

Outlook for Crude Oil and Natural Gas Prices

Ed Ireland, Ph. D.

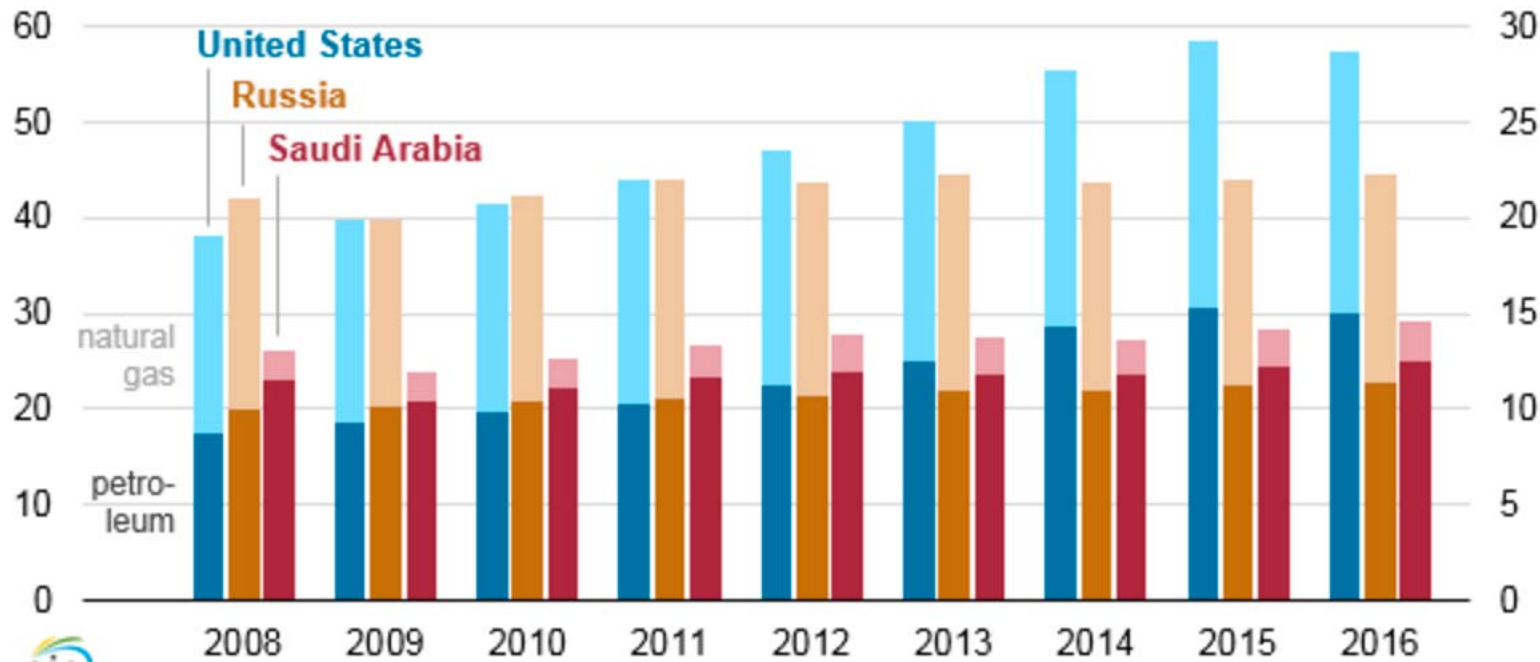
Associate Professor of Professional Practice
Neeley School of Business
TCU Energy MBA Program



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United States remains the world's top producer of petroleum and natural gas hydrocarbons

Estimated petroleum and natural gas hydrocarbon production in selected countries
 quadrillion British thermal units million barrels per day of oil equivalent

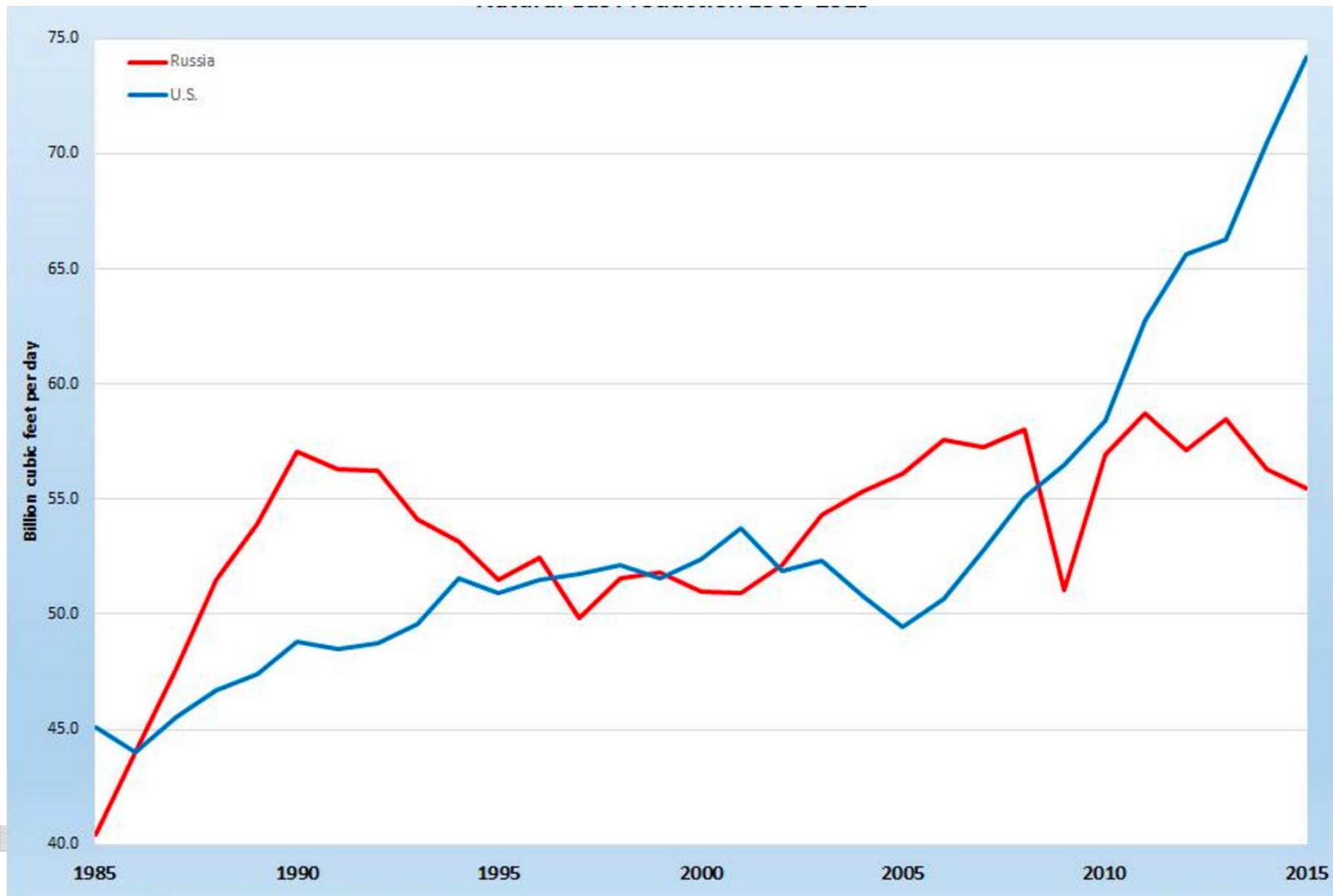


Source: U.S. Energy Information Administration



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U.S. and Russia Natural Gas Production

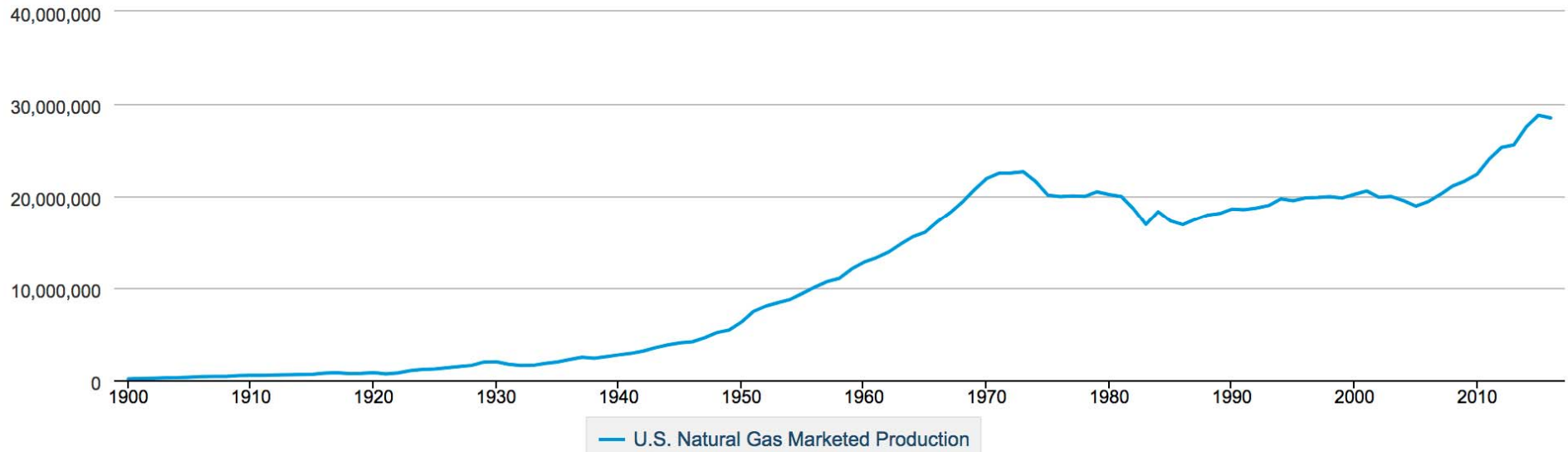


U.S. Natural Gas Production

U.S. Natural Gas Marketed Production

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Million Cubic Feet

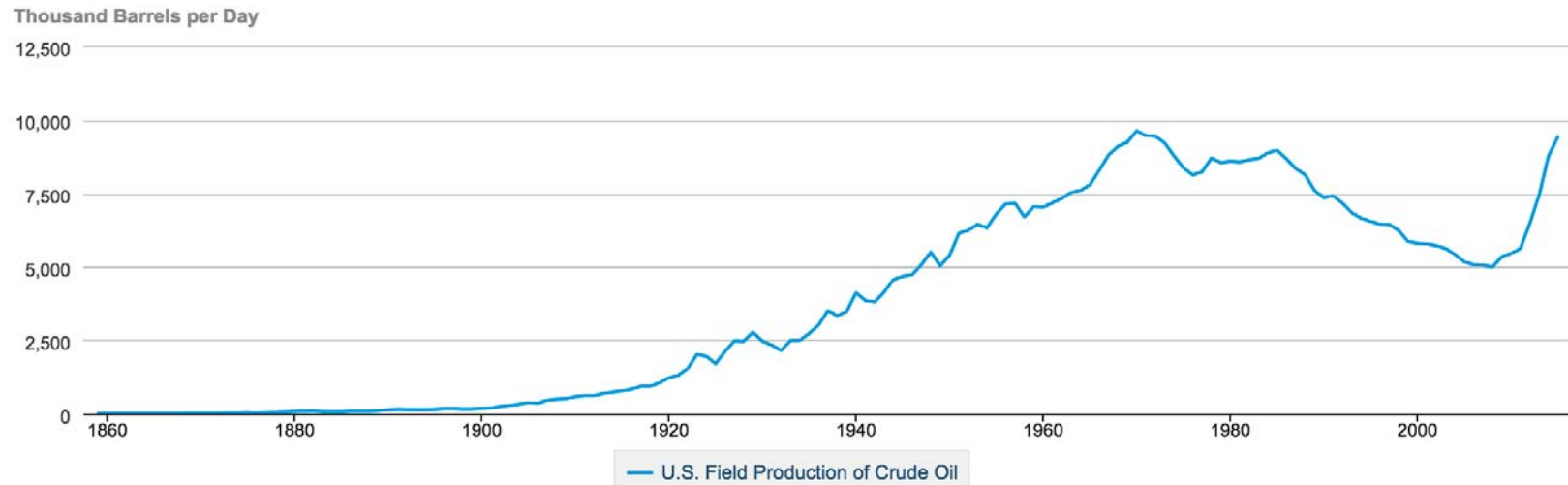


 Source: U.S. Energy Information Administration



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U.S. Crude Oil Production



 Source: U.S. Energy Information Administration



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U.S. SHALE ENERGY REVOLUTION

A Paradigm Shift

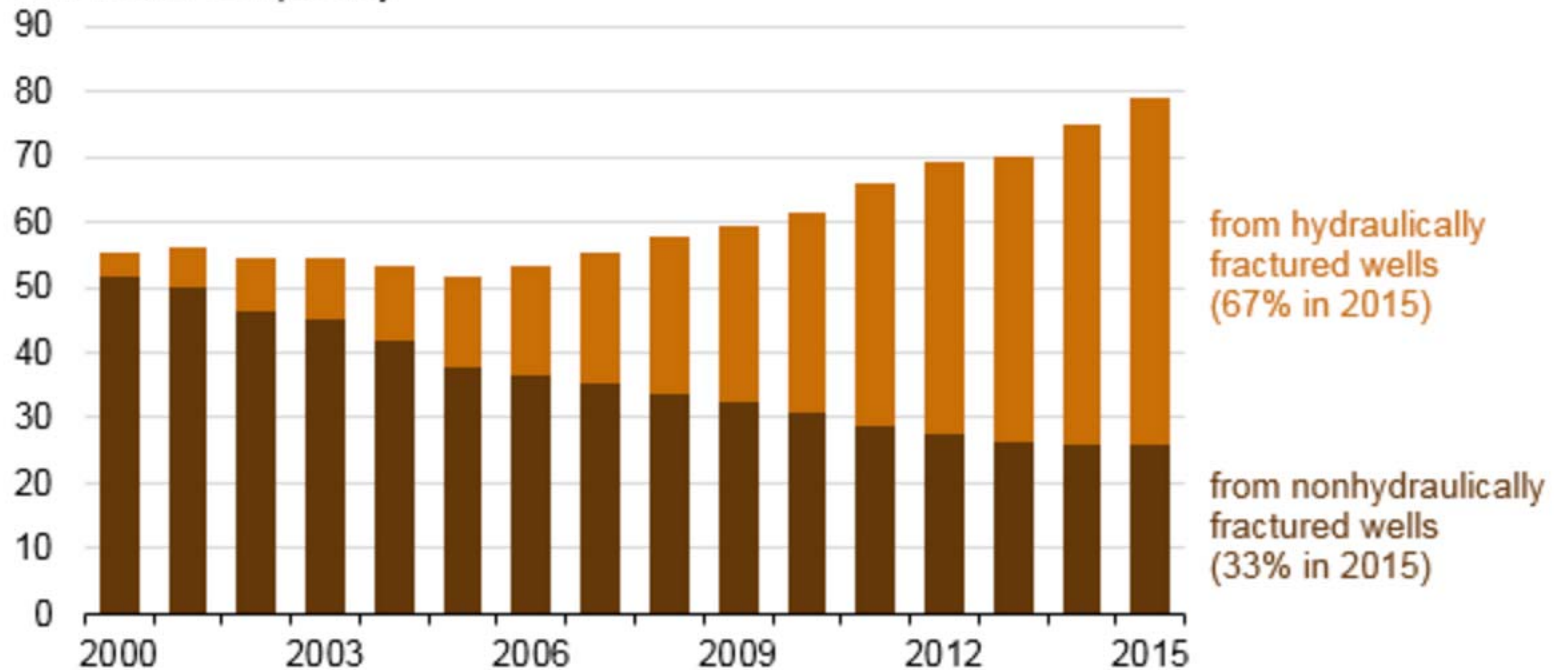


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Hydraulically fractured wells provide two thirds of US Nat Gas

Marketed natural gas production in the United States (2000-2015)

billion cubic feet per day



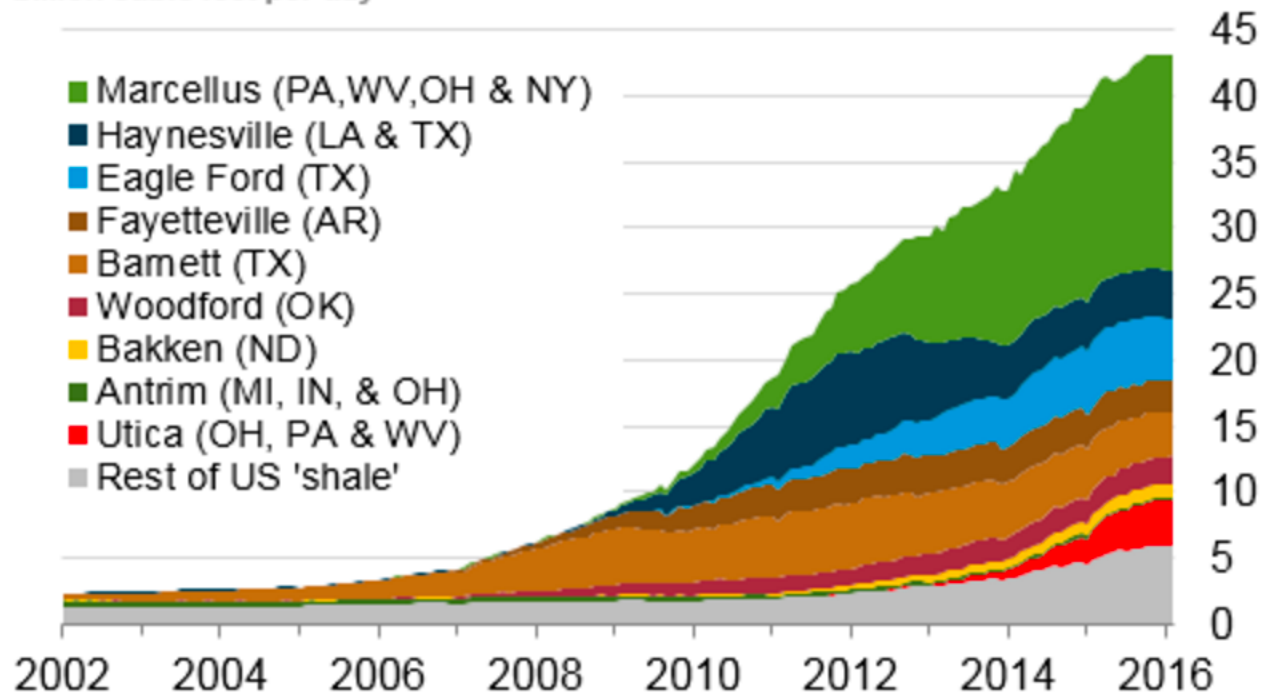
Source: U.S. Energy Information Administration, based on IHS Global Insight and DrillingInfo Inc.



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Over half of U.S. Natural Gas Natural is from Shales

Monthly dry shale gas production
billion cubic feet per day



Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through February 2016 and represent EIA's official shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).

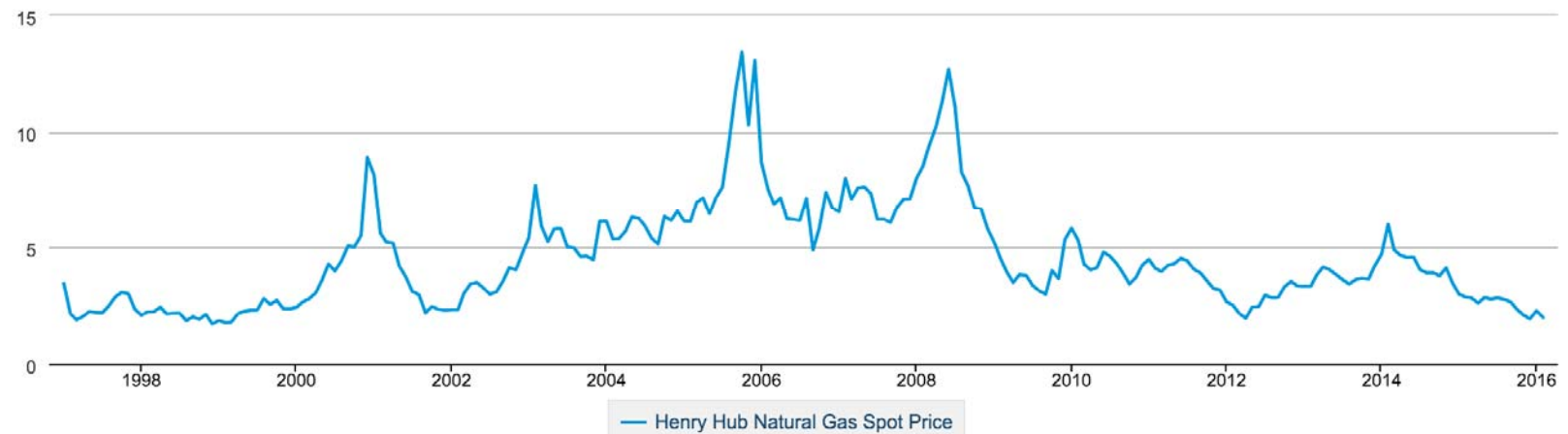


Natural Gas Prices

Henry Hub Natural Gas Spot Price

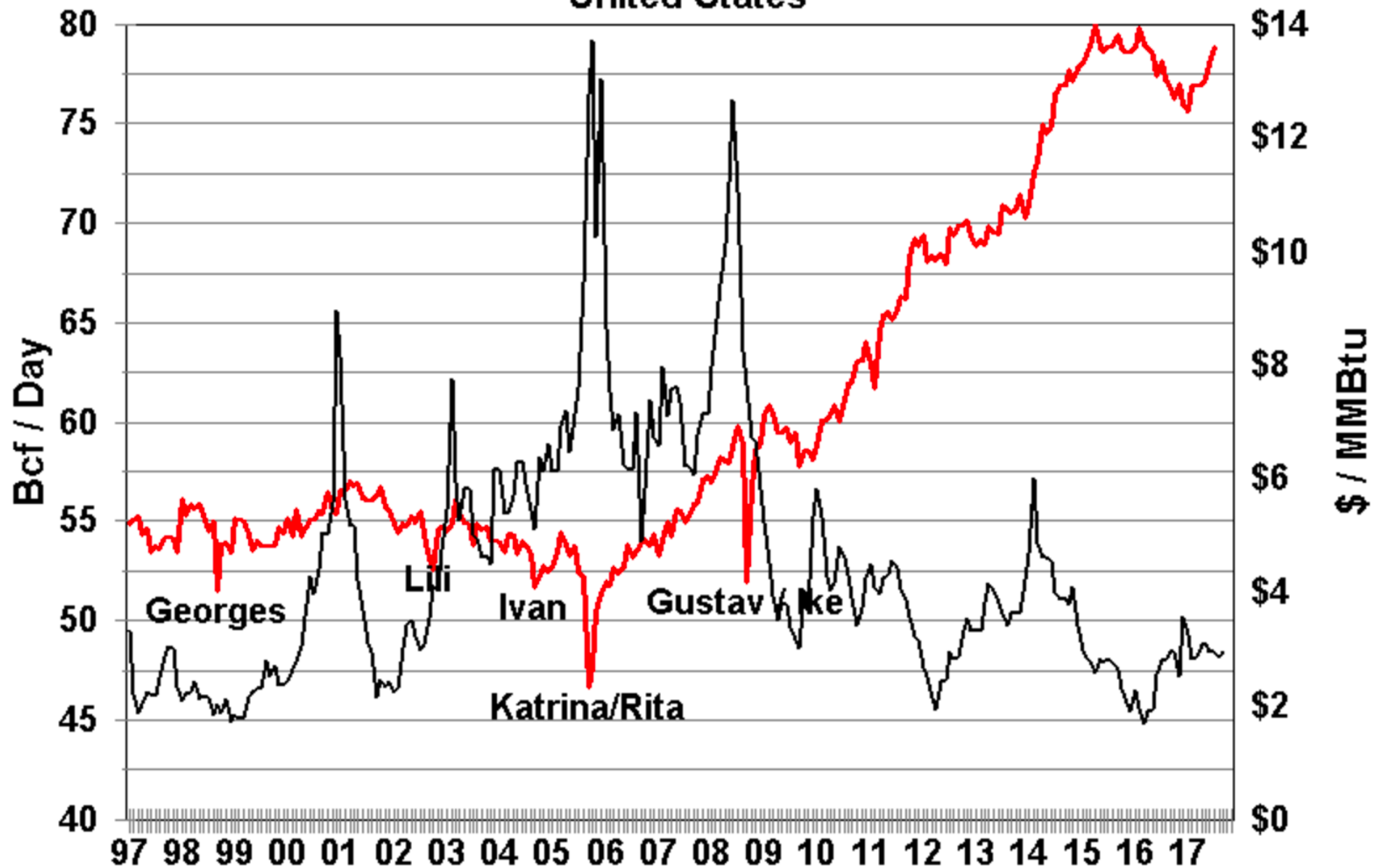
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Dollars per Million Btu



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Marketed Gas Production United States



January 1997 - July 2017

— Production — Price

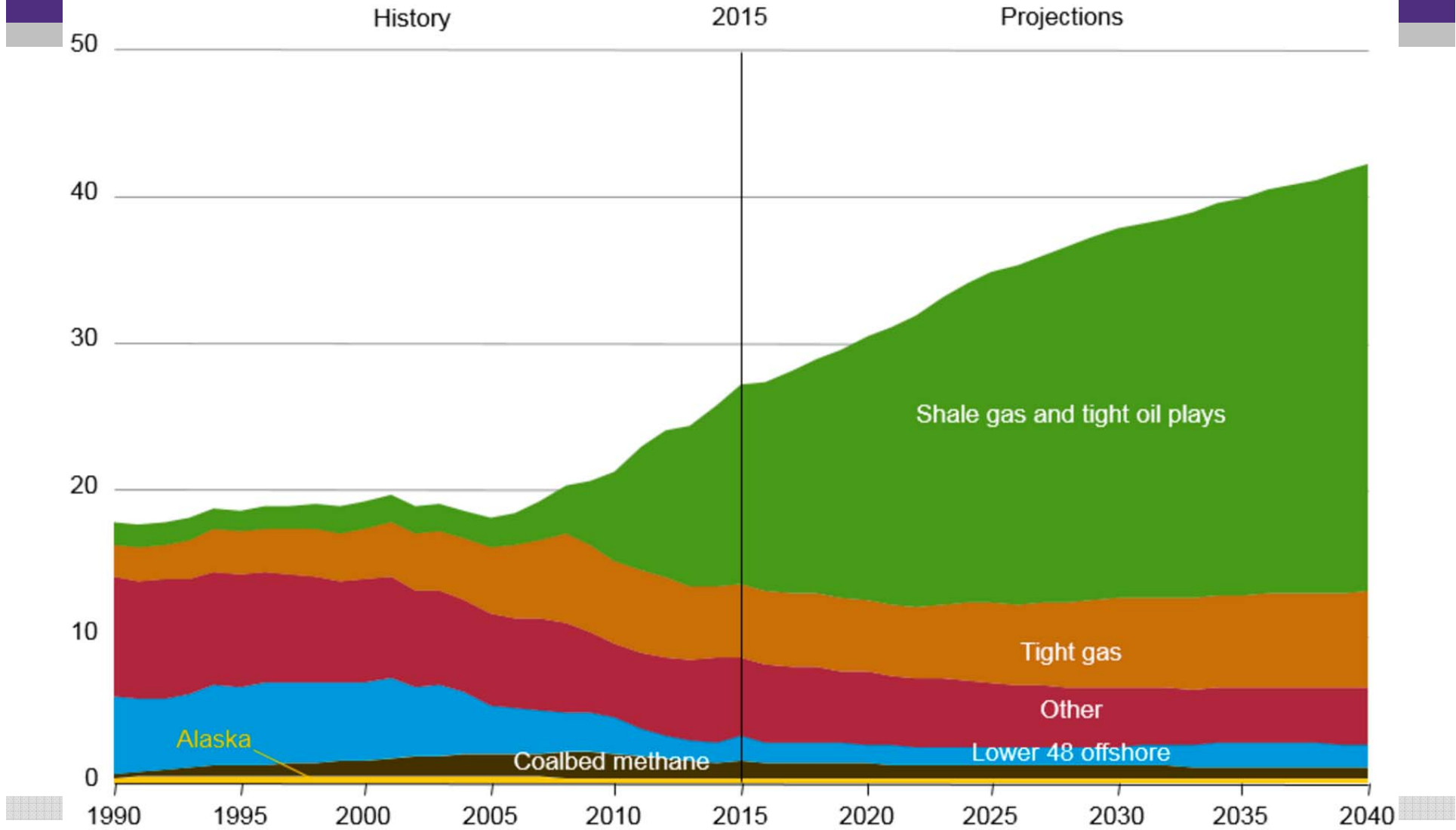
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(479) 293-4081

Outlook for Natural Gas



Figure MT-46. U.S. dry natural gas production by source in the Reference case, 1990–2040

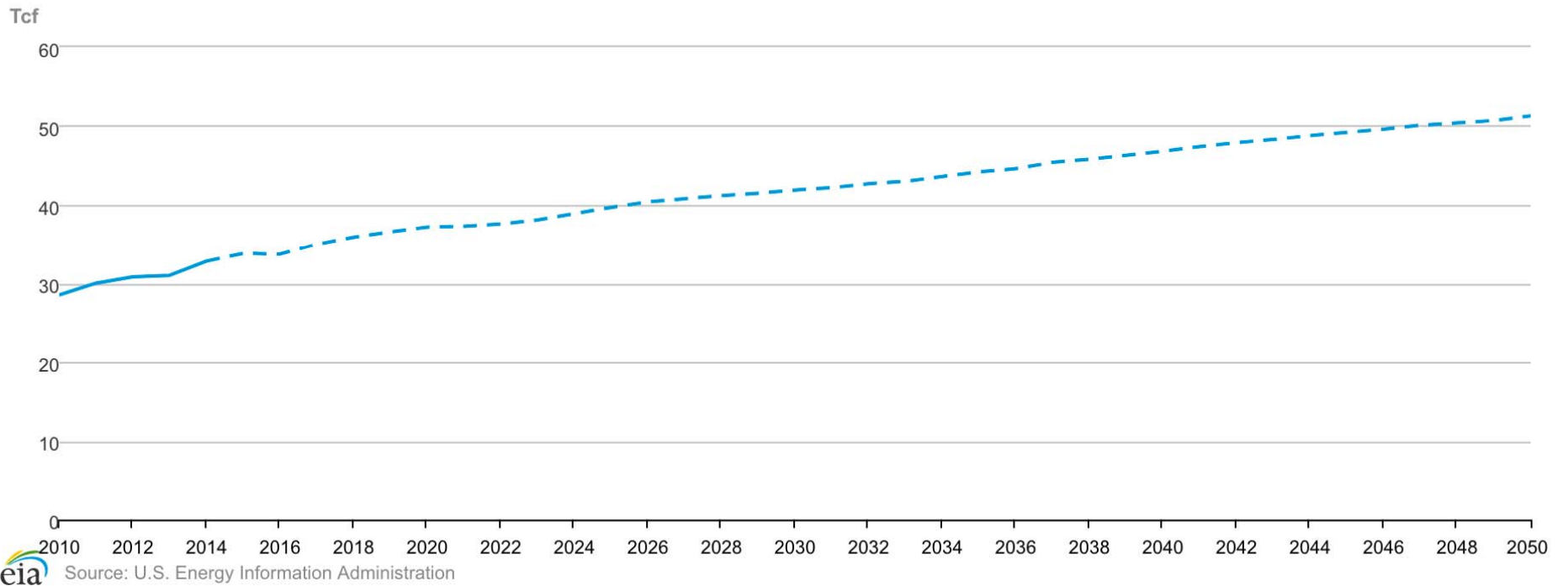
trillion cubic feet



Total natural gas production: OECD: OECD Americas

Case: Reference

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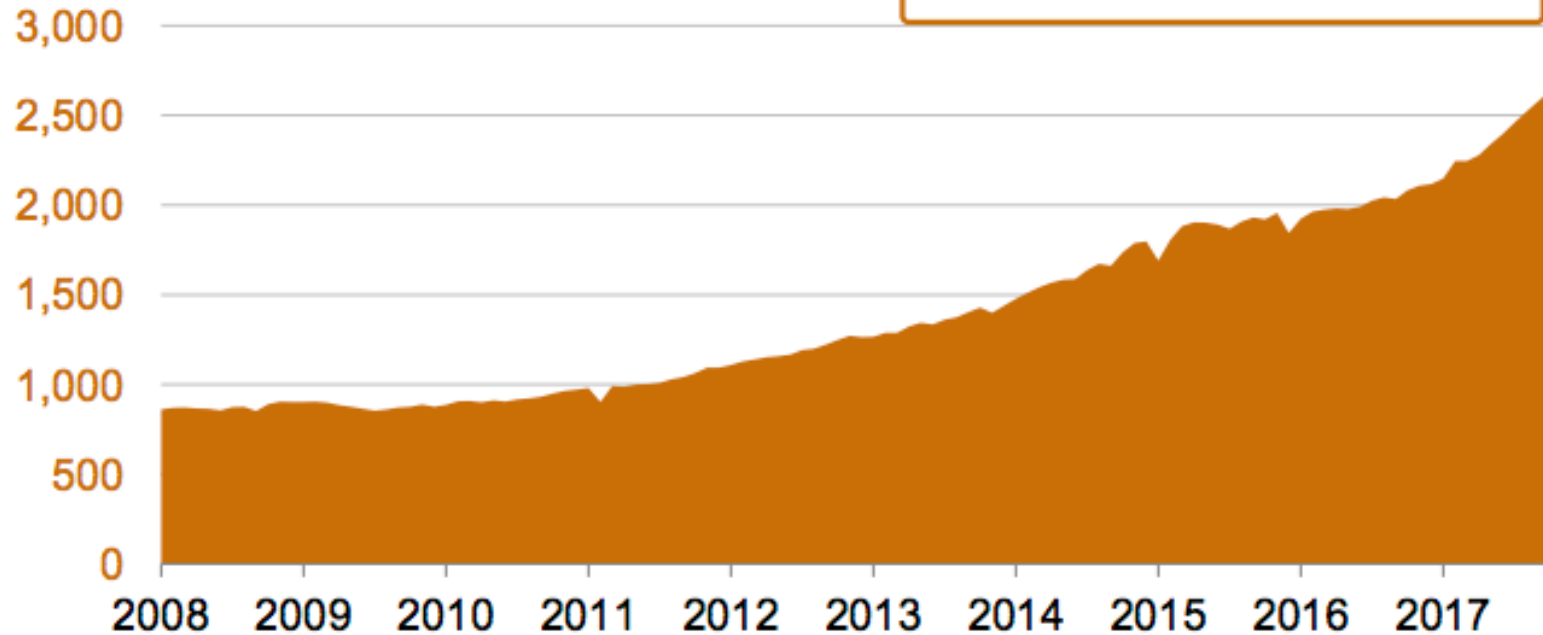


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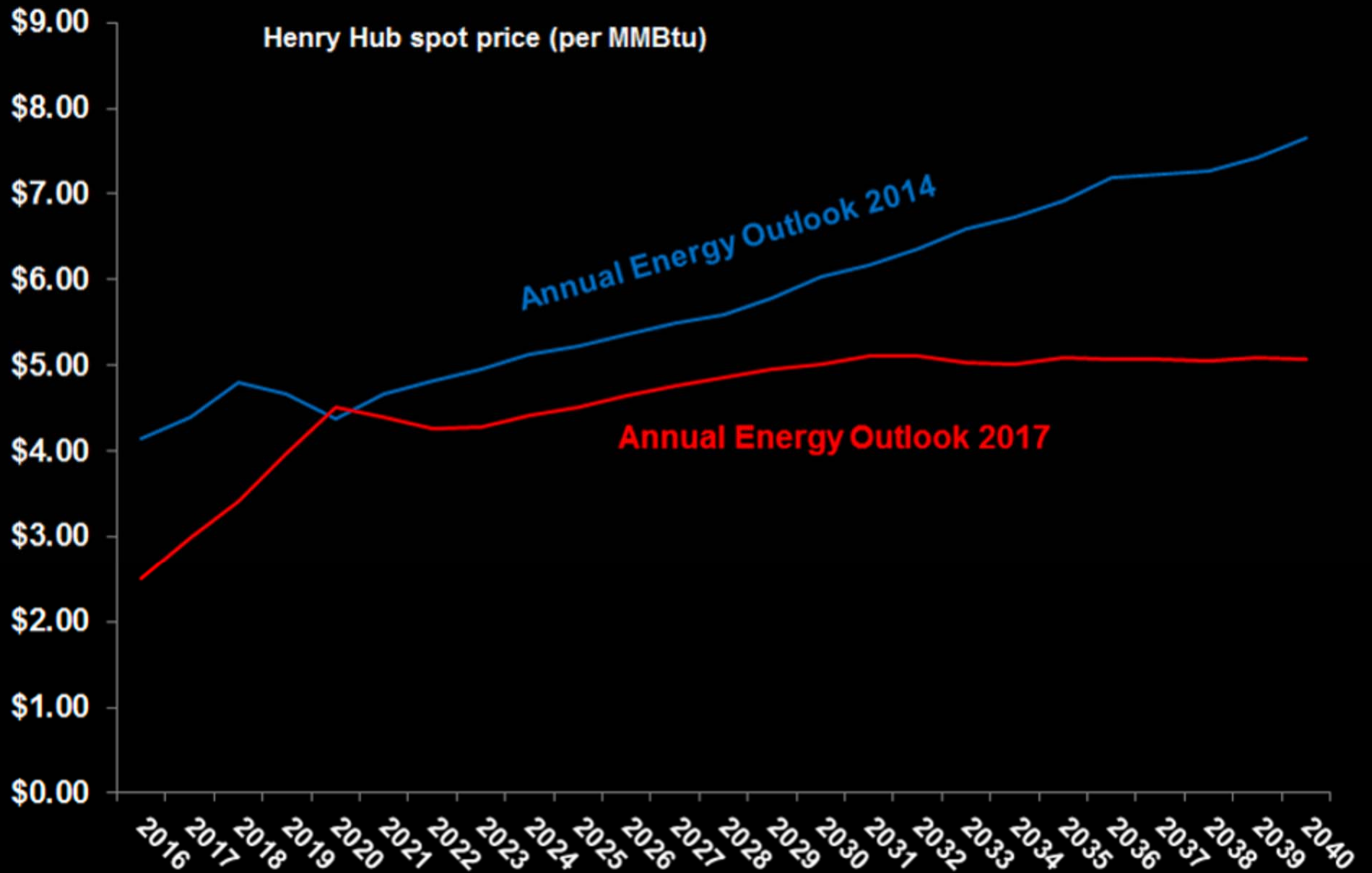
Crude Oil Production in Permian Basin

Permian Region
Oil production
thousand barrels/day

Oil +55
thousand barrels/day
month over month



Projected EIA Natural Gas Prices Continue to Decline



Data source: EIA

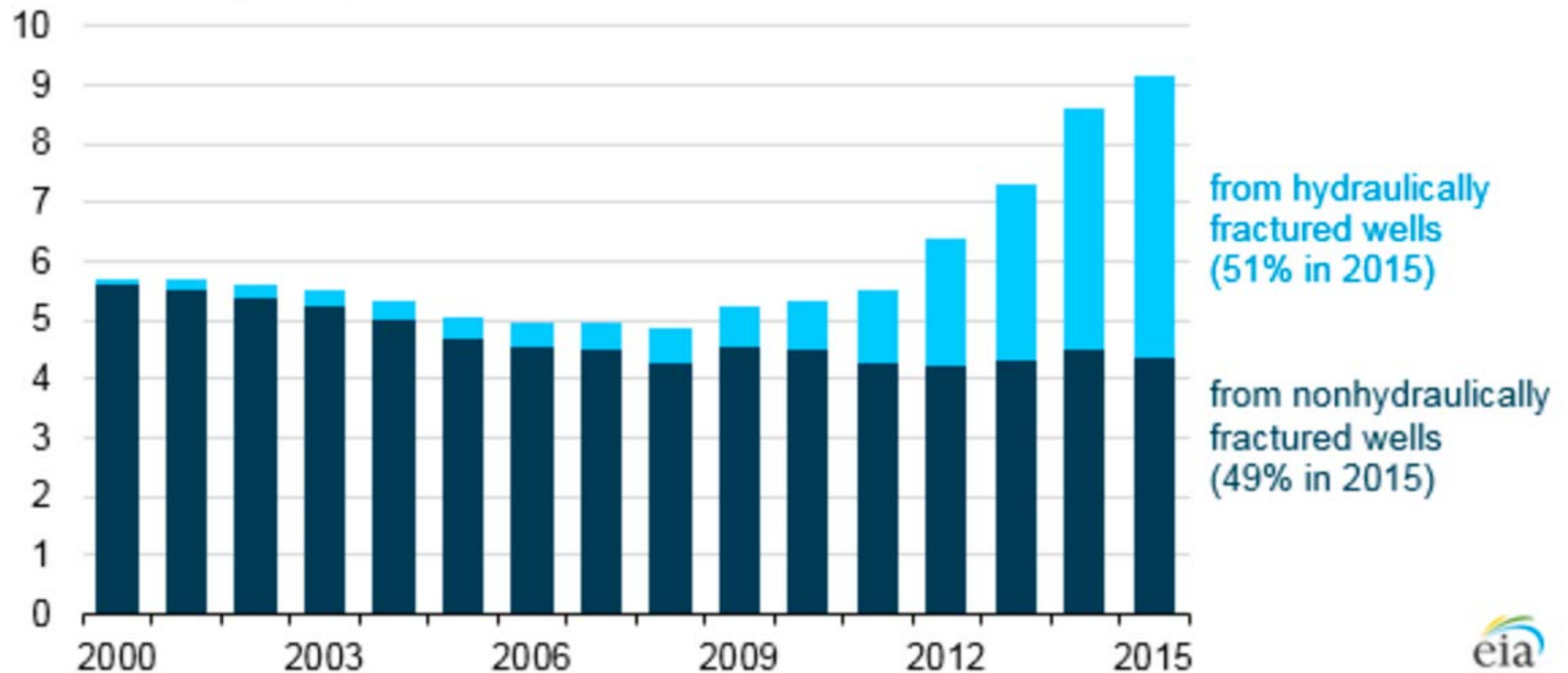
Crude Oil



Over Half of U.S. Oil Production is from Hydraulic Fracturing

Oil production in the United States (2000-2015)

million barrels per day



Source: U.S. Energy Information Administration, IHS Global Insight, and DrillingInfo



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WTI Spot Price, Cushing

Cushing, OK WTI Spot Price FOB

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Dollars per Barrel



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OIL (WTI) PRICE COMMODITY

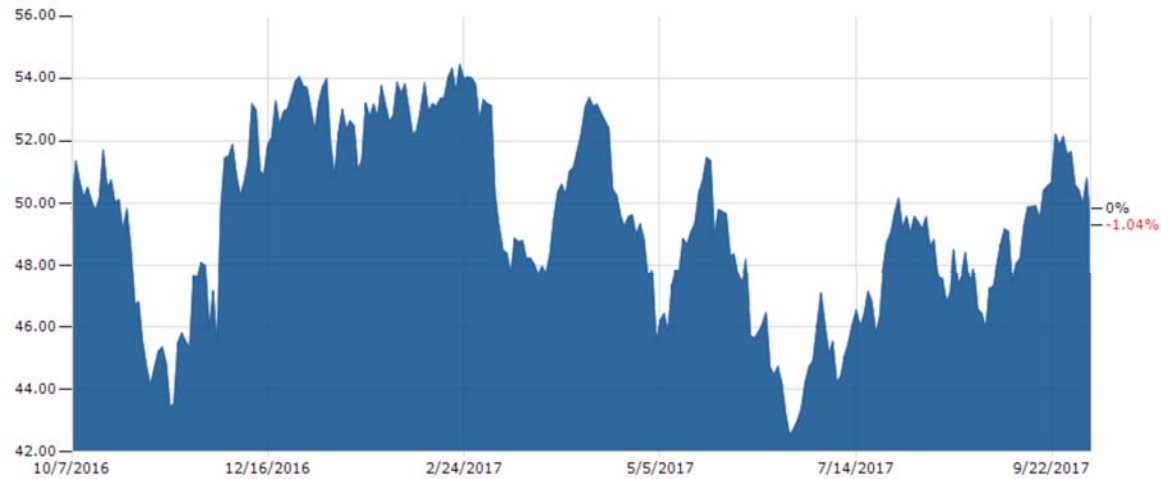
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▼ **49.25** USD **-1.50 (-2.96%)** Official Close 10/6/2017

Prev. Close	50.75	Open	50.75	Day Low	49.10	Day High	50.82	52 Week Low	42.06	52 Week High	55.24
				▲	▲			▲	▲		

INTRADAY 1W 3M **1Y** 3Y 5Y MAX

OIL PRICE CHART OPTIONS ≡



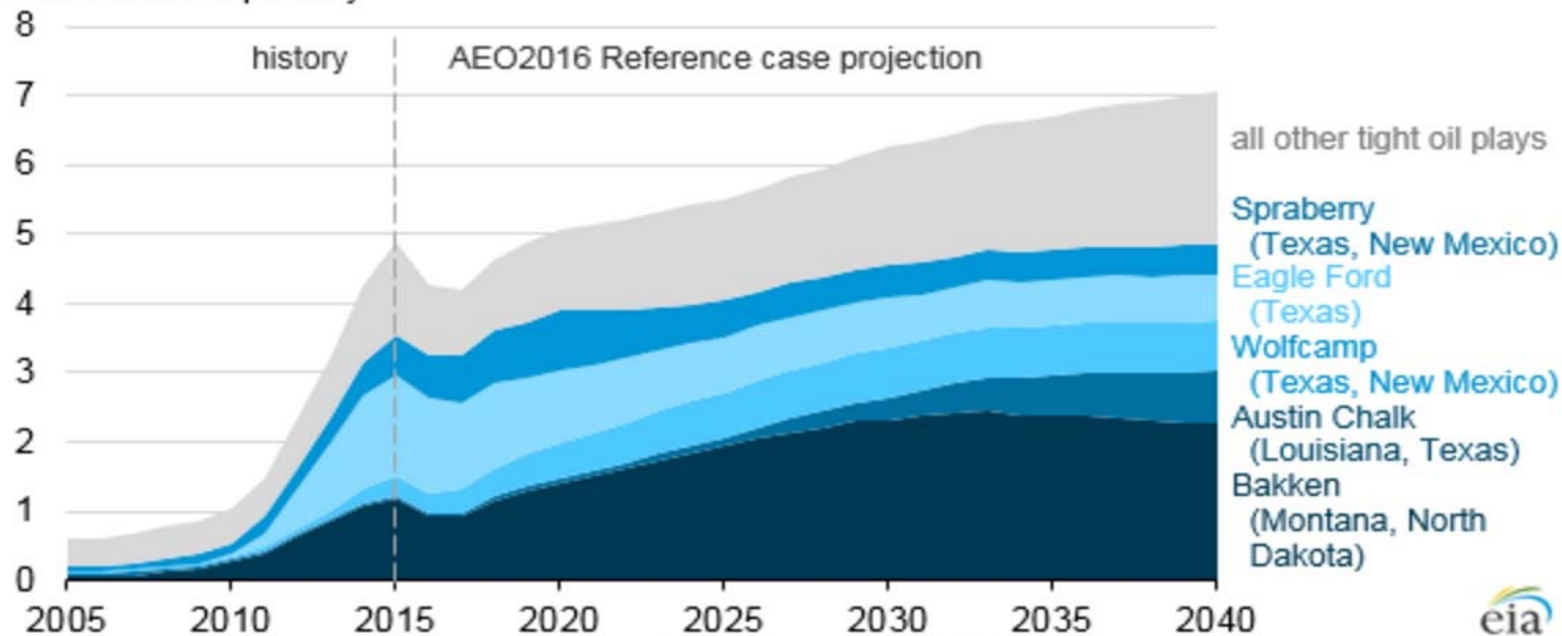
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Outlook for Crude Oil Prices



Future U.S. tight oil and shale gas production depends on resources, technology, markets

U.S. tight oil production (2005-40)
million barrels per day



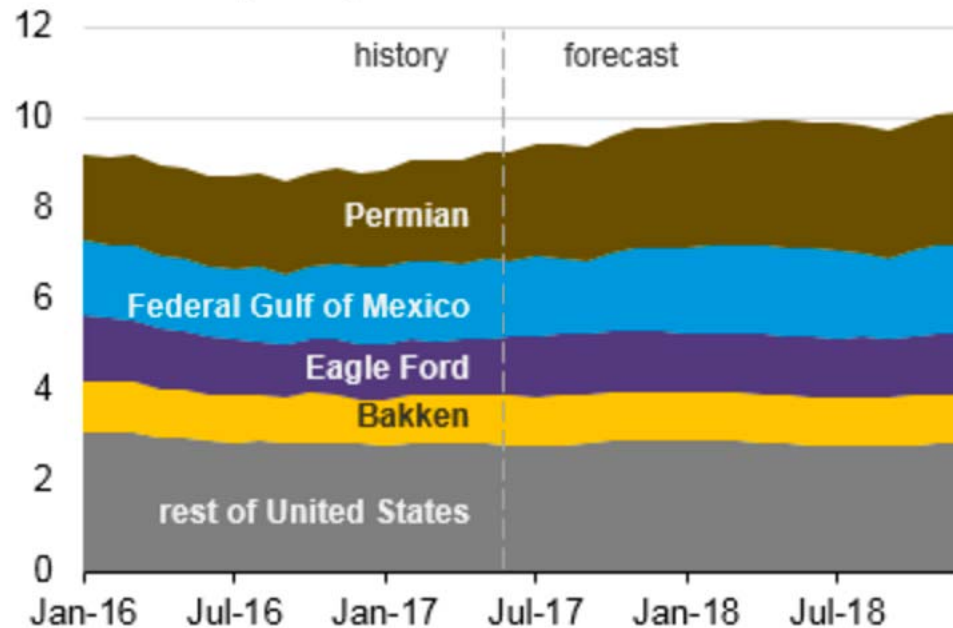
Source: U.S. Energy Information Administration, *Annual Energy Outlook 2016*



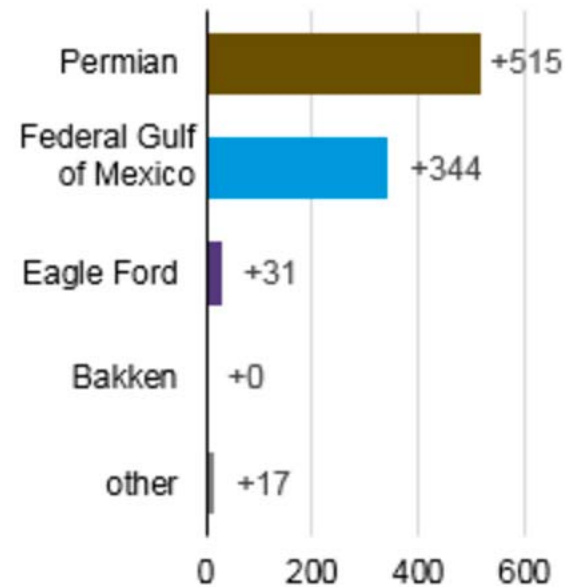
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U.S. crude oil production forecast expected to reach record high in 2018

Monthly U.S. crude oil production by region
 Jan 2016 - Dec 2018
 million barrels per day



Forecasted change
 Jun 2017 - Dec 2018
 thousand barrels per day

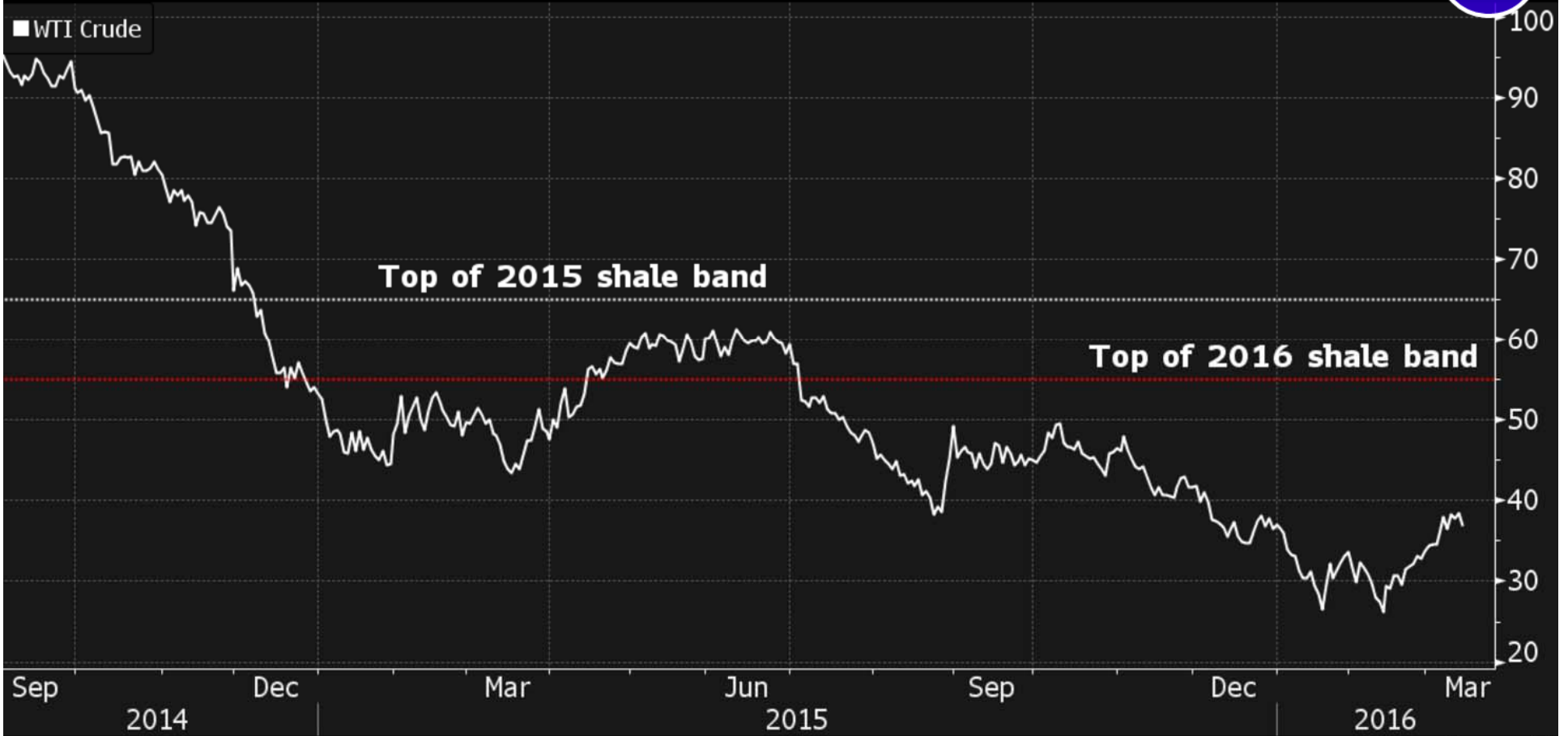


Source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, July 2017



Top of the Oil Market?

Recovery faltered at \$60 in 2015; ceiling may be lower this year



Source: Bloomberg

Bloomberg

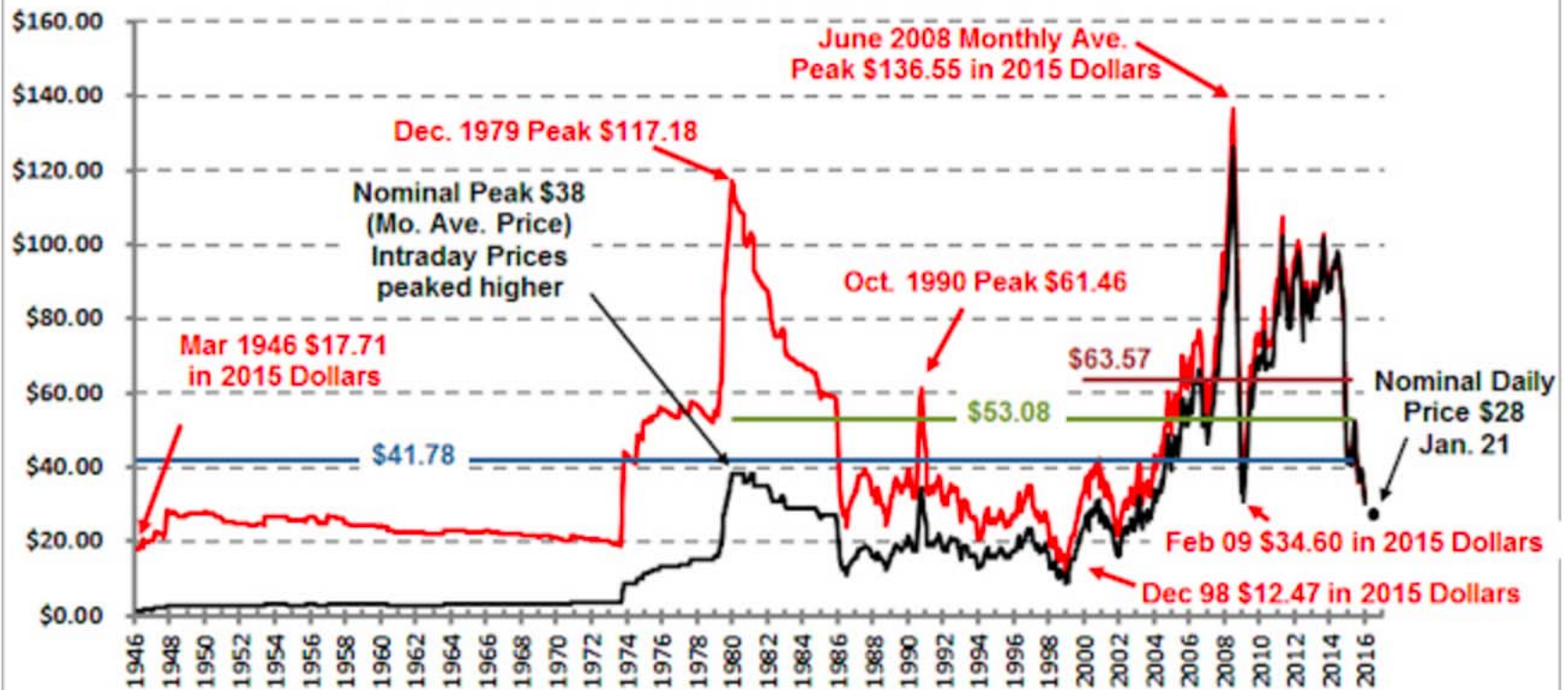


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Inflation Adjusted Monthly Average CRUDE OIL PRICES (1946-Present) In December 2015 Dollars

© www.InflationData.com
Updated 1/23/2016

- Inf. Adj. Oil Price
- Nominal Oil Price
- Ave. Since 2000
- Ave. Since 1980
- Ave. since 1946



OPEC lost control of oil prices thanks to U.S. shale revolution

By Ed Ireland | October 22, 2016



My Crude Price Forecast One Year Ago

OPEC talks a good game about cutting production, but it is doubtful it will do it and lose market share. Even if it reaches an agreement, Iran, Nigeria and Libya, which are exempt from any cuts, will likely increase their production to gain market share.

The bottom line: The crude oil market has transitioned from demand-driven to supply-driven, and crude oil prices will stay in the range of \$40 to \$55 per barrel for the foreseeable future.

And that's a good thing. Building on the American ingenuity that created the shale energy revolution, U.S. oil and natural gas companies are becoming increasingly profitable and taking a bigger share of the world crude oil market. Which puts the United States, not OPEC, in the driver's seat.

Ed Ireland, Ph.D., teaches in the Energy MBA program in the Neeley School of Business at Texas Christian University.



Crude Oil Price Outlook

- Crude oil prices stay in the range of \$40 to \$60 per barrel, and likely in the tighter range of \$45 to \$55 per barrel, for at least the next 2 years.
- By then world wide demand will start putting upward pressure on prices.
- Oil price increases are likely to be gradual.



The Shale Energy Revolution

- The shale energy revolution has permanently increased the resource base of the United States and decreased the cost of energy thereby increasing the productive capacity of the United States.



THANK YOU!



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Finding and Producing Costs are Falling

- Apache Alpine High: early economics indicate gas production breaks even near \$2.50/Mcf and oil breaks even at \$55/bbl.
- EOG says it can make money at \$40
- Wood Mackenzie says costs in the Delaware Basin are below \$40



Finding and producing costs are falling

This will continue as a result of
technological advances coupled
with Big Data



Drilling costs have fallen

<u>Basin</u>	<u>Cost in 2014</u>	<u>Cost in 2015</u>
Bakken	\$7.1m	\$5.9m
Eagle Ford	\$6.6m	\$6.5m
Marcellus	\$6.6m	\$6.1m
Midland Basin	\$7.7m	\$7.2m
Delaware Basin	\$6.6m	\$5.2m

Source: EIA “Trends in Oil and Natural Gas Upstream Costs” based on a study by HIS Global, March 2016.



“Oil Firm Claims Major Discovery in West Texas”- WSJ 9-6-2016

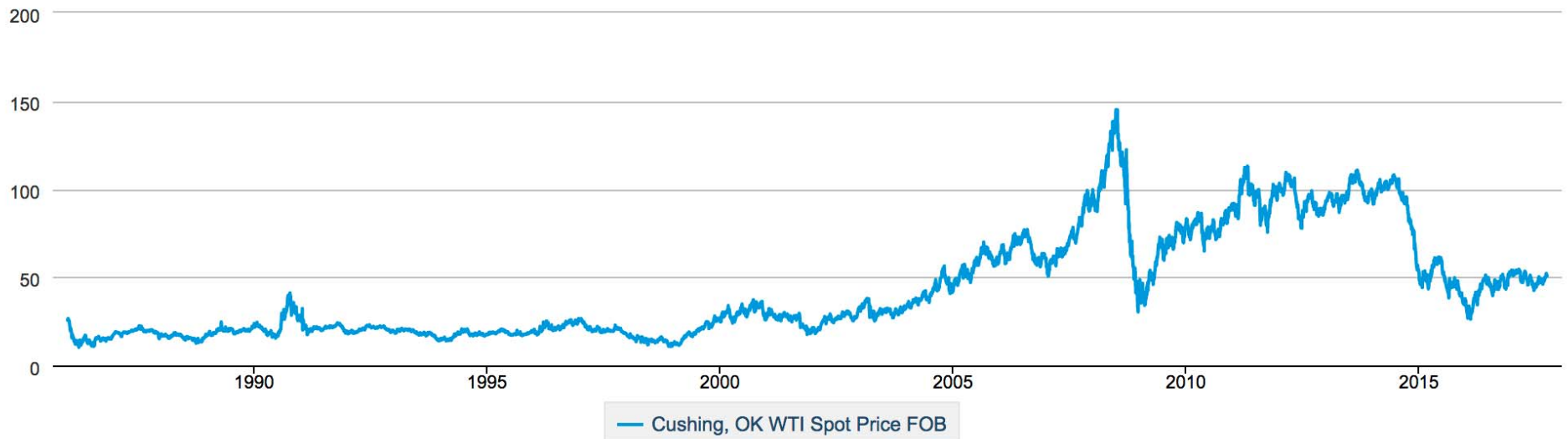
- Apache Corp calls it Alpine High
- Promises to be the biggest energy find in the past decade
- Estimates are that it holds 8.1 billion barrels and natural gas



Cushing, OK WTI Spot Price FOB

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Dollars per Barrel

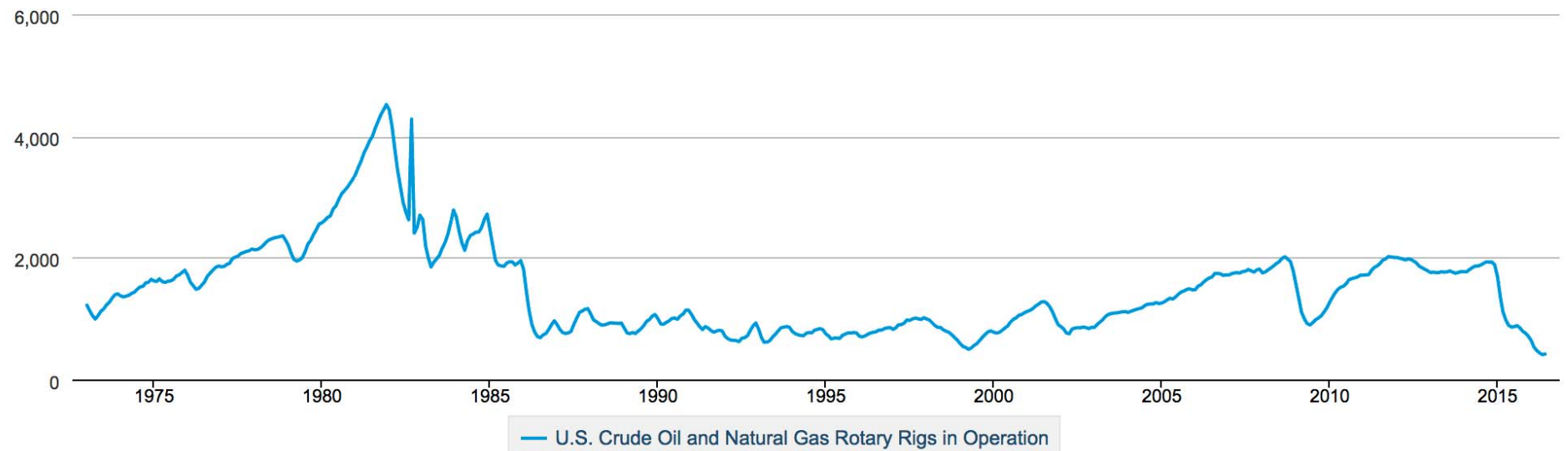


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U.S. Crude Oil and Natural Gas Rotary Rigs in Operation

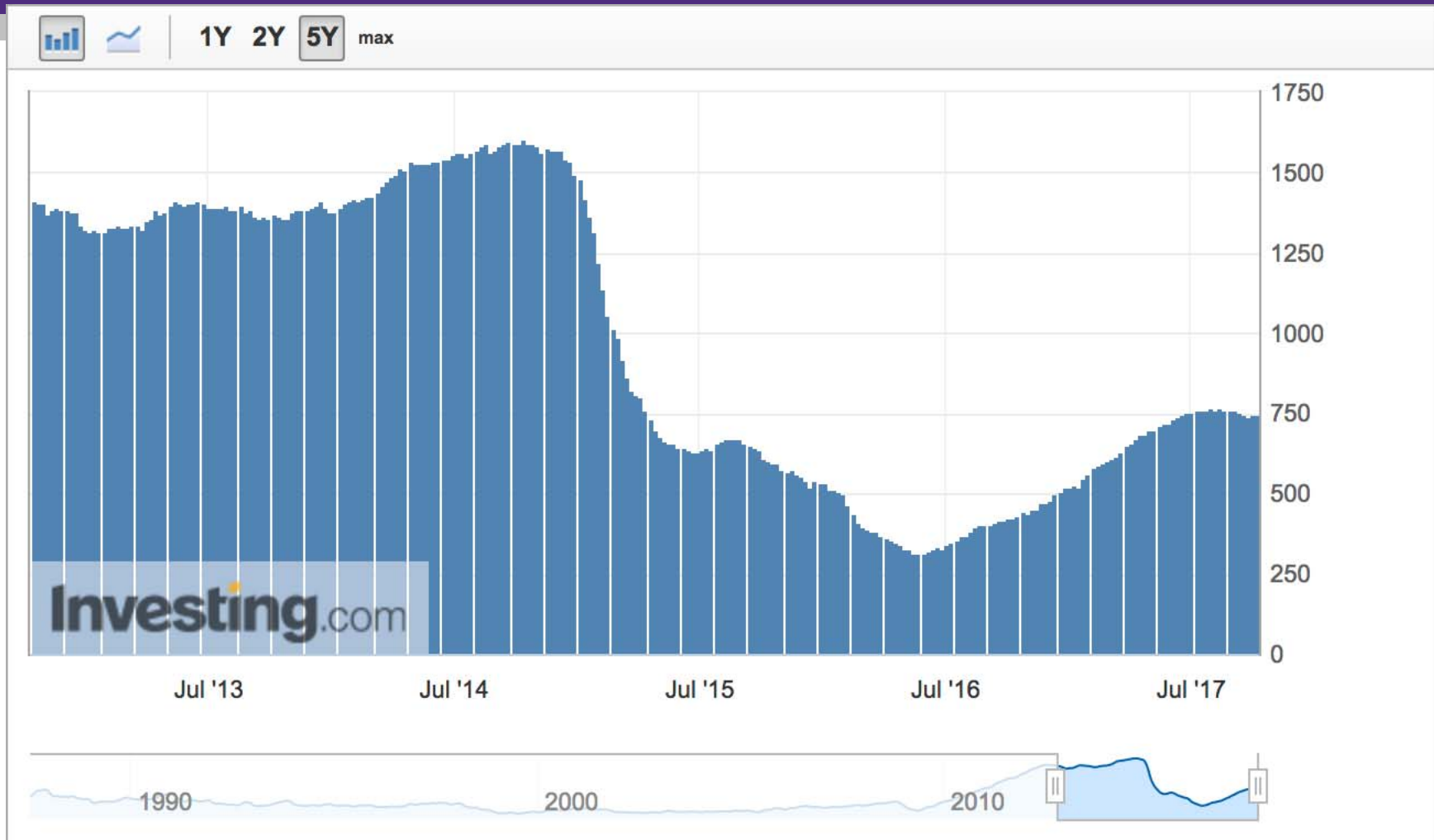
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Number of Elements



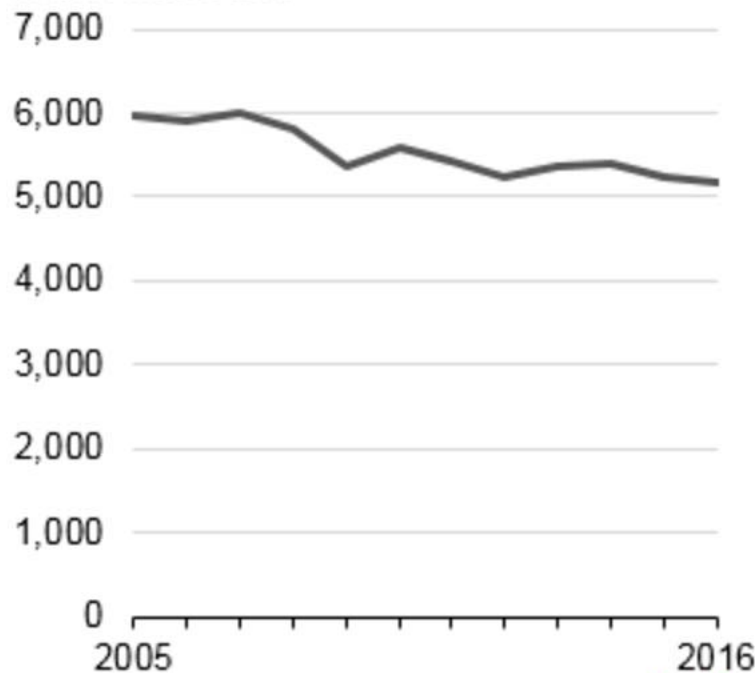
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U. S. Rig Count

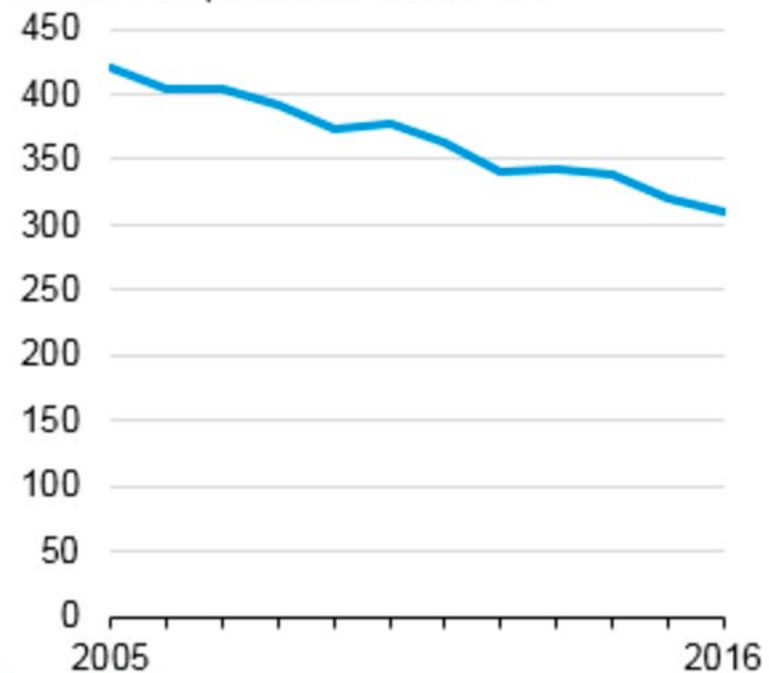


U.S. energy-related CO2 emissions are falling

U.S. energy-related CO2 emissions
million metric tons



Energy-related carbon intensity
metric tons per million dollars GDP



Source: U.S. Energy Information Administration, [Monthly Energy Review](#)

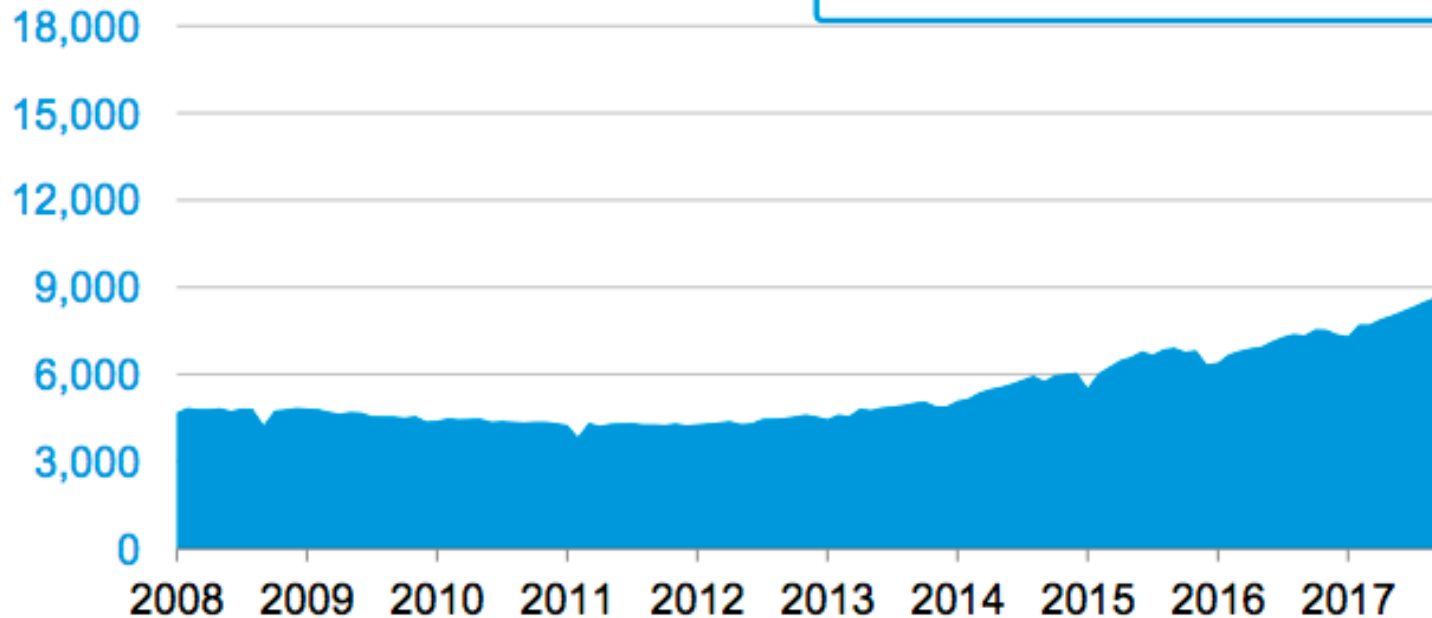


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Natural Gas Production in Permian Basin

Permian Region
Natural gas production
million cubic feet/day

Gas +158
million cubic feet/day
month over month

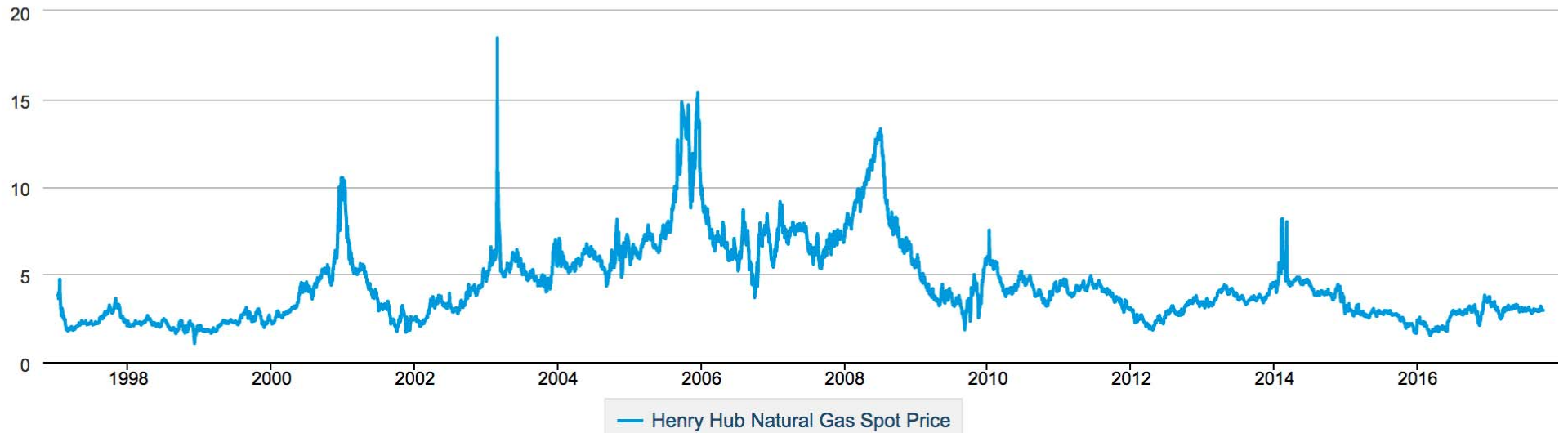


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Henry Hub Natural Gas Spot Price

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Dollars per Million Btu



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