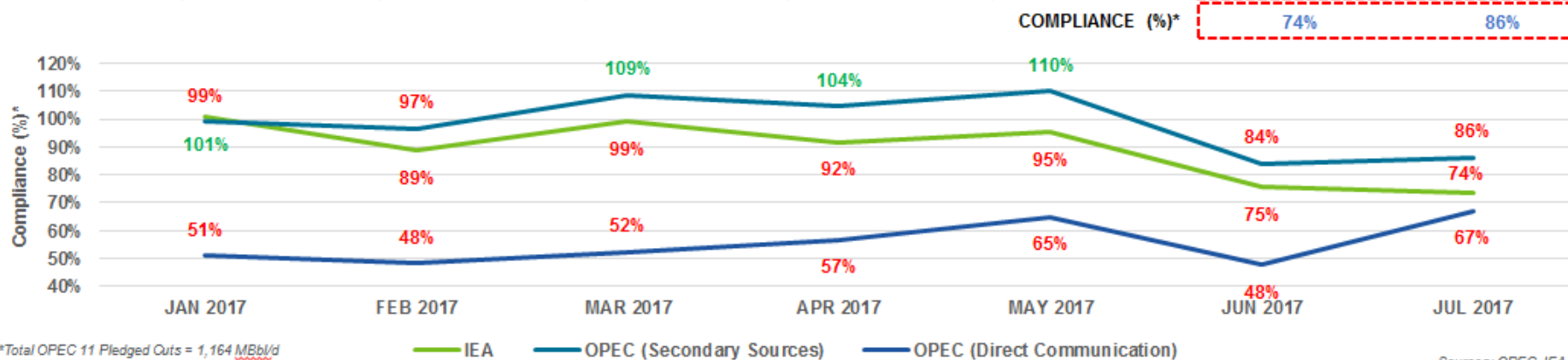


Source: OPEC
*OPEC excl. Eq. Guinea

OPEC: Strong Compliance Led By Saudi Arabia

OPEC Quotas: Strong Compliance

Member	QUOTA (MBbl/d)	June 2017 (IEA) (MBbl/d)	June 2017 (OPEC) (MBbl/d)	July 2017 (IEA) (MBbl/d)	July 2017 (OPEC) (MBbl/d)	July Cuts (IEA) (MBbl/d)	July Cuts (OPEC) (MBbl/d)
Saudi Arabia	10,058	10,050	10,035	10,050	10,067	+8	-9
Iraq	4,351	4,500	4,501	4,490	4,468	-139	-117
UAE	2,874	2,930	2,912	2,940	2,905	-66	-31
Kuwait	2,707	2,710	2,711	2,700	2,703	+7	+4
Venezuela	1,972	2,040	1,948	2,040	1,932	-68	+40
Angola	1,673	1,660	1,665	1,650	1,646	+23	+27
Algeria	1,039	1,060	1,060	1,070	1,059	-31	-20
Qatar	618	620	615	610	619	+8	-1
Ecuador	522	530	528	540	536	-18	-14
Gabon	193	200	198	210	205	-17	-12
Iran	3,797	3,790	3,817	3,810	3,824	-13	-27
OPEC 11	29,804	30,090	29,990	30,110	29,964	-306	-160



Non-OPEC Quotas: Disappointing, But Getting Better

Country	Quota (MBbl/d)	Feb 2017 (MBbl/d)	March 2017 (MBbl/d)	April 2017 (MBbl/d)	May 2017 (MBbl/d)	June 2017 (MBbl/d)	July 2017 (MBbl/d)	July Compliance (MBbl/d)
Russia	10,929	11,108	11,049	10,995	10,952	10,946	10,950	-21
Mexico	2,003	2,016	2,018	2,012	2,020	2,008	1,997	+6
Kazakhstan	1,668	1,723	1,760	1,736	1,706	1,741	1,768	-100
Oman	967	973	967	967	971	969	969	-2
Azerbaijan	779	784	741	784	784	794	797	-18
Malaysia	618	665	659	621	620	681	644	-26
Eq. Guinea*	222	130	135	122	130	110	120	+102
Bahrain	187	192	191	191	191	191	191	-4
South Sudan	96	173	83	102	142	111	122	-26
Brunei	121	123	113	89	110	110	110	+11
Sudan	72	72	71	70	74	74	73	-1
TOTAL	17,662	17,959	17,787	17,689	17,700	17,735	17,741	-79
COMPLIANCE (%)**		47%	78%	95%	93%	87%	86%	

Non-OPEC compliance was poor to start the year. Although compliance picked up in April and May, rates have crept back down over the last three months. However, Equatorial Guinea (who joined OPEC at their last meeting) has been a main factor behind the compliance rates calculated here.

Without the 102 MBbl/d lower than quota production that Equatorial Guinea is posting, compliance rates from the non-OPEC members would still be disappointing. The overproduction by Russia (the largest component of the cuts) and Kazakhstan is striking.

Russia's oil ministry has previously stated that they are compliant with quotas, but third party sources contradict that claim.

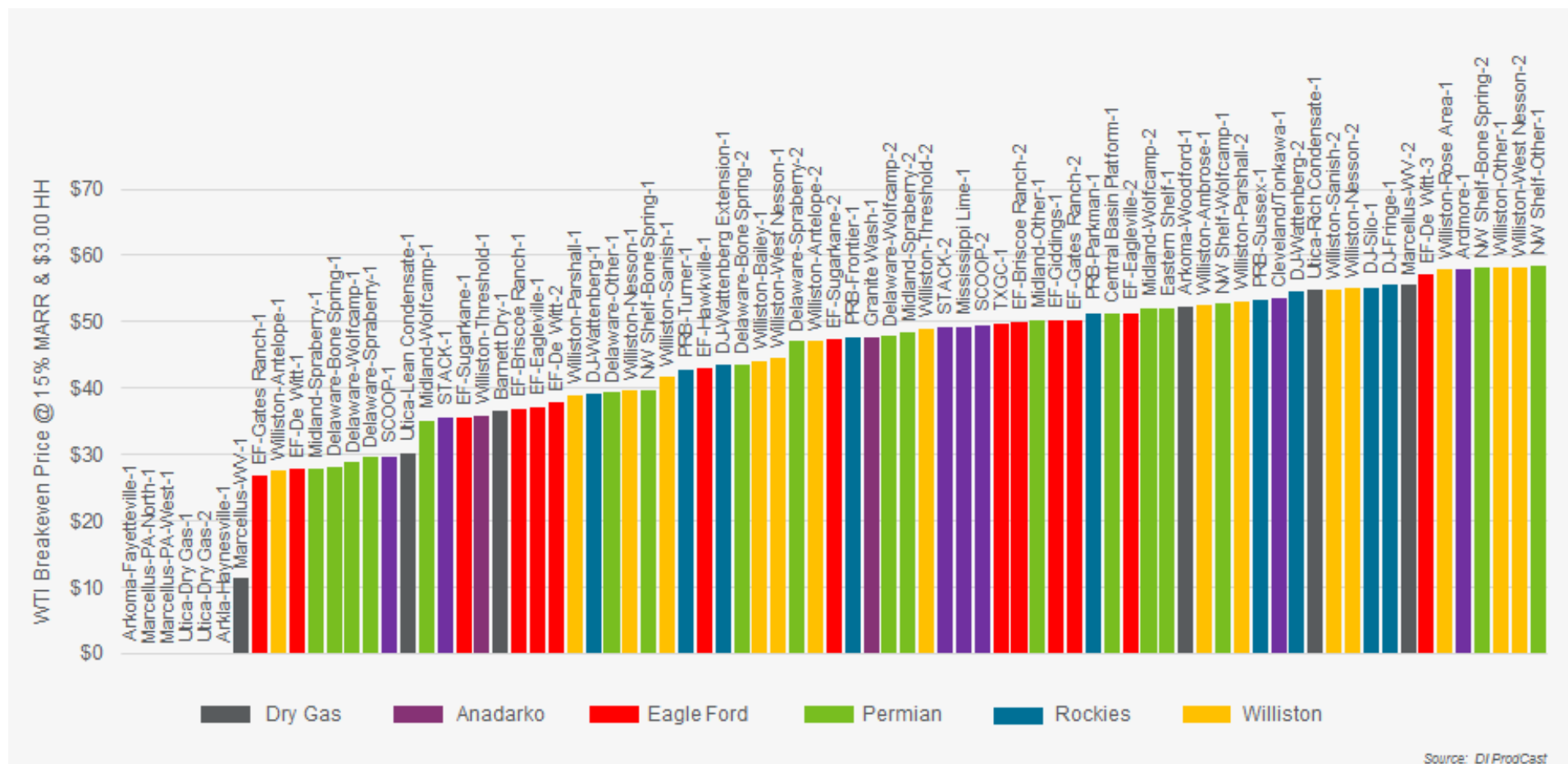
*Joined OPEC during this time frame.

**Total Non-OPEC Pledged Cuts = 558 MBbl/d

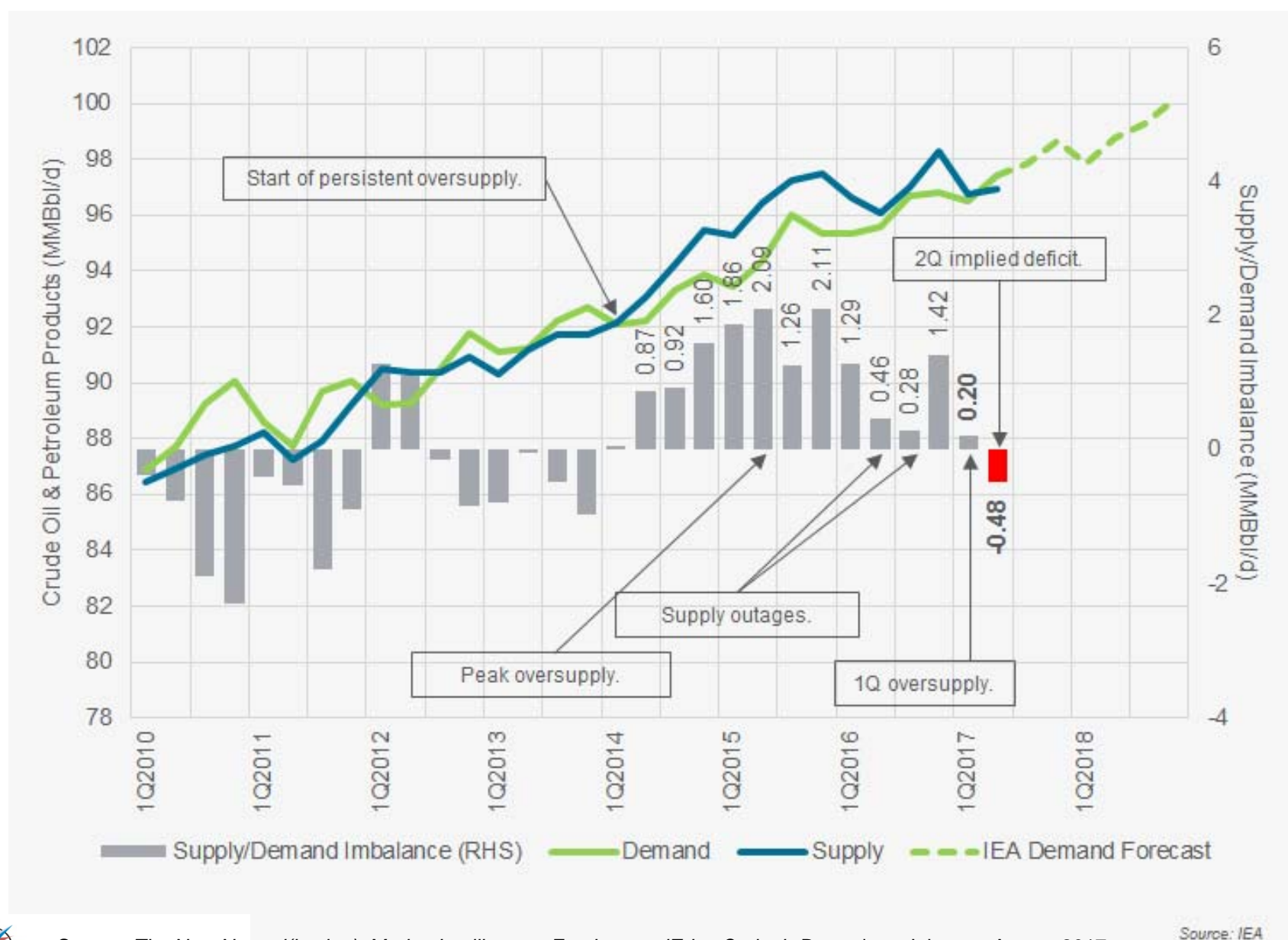
Compliance (%) = $(558 \text{ MBbl/d} + \text{Cuts}) / 558 \text{ MBbl/d}$

Source: IEA

US Production: Economics Support Increased Activity



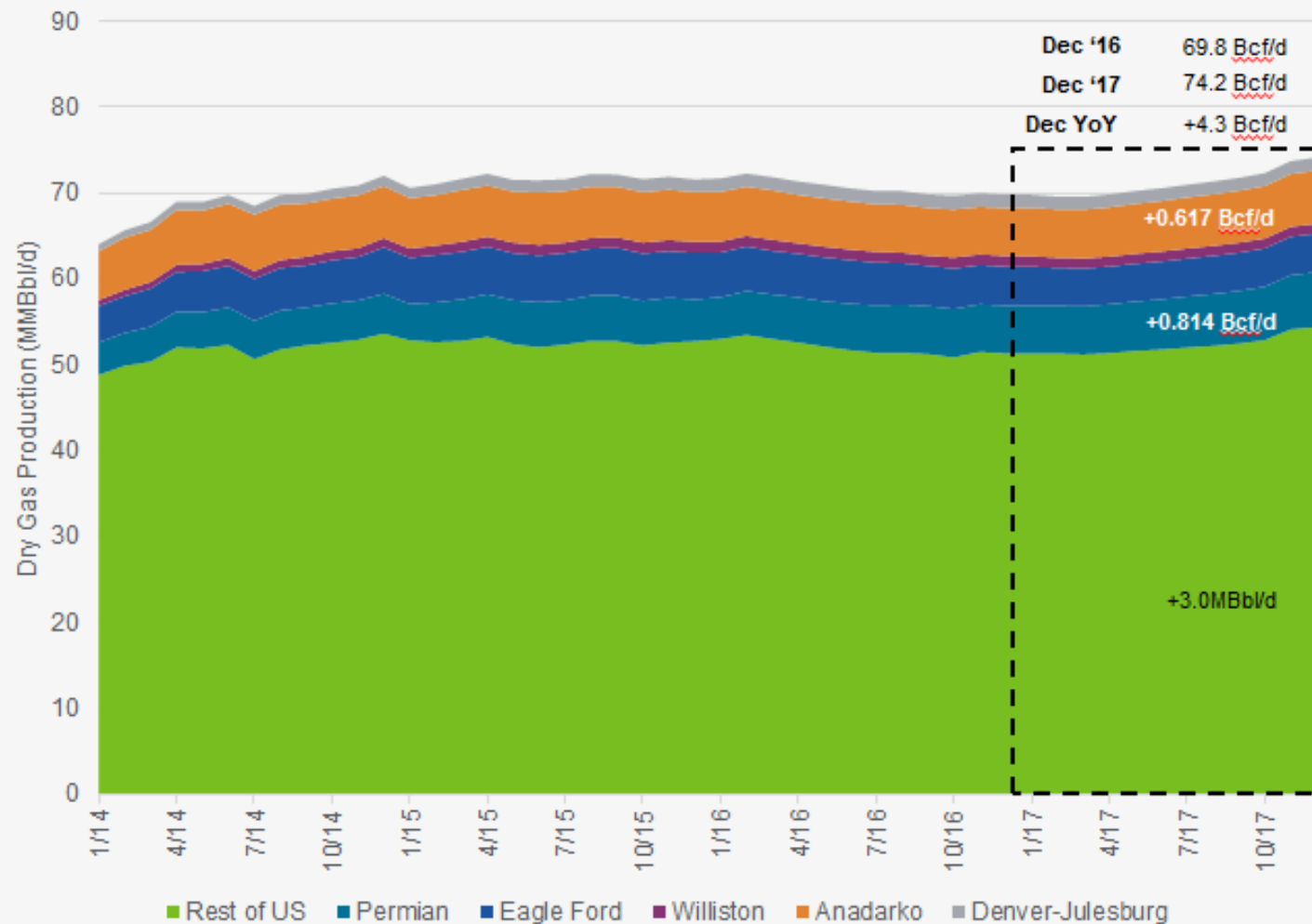
Crude Oil & Petroleum Products: Supply/Demand Imbalance



Source: *The New Normal(ization): Market Intelligence: FundamentalEdge Outlook*, Bernadette Johnson, August 2017

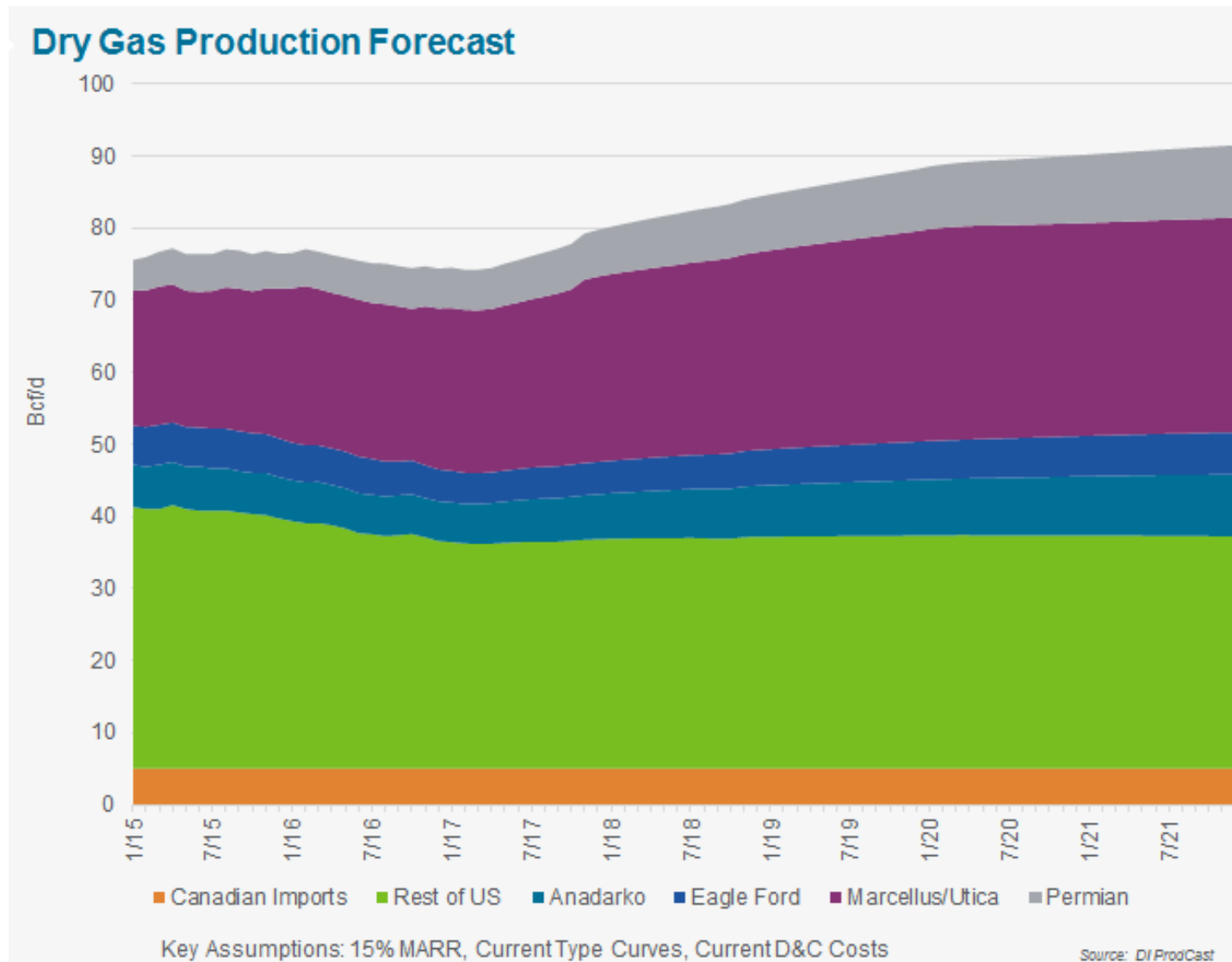
Short Term Production Outlook

US Shale: 2017 Production Growing ~4 Bcf/d

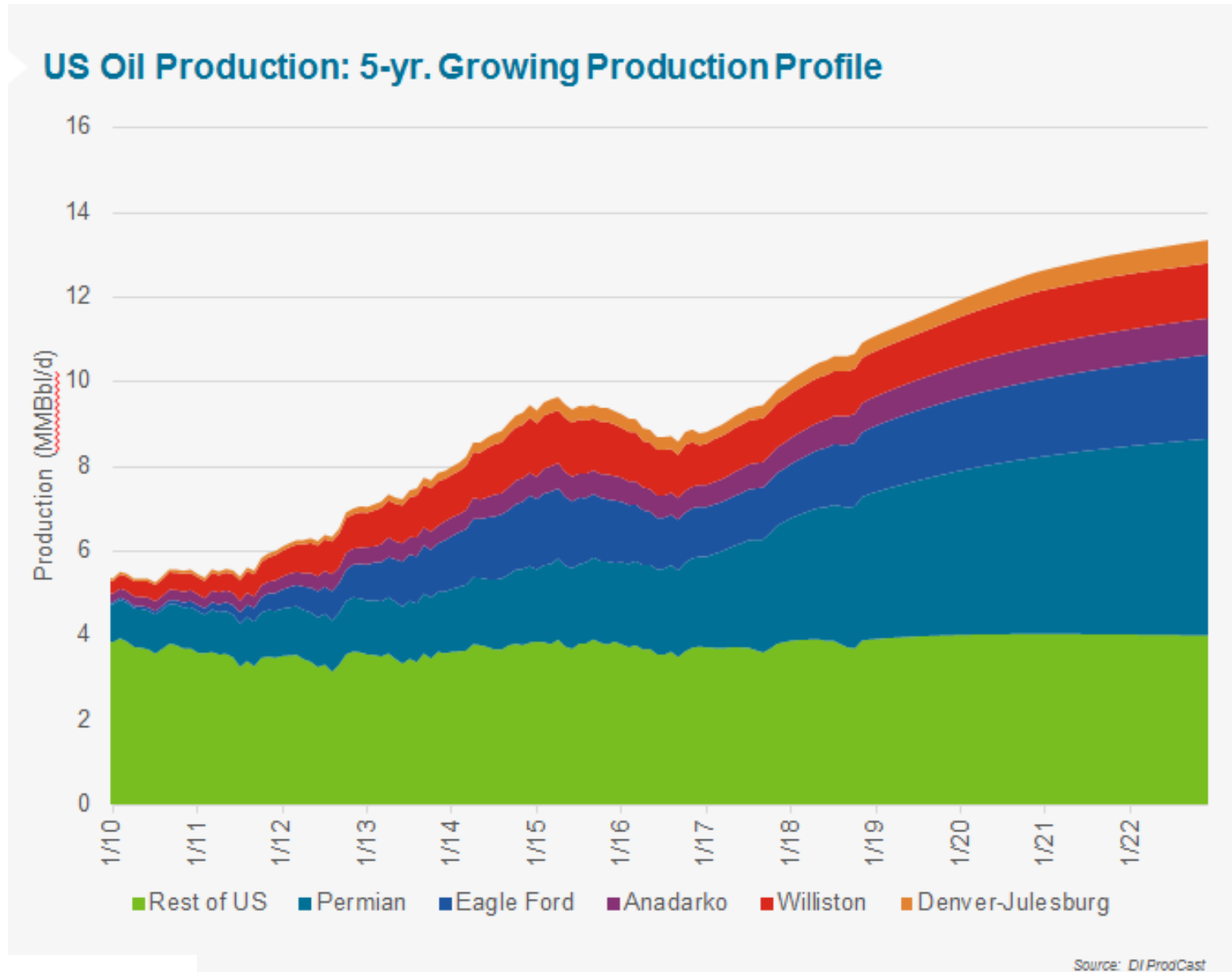


Source: *The New Normal(ization): Market Intelligence: FundamentalEdge Outlook*, Bernadette Johnson, August 2017

Dry Gas Production 5-Year Outlook



US Oil Production: 5-yr. Growing Production Profile



The Crystal Ball Price Forecast

YEAR	WTI (\$/Bbl)	HH (\$/MMBtu)
2017	\$52	\$3.25
2018	\$52	\$3.15
2019	\$60	\$3.00
2020+	\$60	\$2.85

An Update...



Gulf Coast refinery capacity and company exposure

Sub-area	Percentage	Crude unit capacity
Mississippi / Alabama Gulf Coast	5%	410,000
Mississippi River	30%	2,494,500
Lake Charles	9%	767,800
Port Arthur	18%	1,501,500
Houston	20%	1,663,776
Galveston	9%	770,000
Corpus Christi	9%	722,500
Other South Texas Gulf Coast	1%	114,500
Gulf Coast Capacity	100%	8,444,576

Exhibit 7: Eagle Ford: in the path of the storm

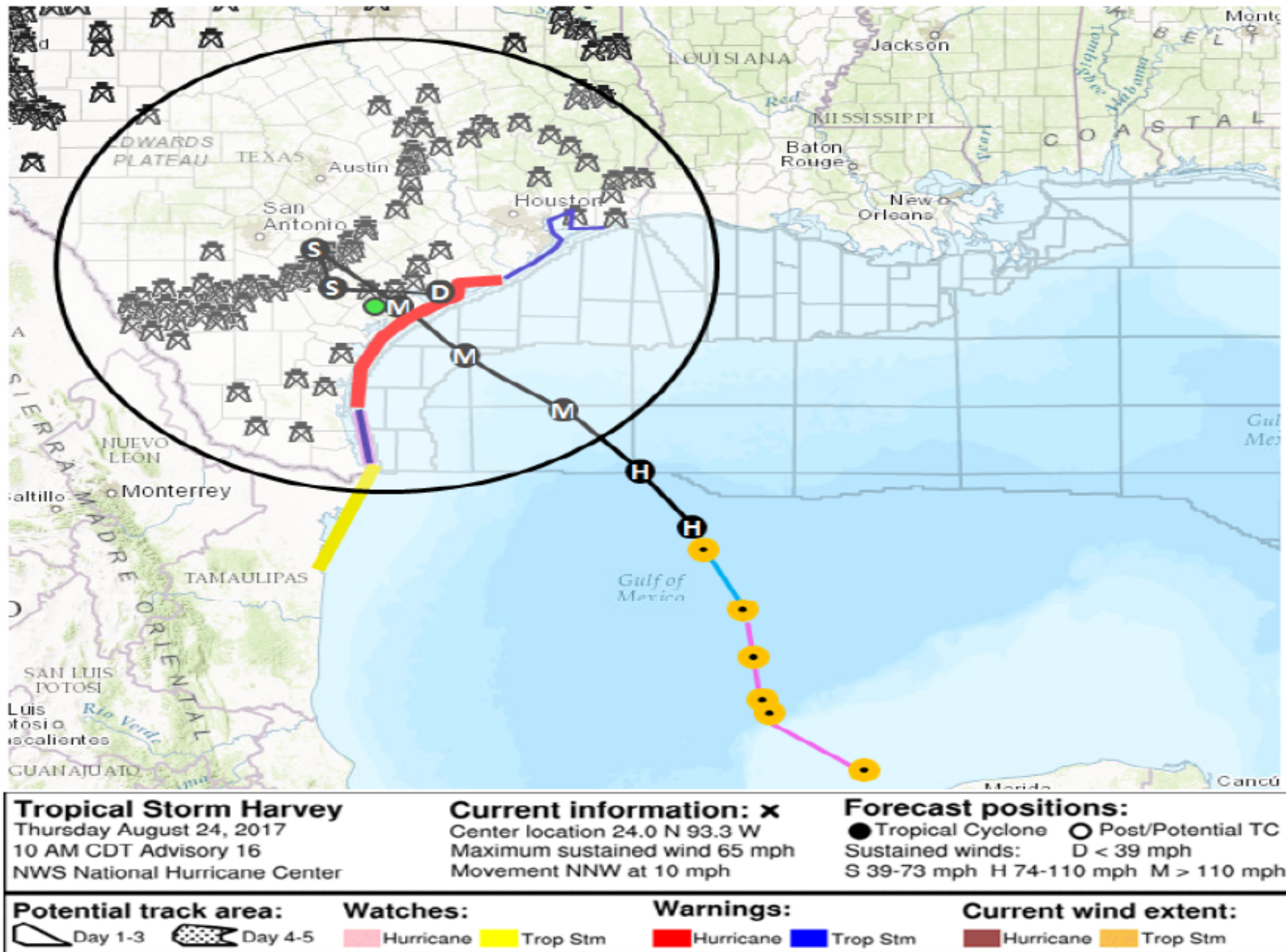
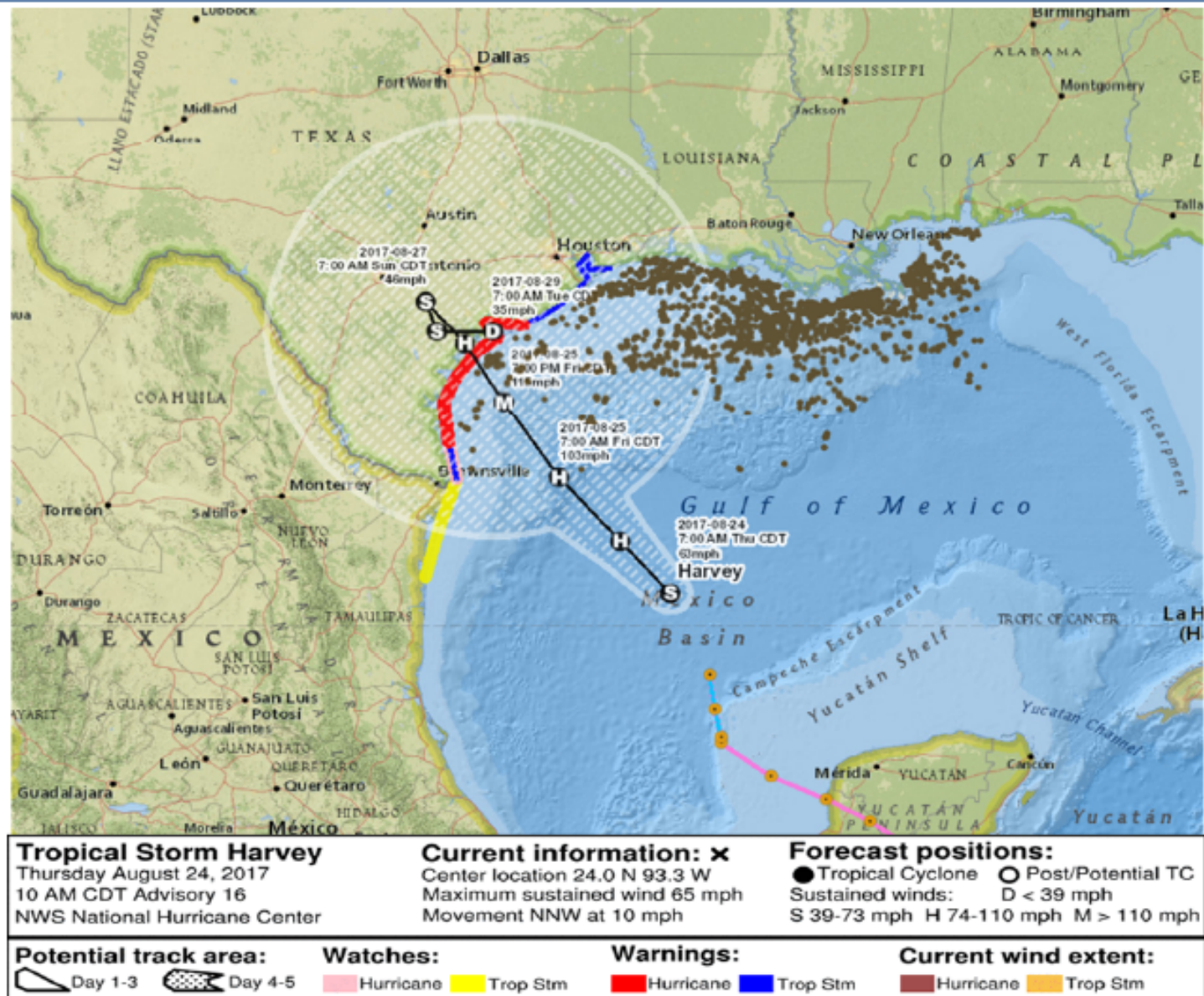


Exhibit 3: Storm path misses the majority of GoM production facilities



Source: EIA / NOAA



Mercator Energy

Source: US Oil and Gas; Hurricane Harvey: expect a bigger impact on refining, but looks transitory (for now), Bank of America Merrill Lynch Industry Overview, August 24, 2017

Conclusions: Crude Oil

- OPEC's compliance has **continued to exceed market expectations** although compliance has posted troubling declines in the recent months. **Saudi Arabia still remains the driving force** behind the compliance and their commitment to the success of the quotas is driven by their impending IPO.
- Collective OPEC production has increased by 841 Mbbbl/d since March, primarily due to increasing production from Nigeria & Libya. These increased are **undermining** OPEC 11's goal of inventory normalization. Inventory normalization to level prior to the price crash are necessary **before any sustained price increased can materialize.**

Conclusions: Crude Oil (cont'd)

- Non-OPEC compliance to-date **has fallen short of promises**. Although compliance has increased steadily, Equatorial Guinea becoming a part of OPEC means that the non-OPEC production remains consistently above promised quotas. Russia and Kazakhstan's overproduction are note-worthy.
- Favorable US production economics, even at current price levels, have generated a steep increase in rig counts since last May. While **nearly 50% of the rig additions were in the Permian**, there are economic sweet spots in many basins. These world-class economics continue to keep a lid on price runs s the US has become the swing producer.

Conclusions: Crude Oil (cont'd)

- **Efficiencies** will continue to play a large role in the declining breakeven costs of the most prolific basins like the Anadarko & Permian. **Efficiencies** will not only lead to production forecasts possibly getting revised higher, but also in offsetting the impact of possible service cost inflation. Takeaway capacity & other infrastructure bottlenecks may lead to times where regional differentials blow out and production may get curtailed during these times.

Conclusions: Natural Gas

- US natural gas supply **is growing again**. Dry gas production in June 2017 is **1.1 Bcf/d higher** than December levels. June 2017 also marked the first month of production above 2016 levels. **However, year-to-date production remains below 2016 levels.** DI expects the largest gains in production during 4Q2017 as pipeline takeaway capacity becomes available. This will allow a year-on-year growth of 0.5 Bcf/d.

Conclusions: Natural Gas (cont'd)

- Pipeline flows across the country **have already changed dramatically** as a result of the Marcellus/Utica growth.
 - A **de-bottlenecking in the Northeast** should finally occur in 4Q2017. Expect Northeast basis to tighten starting this winter
 - **Bottlenecks in the Permian and Anadarko are emerging.** In the Permian, gas needs to move East in order to reach growing LNG demand while in the Anadarko, the constraints are intra-basin and to interstate pipelines.
- Over the next 5 years, **significant natural gas production growth is expected in the Permian, Anadarko and Marcellus/Utica.** Significant demand growth is also expected, led by LNG exports.

Final Conclusion

- The U.S. is poised to meet any decline in worldwide production for oil or gas for the foreseeable future.

Final Question

- How important is the U.S. Shale Revolution to the U.S. and to the free world?

Contact Information

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NYMEX Henry Hub Gas Futures Contract Open Interest Position

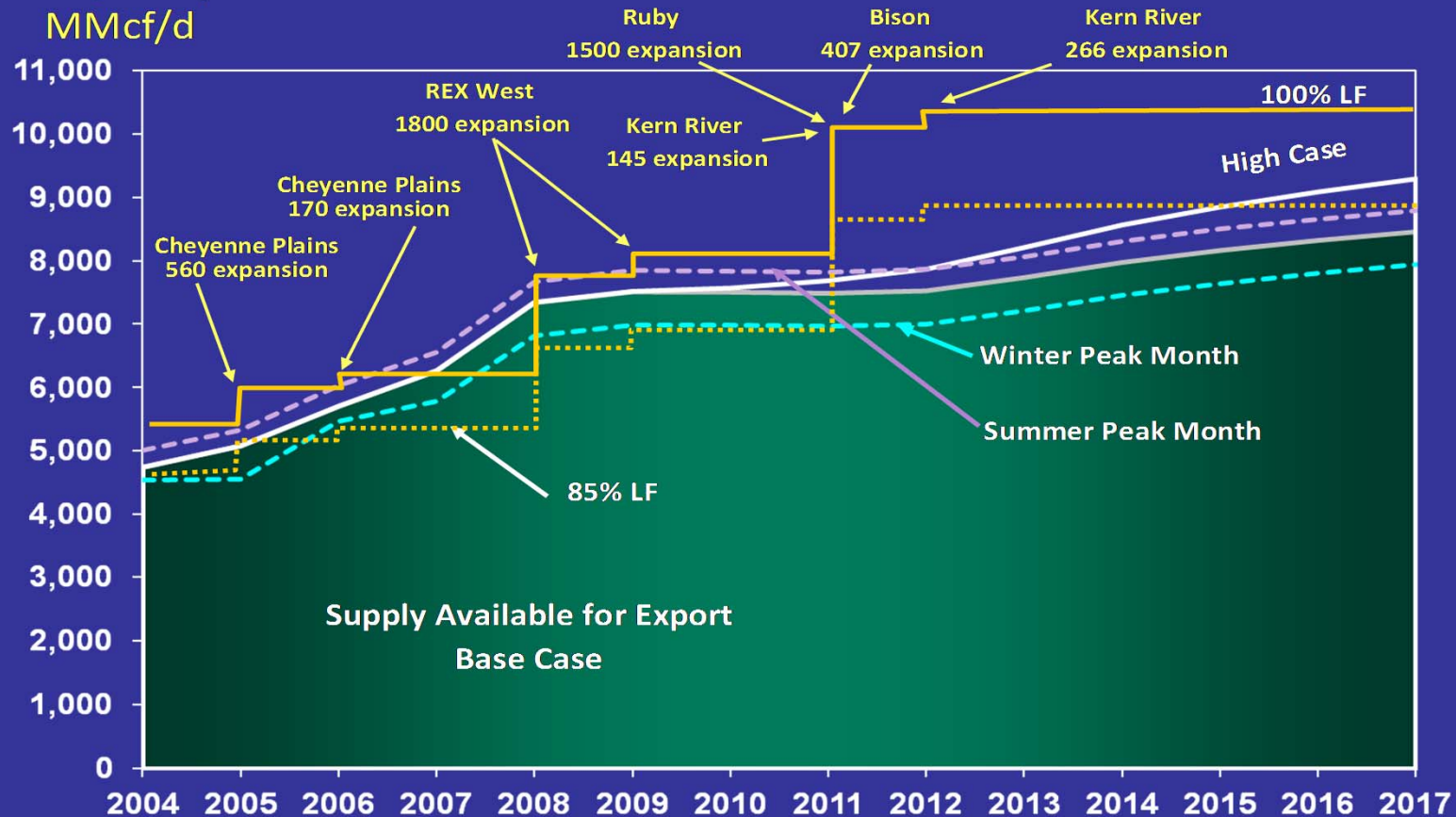


Rockies Supply vs. Regional Export Capacity

Rockies Supply vs. Regional Export Capacity

1.5 Bcf/d Ruby

MMcf/d



Source: George Wayne, Wyoming Gas Fair—Rockies Market Update—9/15/2011 presentation