

# **The Current State of U.S. and Global Crude Oil Markets\***

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## **Abstract**

Presently, a surplus of both crude oil and refined products exists globally as well as, here in the U.S. The excess inventory of refined products was just more recently brought to light.

The U.S. remains the world's largest producer of petroleum and liquid hydrocarbon products, and expectations are that global demand will increase in the future (IEA). U.S. crude oil production peaked at approximately 9.4 million Bbls/day in April, 2016, but has declined to about 8.4 million Bbls/day more recently in large part due to continuing low prices that necessitate the shut-in of uneconomical wells and in the reduction of CAPEX for new drilling and production. Ironically, imports of crude oil have increased from 2015 levels as U.S. refiners have to blend the "lighter" shale oil with foreign grades as gasoline demand has been strong this year. Canada continues to be the No. 1 source of imported oil for the U.S.

After about 18 months of straight declines, the U.S. oil and gas rig count has steadily increased over the past 90 days largely as a result of "economic" plays such as the Permian Basin in West Texas and, the "SCOOP" and "STACK" in Oklahoma. Producers have found profitability at \$40/Bbl, or higher in these areas.

Current U.S. crude oil inventory exceeds 530 million Bbl, not including the U.S. Strategic Petroleum Reserve which equates to about a 30-day supply for all U.S. needs. The Cushing, OK Hub, the world's largest crude storage facility, has been as high as 90% full in the past 6 months.

The removal of the U.S. ban on oil exports in December, 2015, has provided an outlet for some of the domestic surplus and has allowed U.S. oil producers to participate in the global market for crude, thus providing more price parity related to the Brent North Sea standard.

There are many, many factors that can and, do, influence the price of crude oil and the financial market for oil continues to be very volatile. Savvy oil producers can utilize various financial energy derivative instruments to hedge their price and market risk in the future. E&P companies choosing not to develop some type of hedging program will continue put their future in the hands of an ever-changing marketplace and are at risk for the huge price swings we continue to experience.

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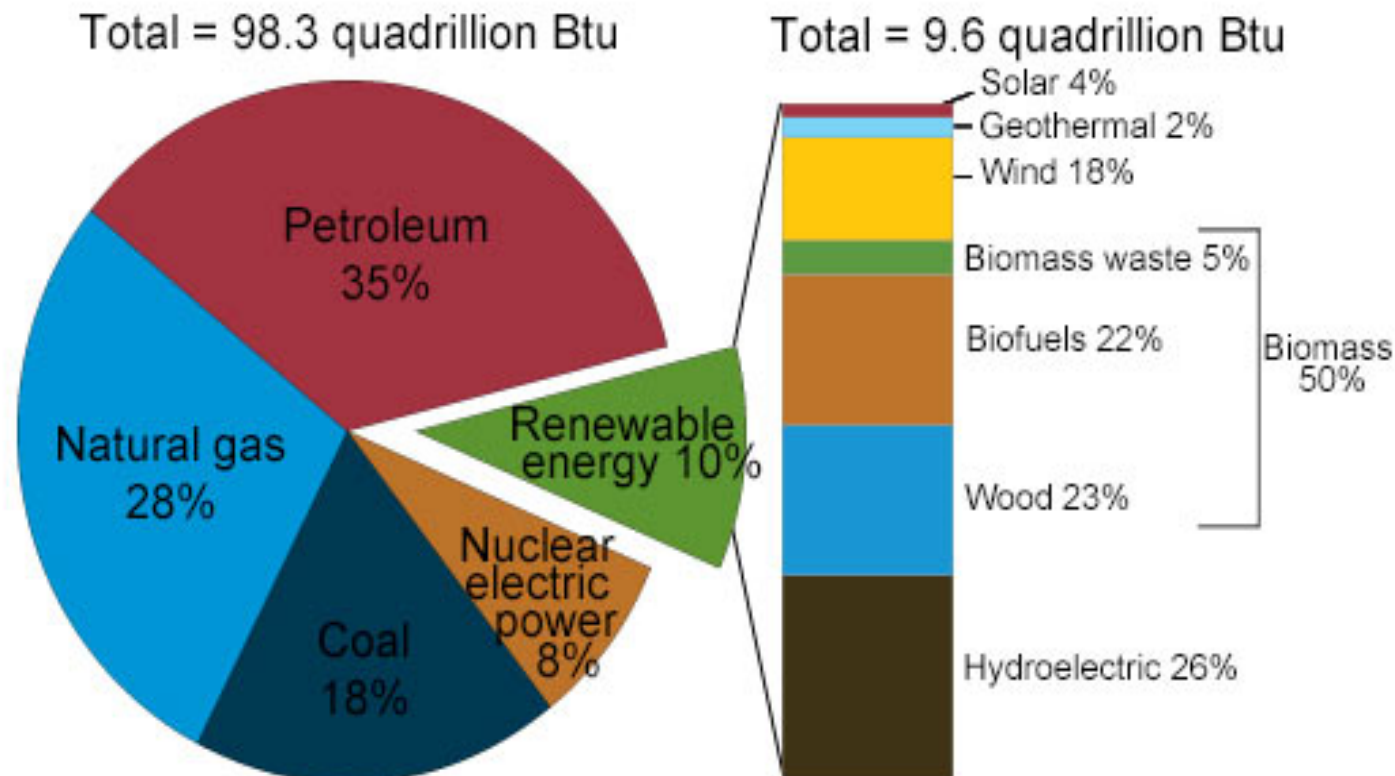
“The Current State of US & Global Oil Markets”

*Presented by*

Tom Seng

*Assistant Professor – The University of Tulsa*

# U.S. energy consumption by energy source, 2014



Note: Sum of components may not equal 100% as a result of independent rounding.

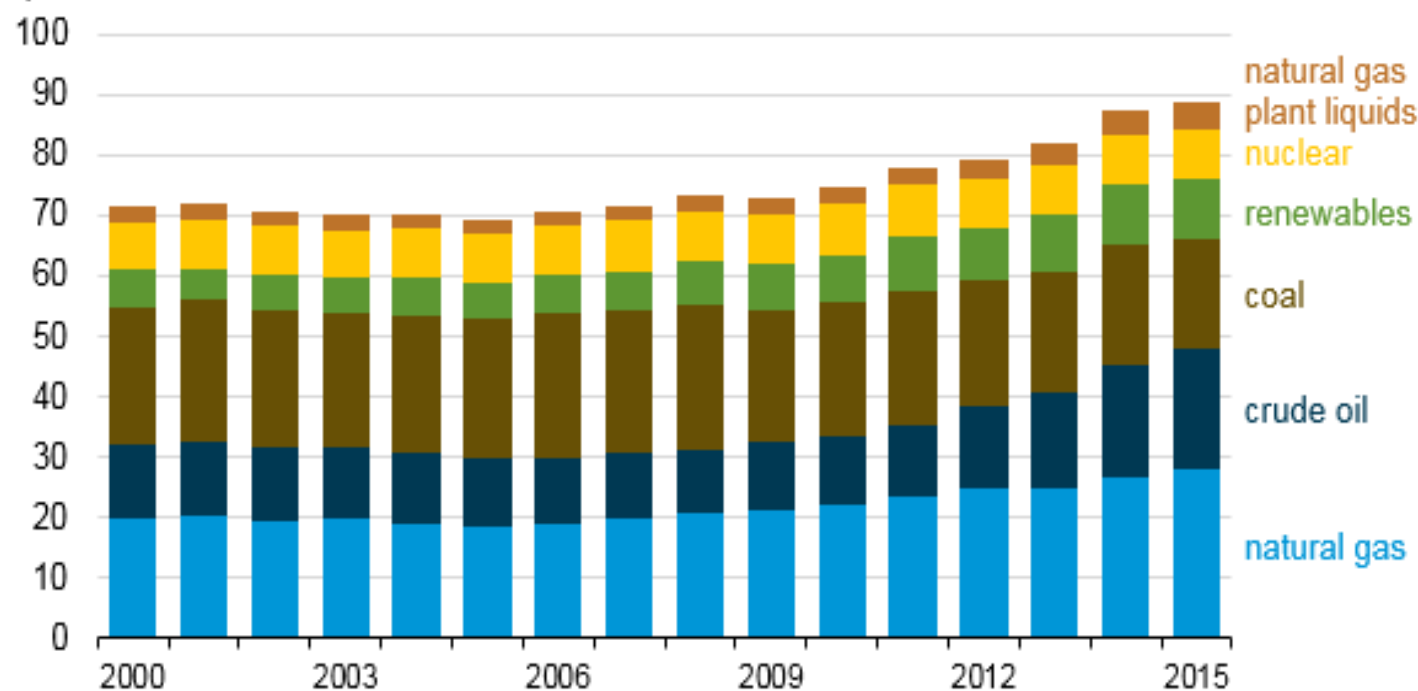
Source: U.S. Energy Information Administration, *Monthly Energy Review*, Table 1.3 and 10.1 (March 2015), preliminary data

APRIL 18, 2016

## Total U.S. energy production increases for sixth consecutive year

United States total energy production (2000-2015)

quadrillion Btu



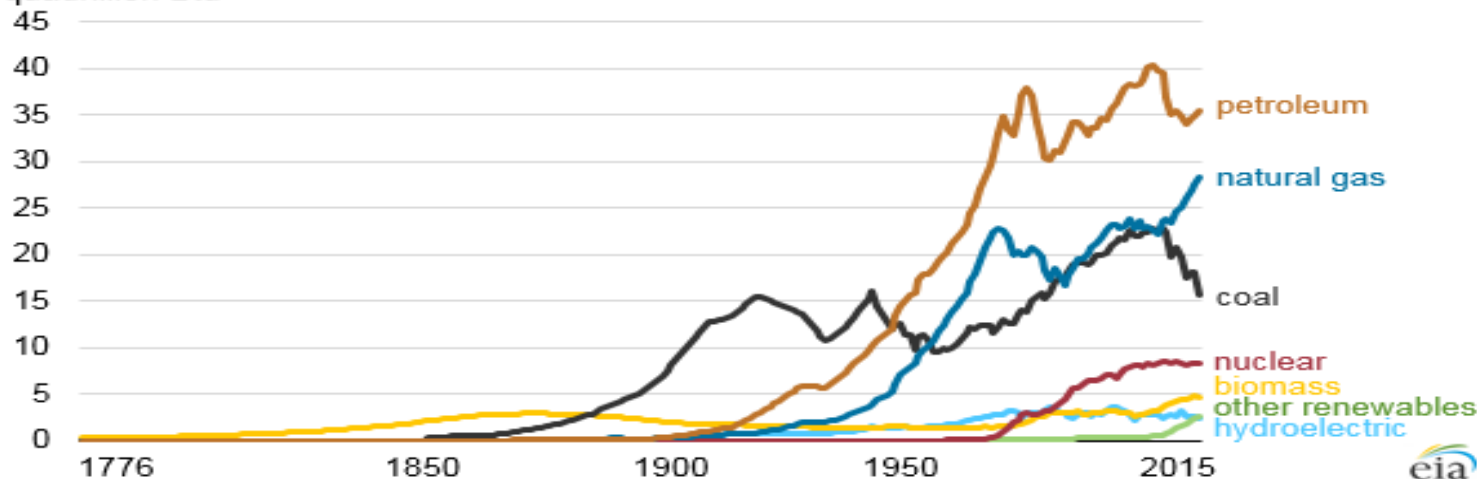
Source: U.S. Energy Information Administration, [Monthly Energy Review](#)

JULY 1, 2016

## Fossil fuels still dominate U.S. energy consumption despite recent market share decline

### Energy consumption in the United States (1776-2015)

quadrillion Btu



Three fossil fuels—petroleum, natural gas, and coal—have provided more than 80% of total U.S. energy consumption for more than 100 years. In 2015, fossil fuels made up 81.5% of total U.S. energy consumption, the lowest fossil fuel share in the past century. In EIA's [Annual Energy Outlook 2016](#) Reference case projections, which [reflect current laws and policies](#), that percentage declines to 76.6% by 2040. Policy changes or technology breakthroughs that go beyond the trend improvements included in the Reference case could significantly change that projection.

In 2015, the renewable share of energy consumption in the United States was its largest since the 1930s at nearly 10%. The greatest growth in renewables over the past decade has been in [solar and wind electricity generation](#). [Liquid biofuels](#) have also increased in recent years, contributing to the growing renewable share of total energy consumption.

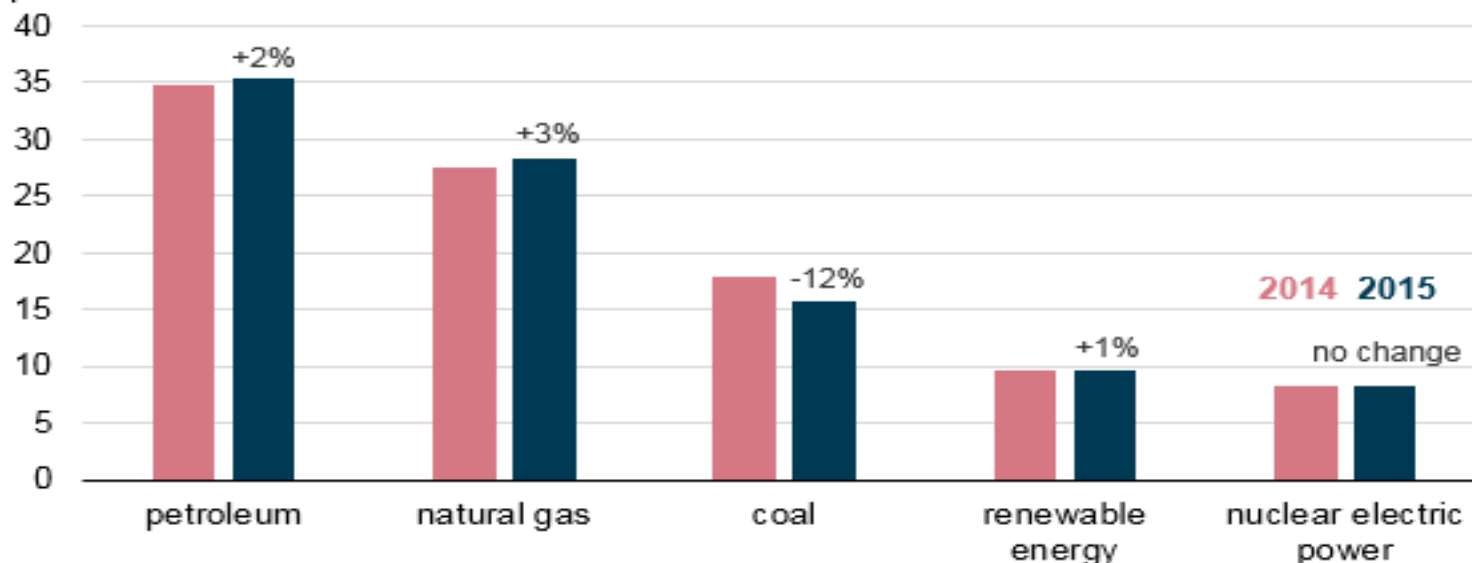
The most significant decline in recent years has been coal: U.S. coal consumption fell 13% in 2015, the highest annual percentage decrease of any fossil fuel in the past 50 years. The only similar declines were in 2009 and 2012, when coal fell 12% below the level in the previous year.

JULY 21, 2016

## Changing U.S. energy mix reflects growing use of natural gas, petroleum, and renewables

### United States primary energy consumption by source, 2014-15

quadrillion British thermal units



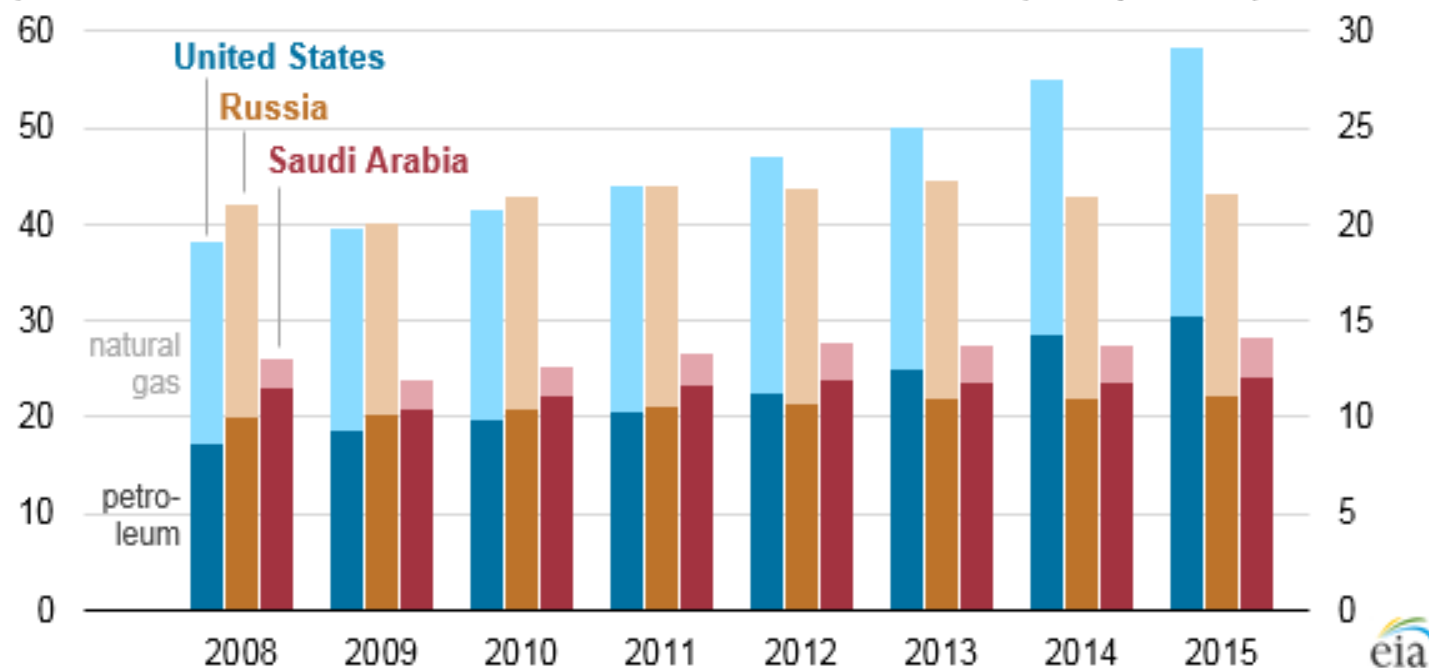
Source: U.S. Energy Information Administration, [Monthly Energy Review](#), April 2016

Primary energy consumption fell slightly in 2015 as a decline in coal use exceeded increases in natural gas, petroleum, and renewables use. In most cases, changes between 2014 and 2015 reflect longer-term trends in energy use.

In 2015, natural gas consumption increased more than any other energy source, accounting for 29% of total primary energy consumption. As [domestic natural gas production continues to reach record levels](#), natural gas prices [have remained low](#). Low natural gas prices have led to [increased use](#) of natural gas-fired generators in the electric power sector.

# United States remains largest 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

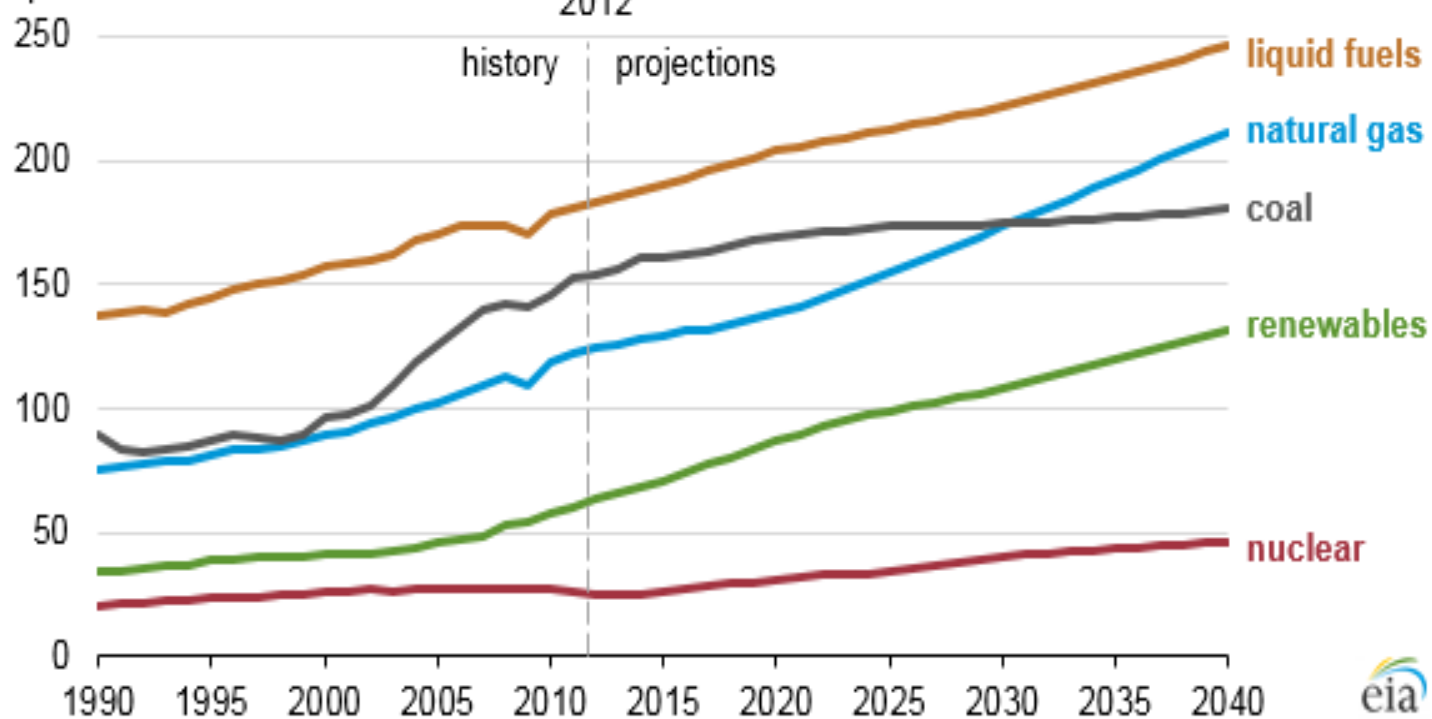
The United States remained the world's top producer of petroleum and natural gas hydrocarbons in 2015, according to U.S. Energy Information Administration estimates. U.S. petroleum and natural gas production first surpassed Russia in 2012, and the United States has been the world's top producer of natural gas since 2011 and the world's top producer of petroleum hydrocarbons since 2013.

MAY 12, 2016

## EIA projects 48% increase in world energy consumption by 2040

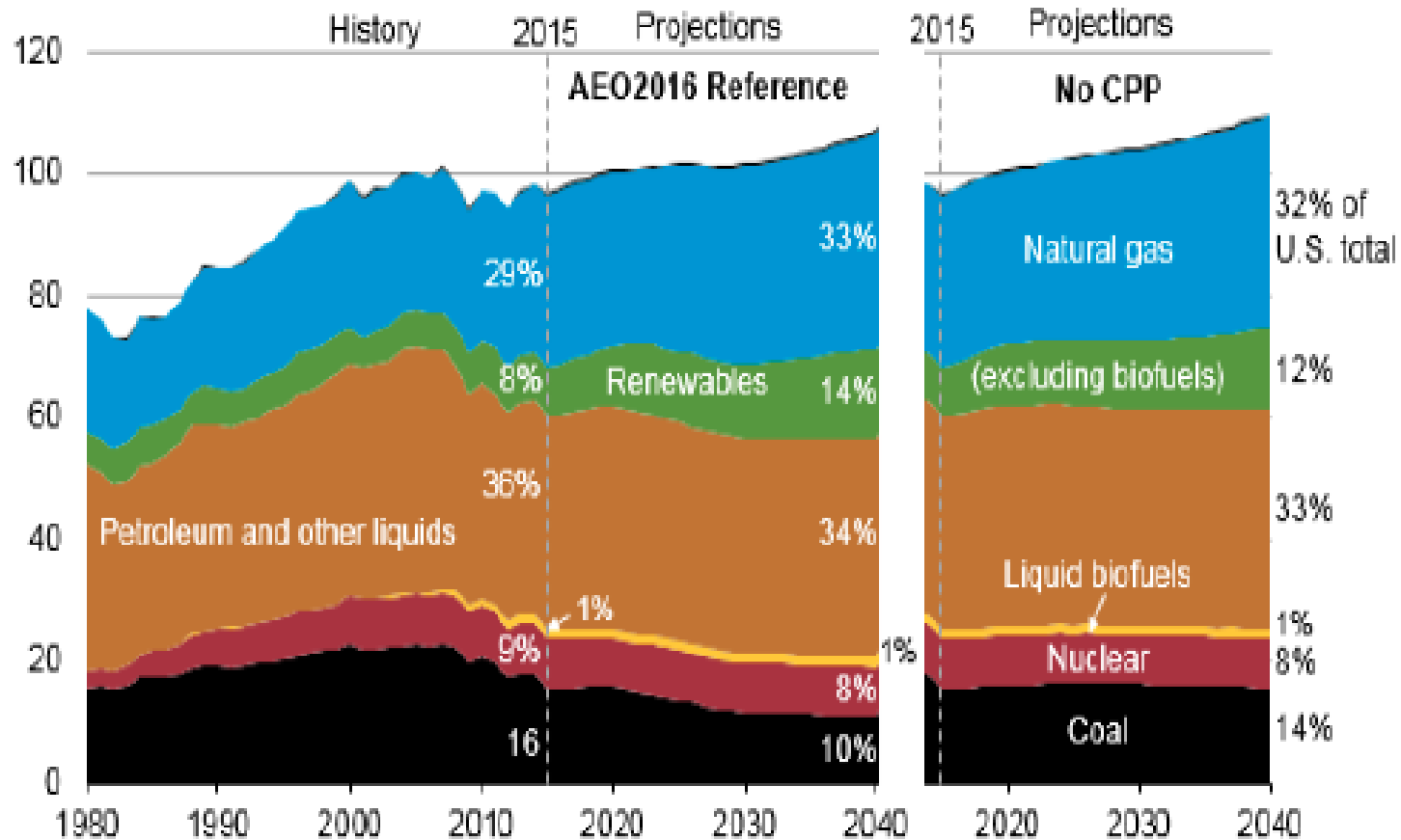
### World energy consumption by source, 1990-2040

quadrillion Btu



Source: U.S. Energy Information Administration, [International Energy Outlook 2016](#)

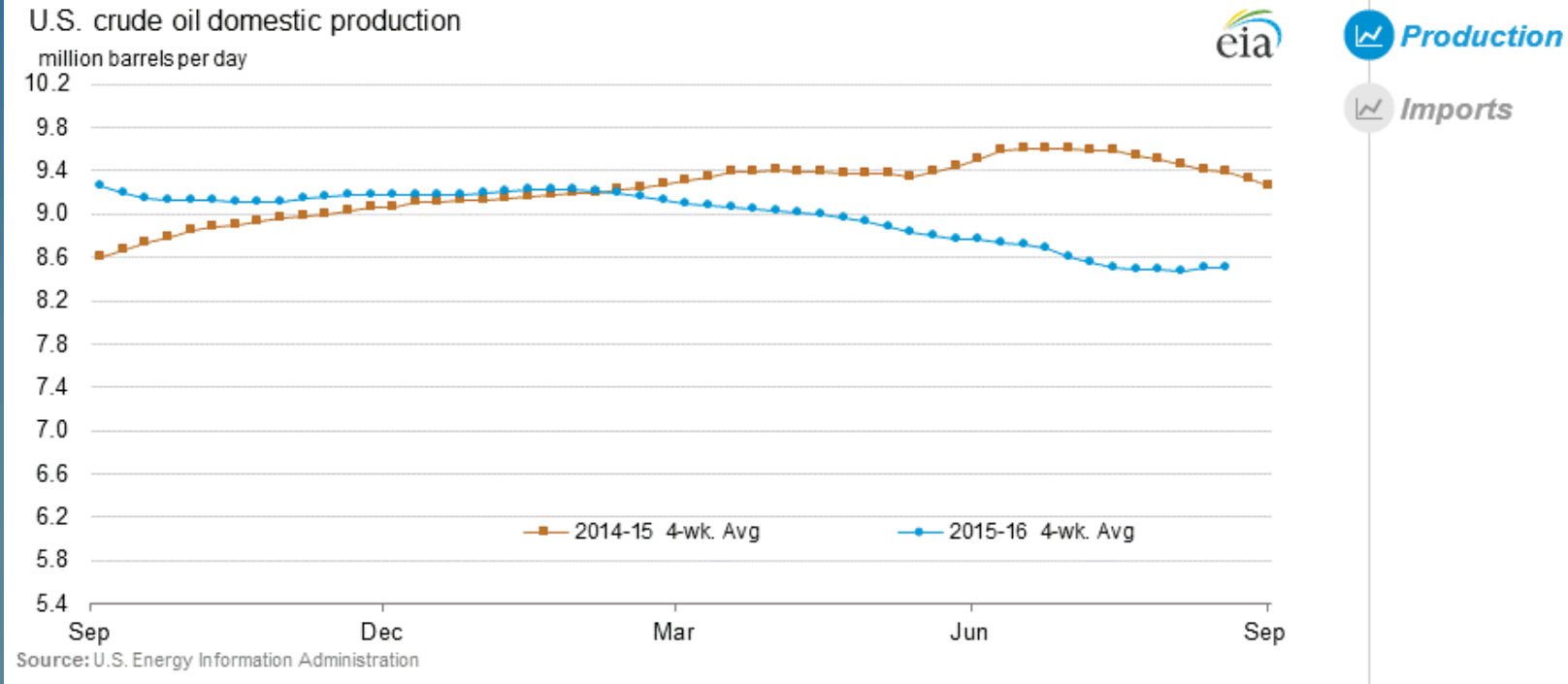
U.S. primary energy consumption  
quadrillion Btu



Source: EIA, Annual Energy Outlook 2016

# US Crude Oil Production

## Crude oil production and imports (million barrels per day)



## CRUDE OIL PRODUCTION (million barrels per day)

[more production data >](#)

	Year ago	Four-week averages				Year ago	Week ending			
	08/21/15	08/19/16	08/12/16	08/05/16	08/21/15	08/19/16	08/12/16	08/05/16		
U.S. production	9.386	8.513	8.504	8.479	9.337	8.548	8.597	8.445		

# US Crude Oil Imports

## Crude oil production and imports (million barrels per day)

U.S. crude oil imports

million barrels per day

9.0

8.0

7.0

6.0

Sep

Dec

Mar

Jun

Sep

— 2014-15 4-wk. Avg.

— 2015-16 4-wk. Avg.

Source: U.S. Energy Information Administration



Production



Imports

## CRUDE OIL PRODUCTION (million barrels per day)

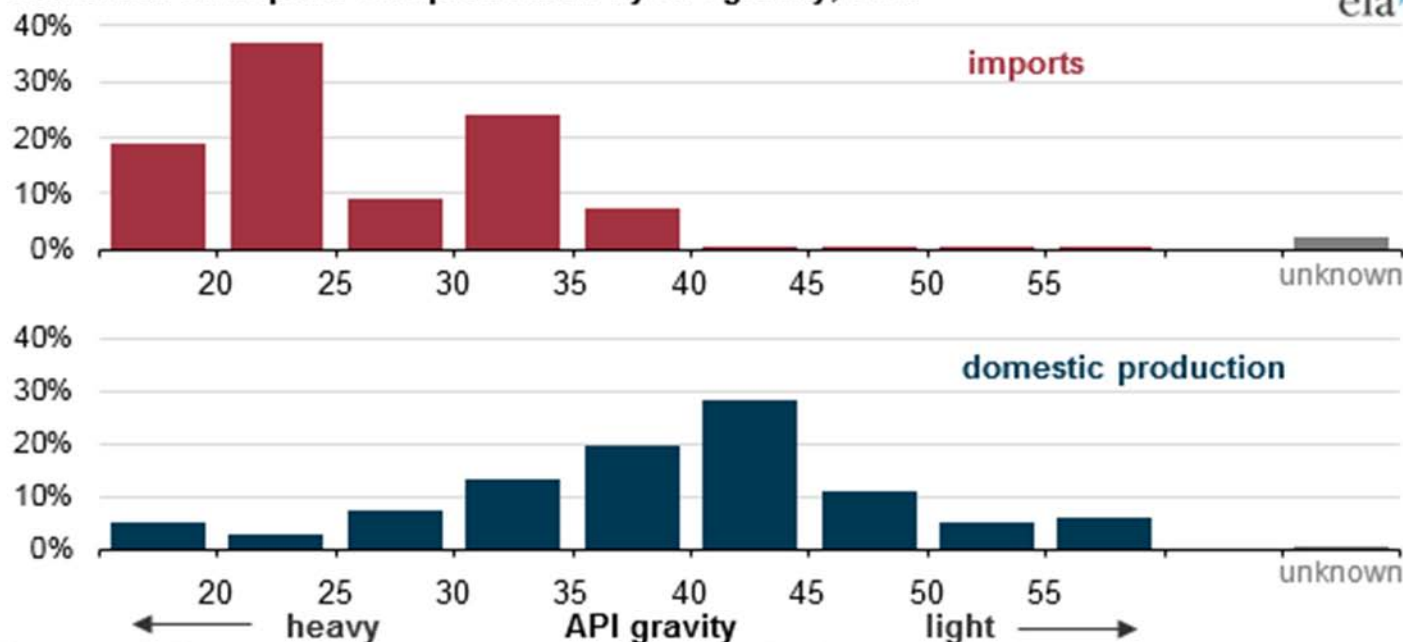
[more production data >](#)

	Year ago	Four-week averages			Year ago	Week ending		
	08/21/15	08/19/16	08/12/16	08/05/16	08/21/15	08/19/16	08/12/16	08/05/16
U.S. production	9.386	8.513	8.504	8.479	9.337	8.548	8.597	8.445

MAY 6, 2016

## Recent U.S. imports of oil tend to be heavier than domestic production

U.S. crude oil imports and production by API gravity, 2015



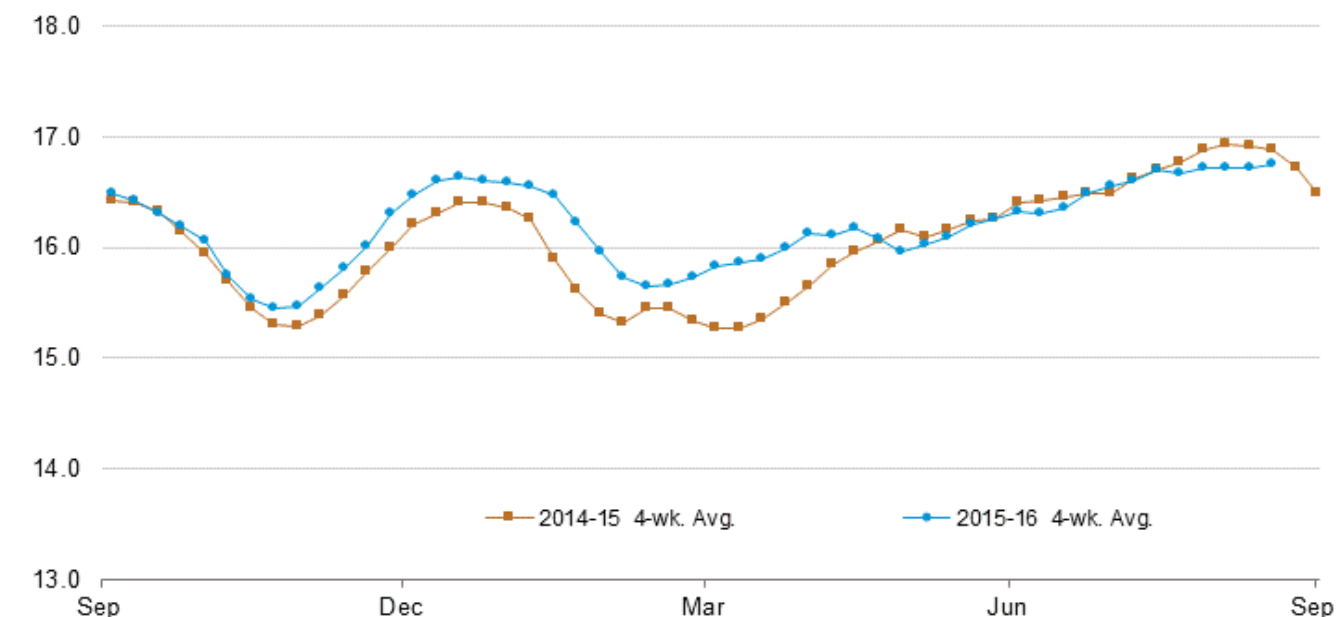
Source: U.S. Energy Information Administration, EIA-914 and EIA-814

In 2015, more than 70% of the crude oil produced in the Lower 48 states was light oil with an [API gravity](#) above 35 degrees. At the same time, 90% of imported crude oil was heavier, with a gravity below 35 degrees API. To accommodate increasing U.S. production of light crude oil, refineries have adjusted their imports by reducing imports of light crudes. The differences between domestic production and imports in this key oil characteristic could bring changes to petroleum refinery operations in the United States, as discussed in the EIA report, [Implications of Increasing Light Tight Oil Production for U.S. Refining](#).

# US Crude Refinery Inputs

## Crude oil refinery inputs (million barrels per day)

U.S. crude oil refinery inputs  
million barrels per day

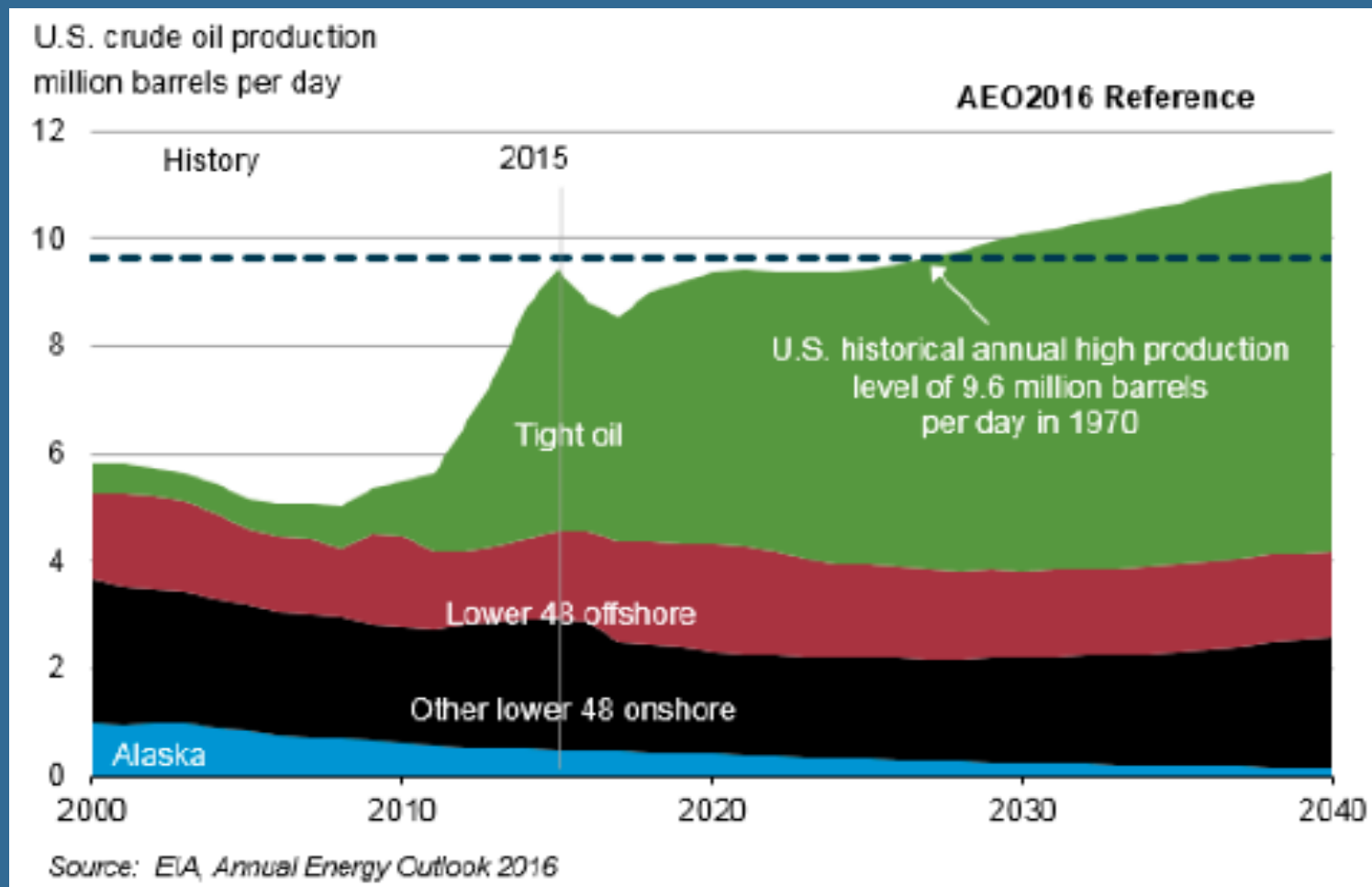


Regional

## CRUDE OIL REFINERY INPUTS (million barrels per day)

[more refinery input data >](#)

	Year ago	Four-week averages			Year ago	Week ending		
	08/21/15	08/19/16	08/12/16	08/05/16	08/21/15	08/19/16	08/12/16	08/05/16
U.S.	16.884	16.748	16.725	16.725	16.658	16.679	16.865	16.597



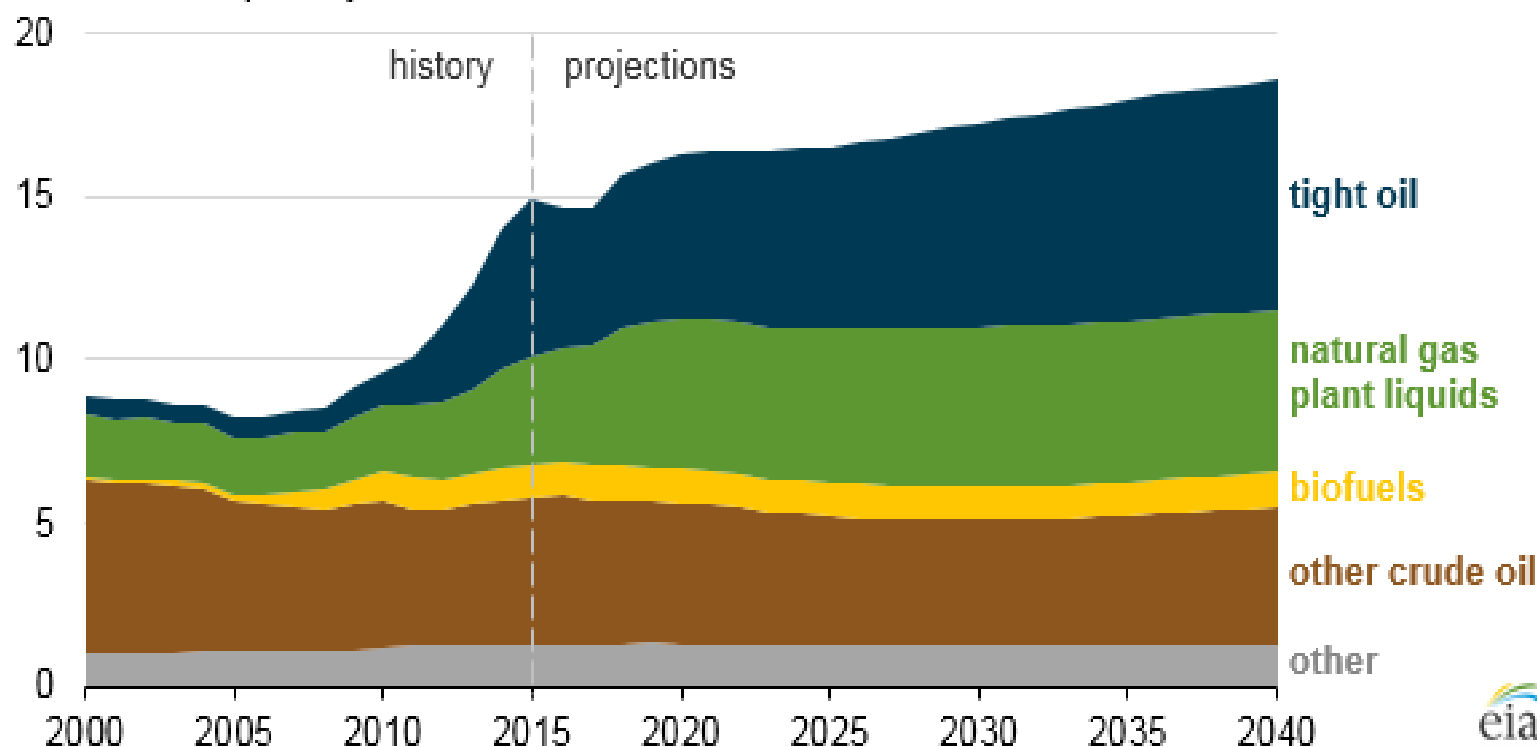
U.S. crude oil production drops from 9.4 million barrels/day (b/d) in 2015 to 8.6 million b/d in 2017 (mainly in response to declines in crude oil prices), before growing through 2040 to reach 11.3 million b/d

JULY 11, 2016

## EIA projects rise in U.S. crude oil and other liquid fuels production beyond 2017


### U.S. production of petroleum and other liquids (2000-2040)

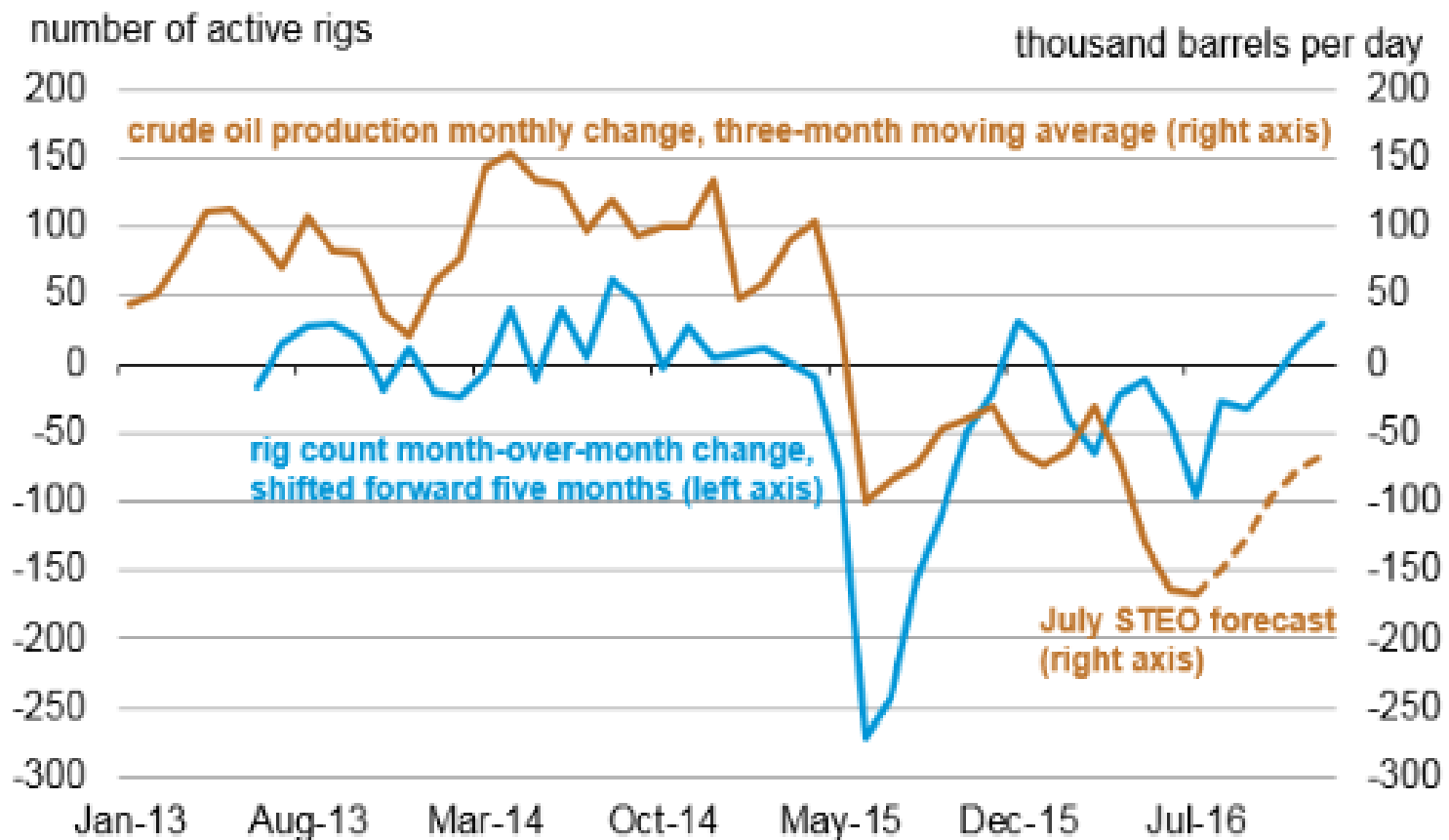
million barrels per day



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



Figure 1. Lower 48 states onshore rig count and crude oil production 

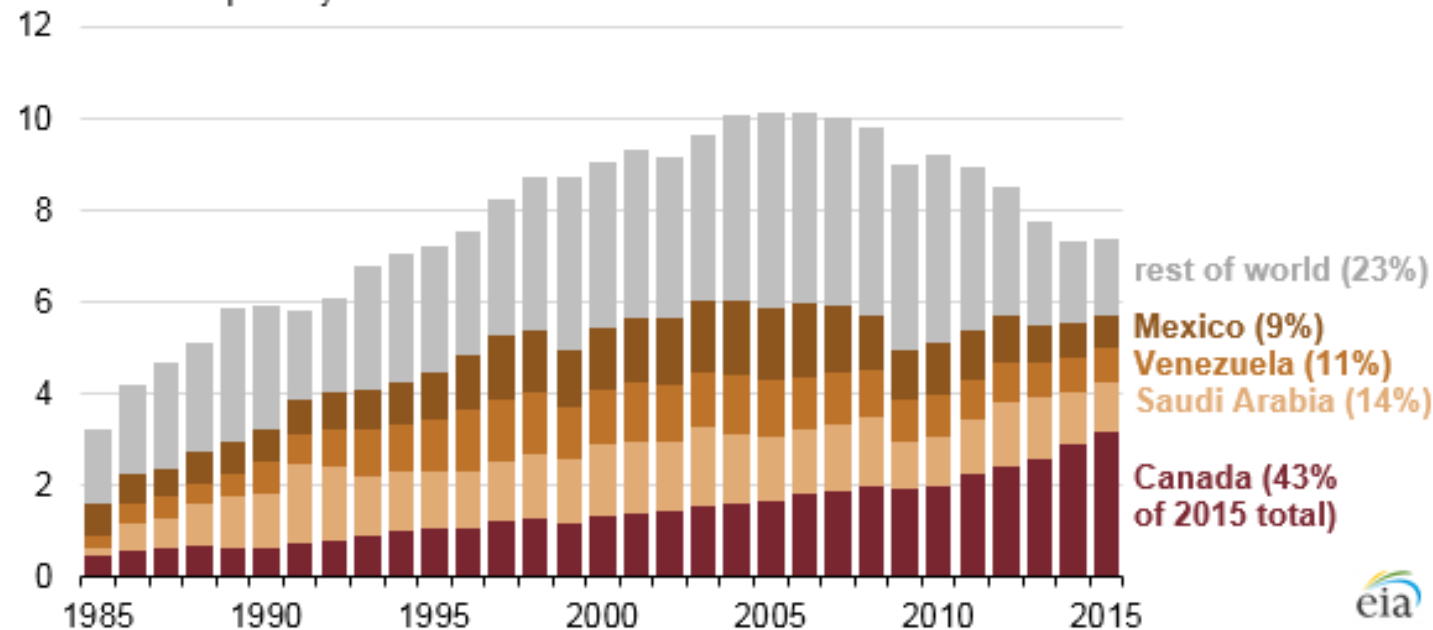


Sources: Baker Hughes; U.S. Energy Information Administration, *Short-Term Energy Outlook*, July 2016.

## Canada provides record-high share and amount of U.S. crude oil imports in 2015

Gross imports of crude oil to the United States by country, 1985-2015

million barrels per day



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

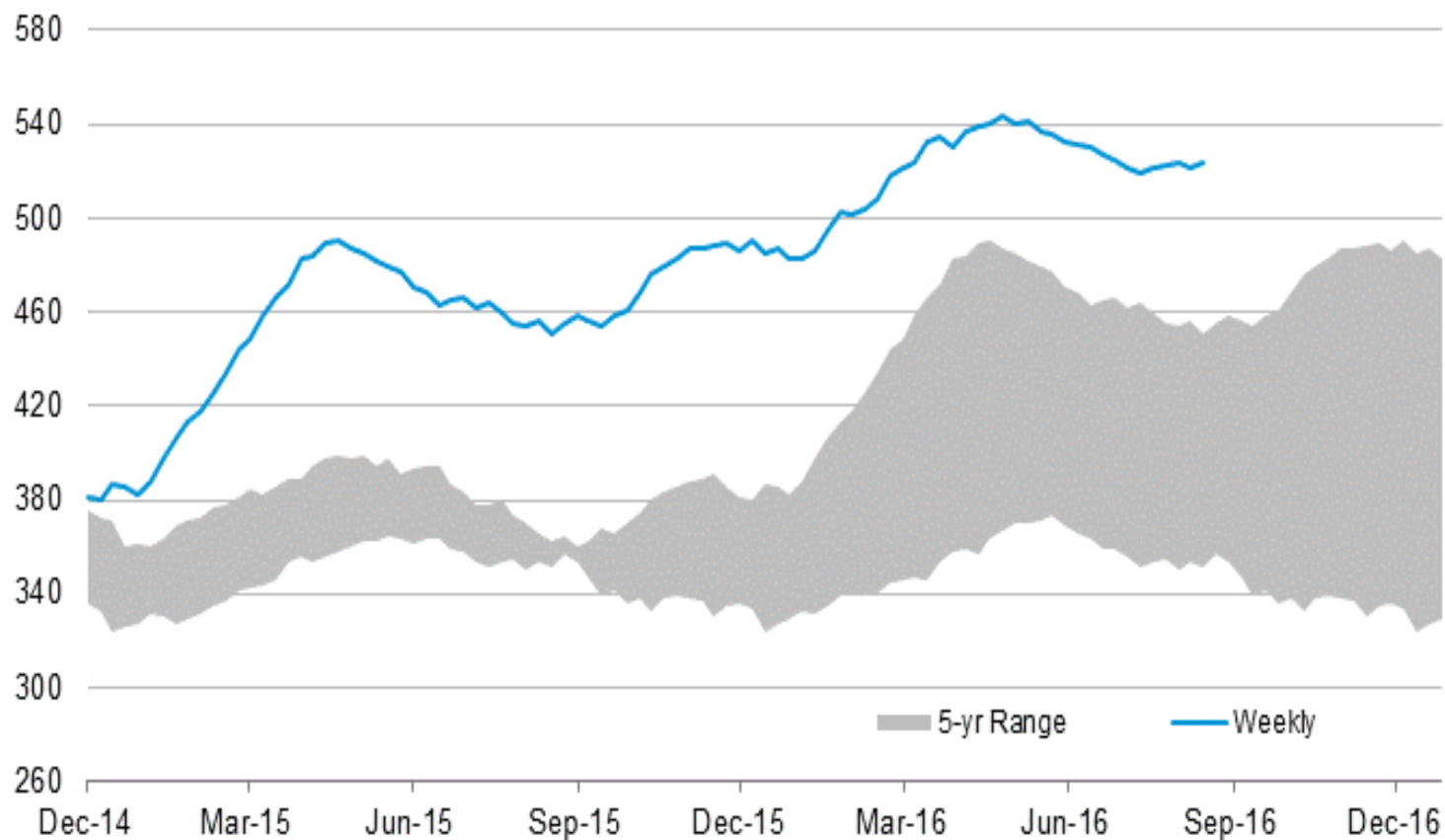
Although total U.S. crude oil imports in 2015 continued to be lower than levels reached during the mid-2000s, imports from the United States' top foreign oil supplier—[Canada](#)—were the highest on record, according to annual trade data from EIA's [Petroleum Supply Monthly](#). Canada provided 4 out of every 10 barrels of oil imported into the United States in 2015.

# US Crude Oil Inventory (non-SPR)

Crude oil stocks (*million barrels*) and days of supply

U.S. crude oil stocks


million barrels



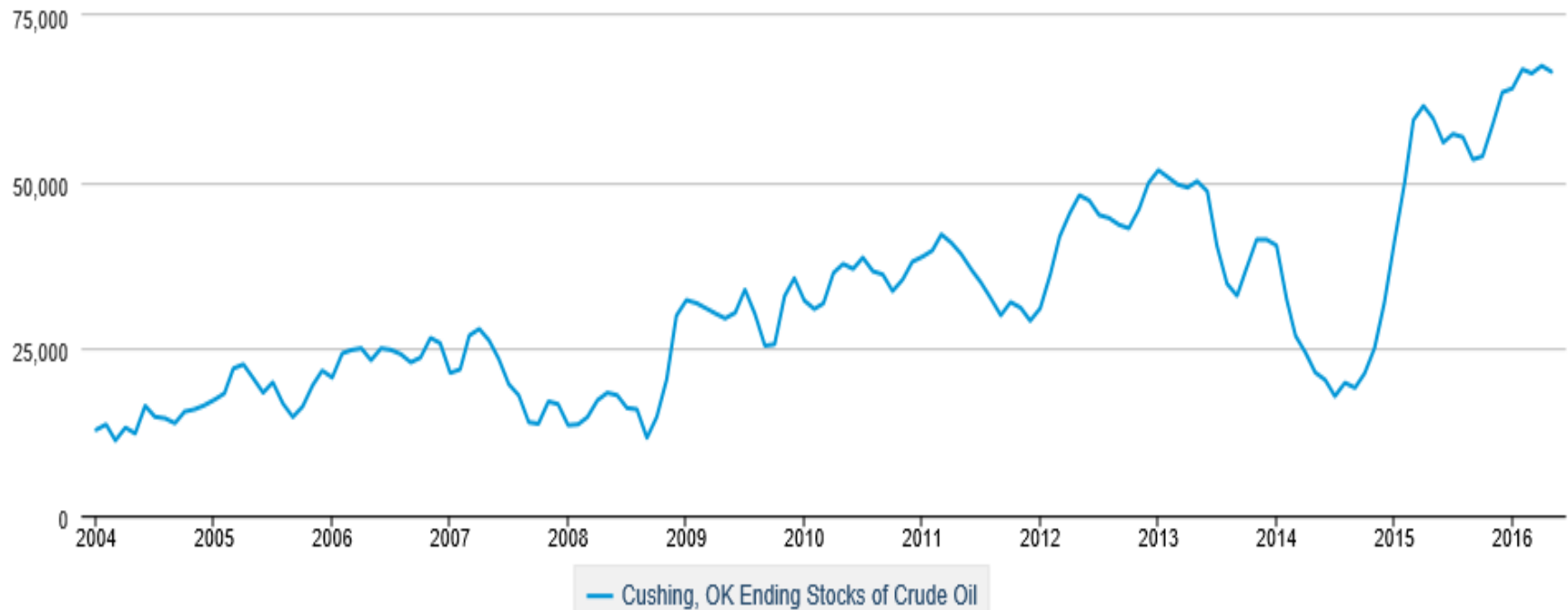
Source: U.S. Energy Information Administration

# Cushing, OK Stocks

Cushing, OK Ending Stocks of Crude Oil

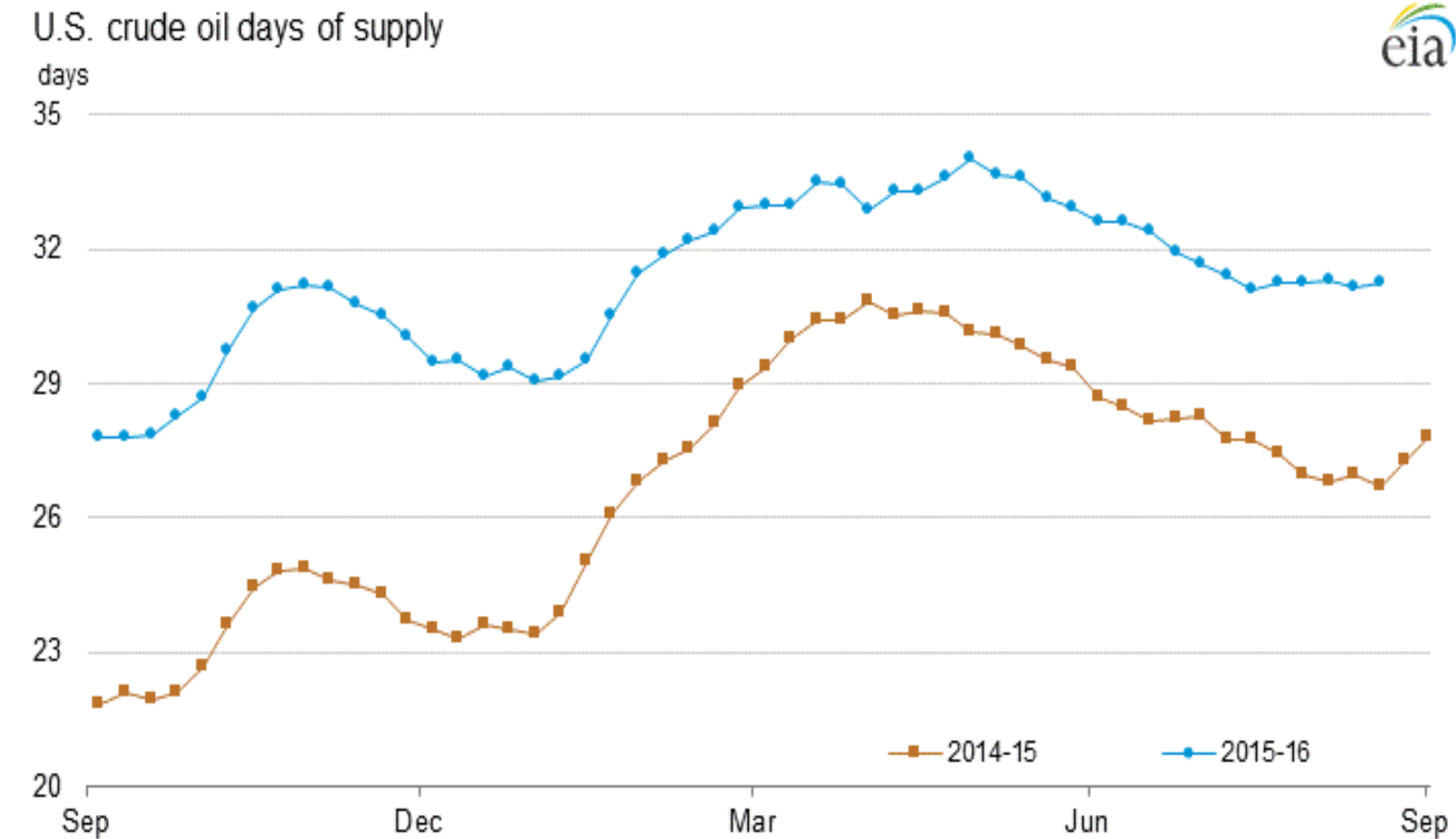
 [DOWNLOAD](#)

Thousand Barrels



# US Crude Oil Inventory – Days of Supply

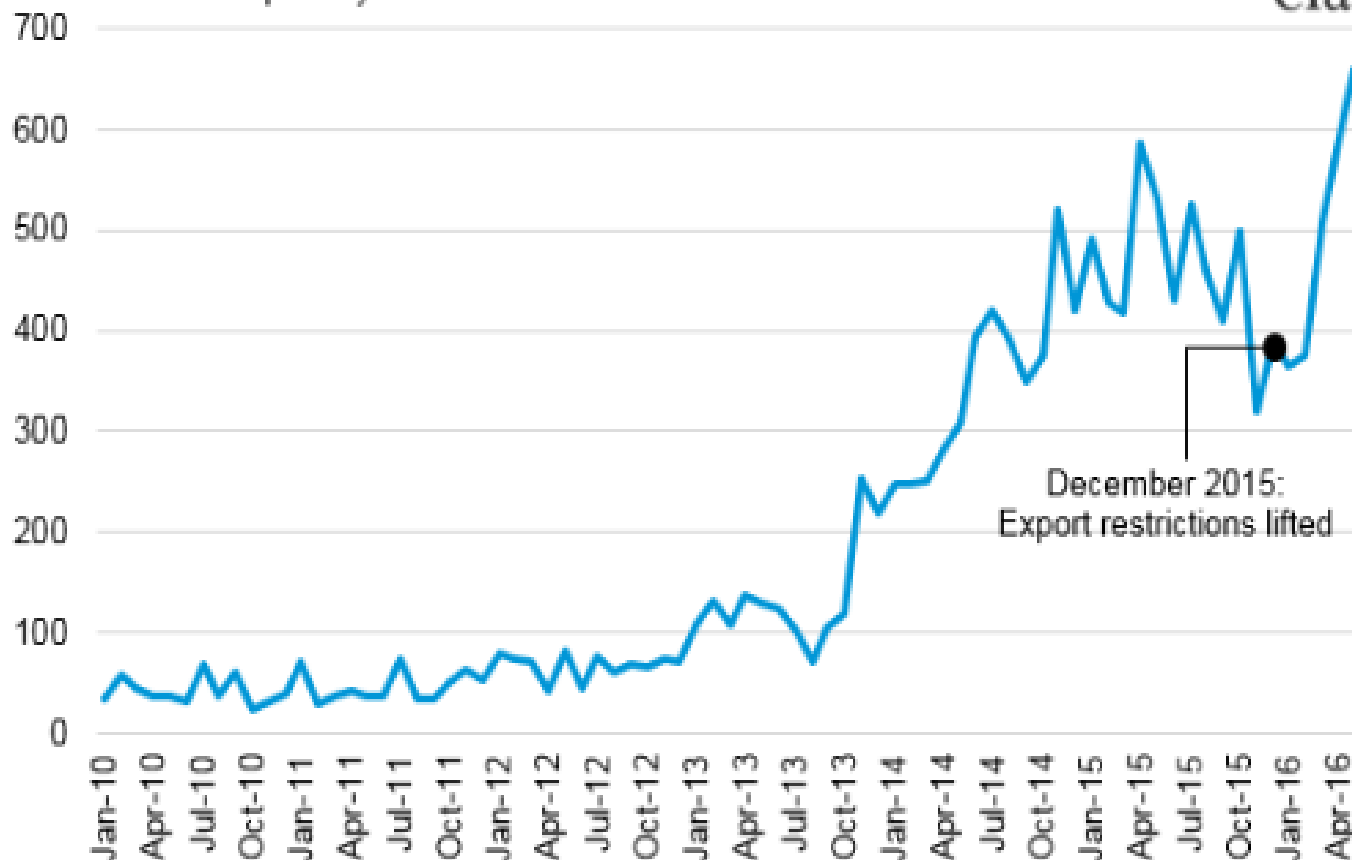
Crude oil stocks (*million barrels*) and days of supply



Source: U.S. Energy Information Administration

Figure 1. U.S. crude oil exports

thousand barrels per day



Source: U.S. Energy Information Administration



# Crude Exportation

- Energy Policy & Conservation Act – 1975
  - No exact definition of “crude”
  - Implies anything after the “still” is not crude
  - Loophole which qualified *processed* condensate
  - 07/14: Enterprise & Pioneer export condensate
- 12/18/15: Ban lifted – exporting starts
  - 12/31/15: *Theo T* leaves Corpus Christi (NuStar)
    - 01/20/16 - Arrives in Marseille, France
  - 01/01/16: *Seaqueen* leaves Port of Houston (EPP)
    - 01/21/16 – Arrives in Rotterdam, The Netherlands
  - 01/09/16: *Angelica Schulte* leaves Port of Houston
    - 01/31/16 - Arrives in Marseille, France

# First Crude Oil Shipment in 40 Years Sails From U.S.

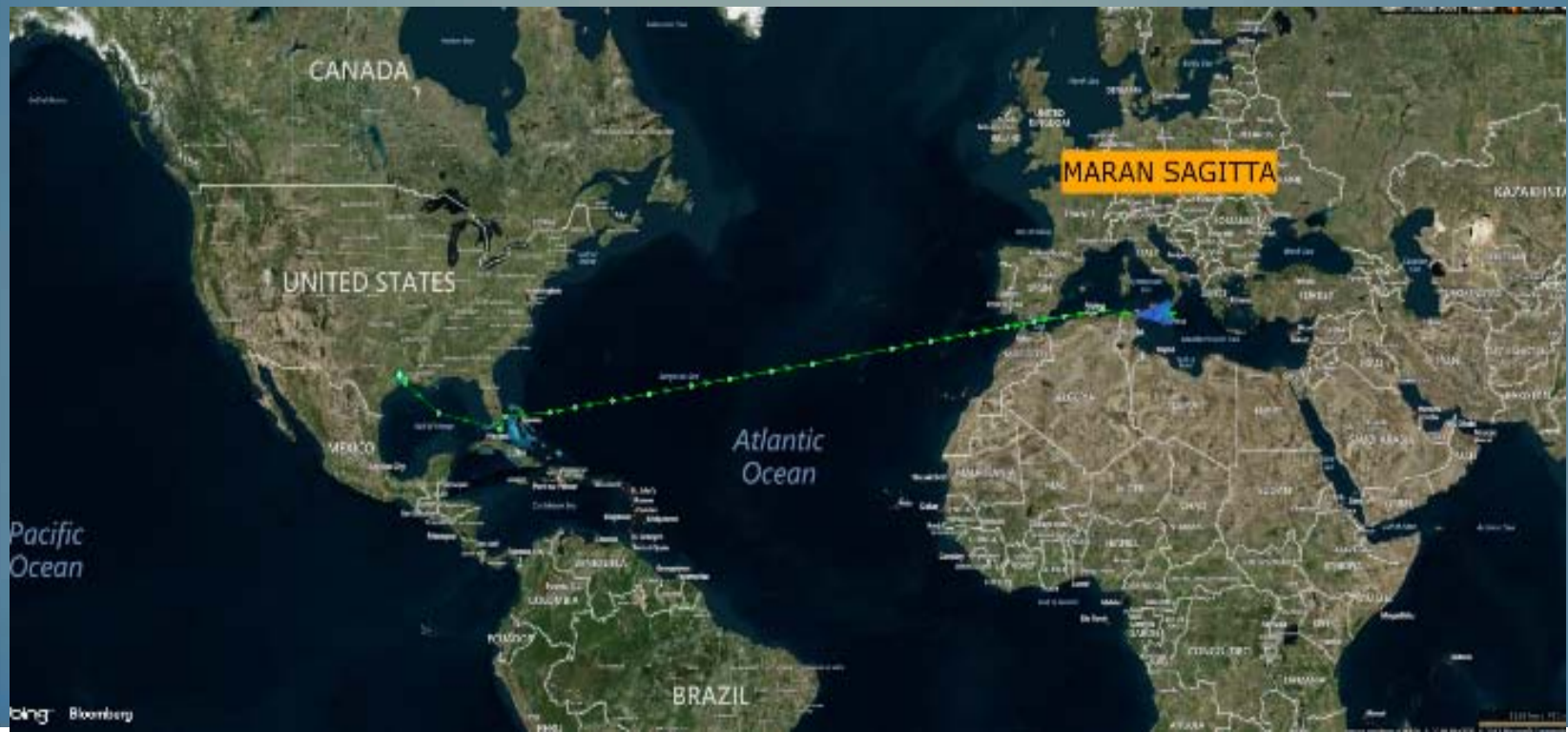


Tanker Theo T departing (courtesy Port of Corpus Christi)

12/31/15: Bahamian Vessel, *Theo T*, leaves The Port of Corpus Christi with a load of Conoco-Phillips crude oil bound for Italy. Corpus Christi has 1.0 million Bbld of offloading capability.

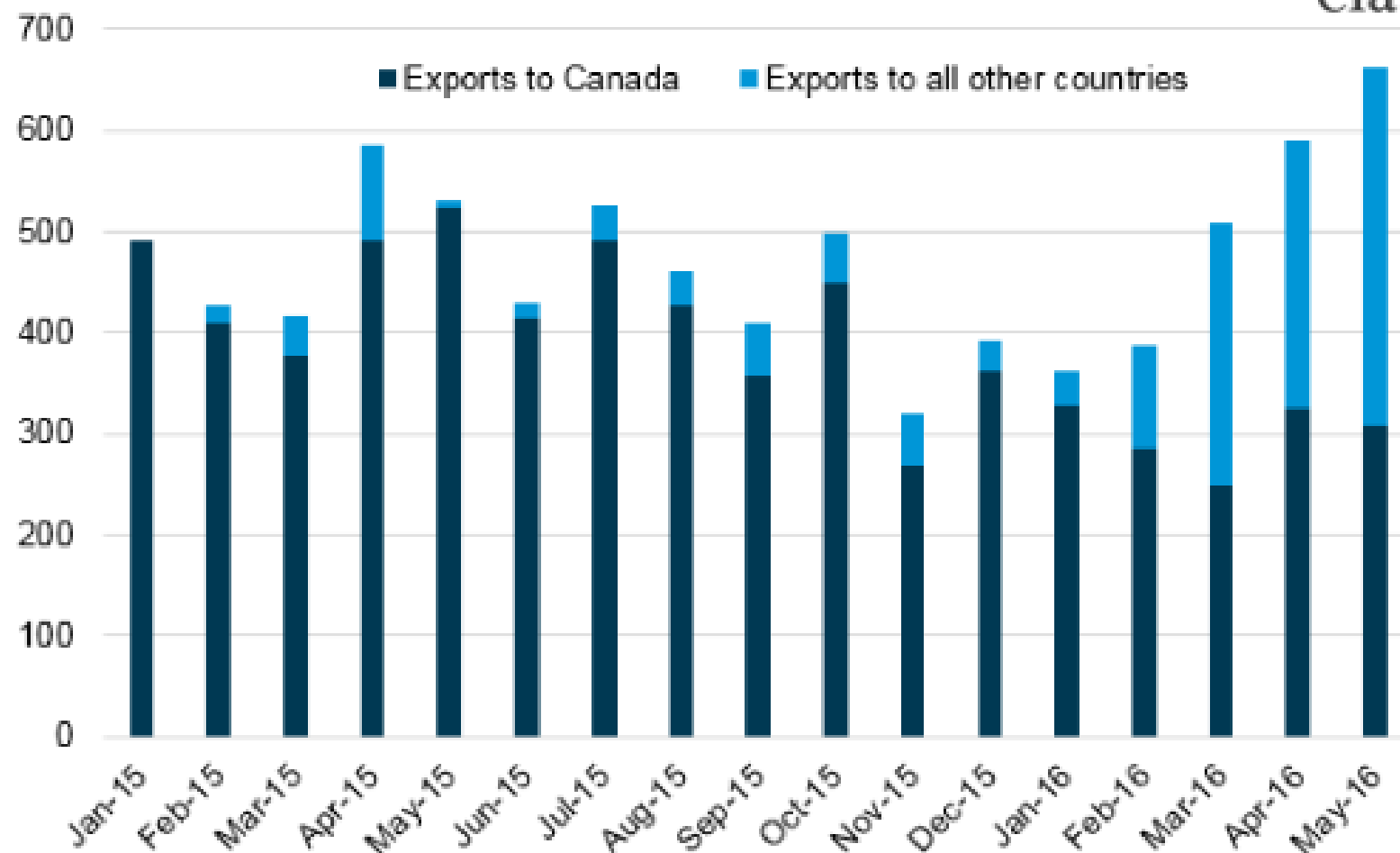
# ExxonMobil

- 02/2016 – 1<sup>st</sup> US major oil company to export crude
  - *Maran Sagitta* leaves Beaumont, TX
  - 03/2016: arrives in Italy



## Figure 2. U.S. crude oil exports

thousand barrels per day

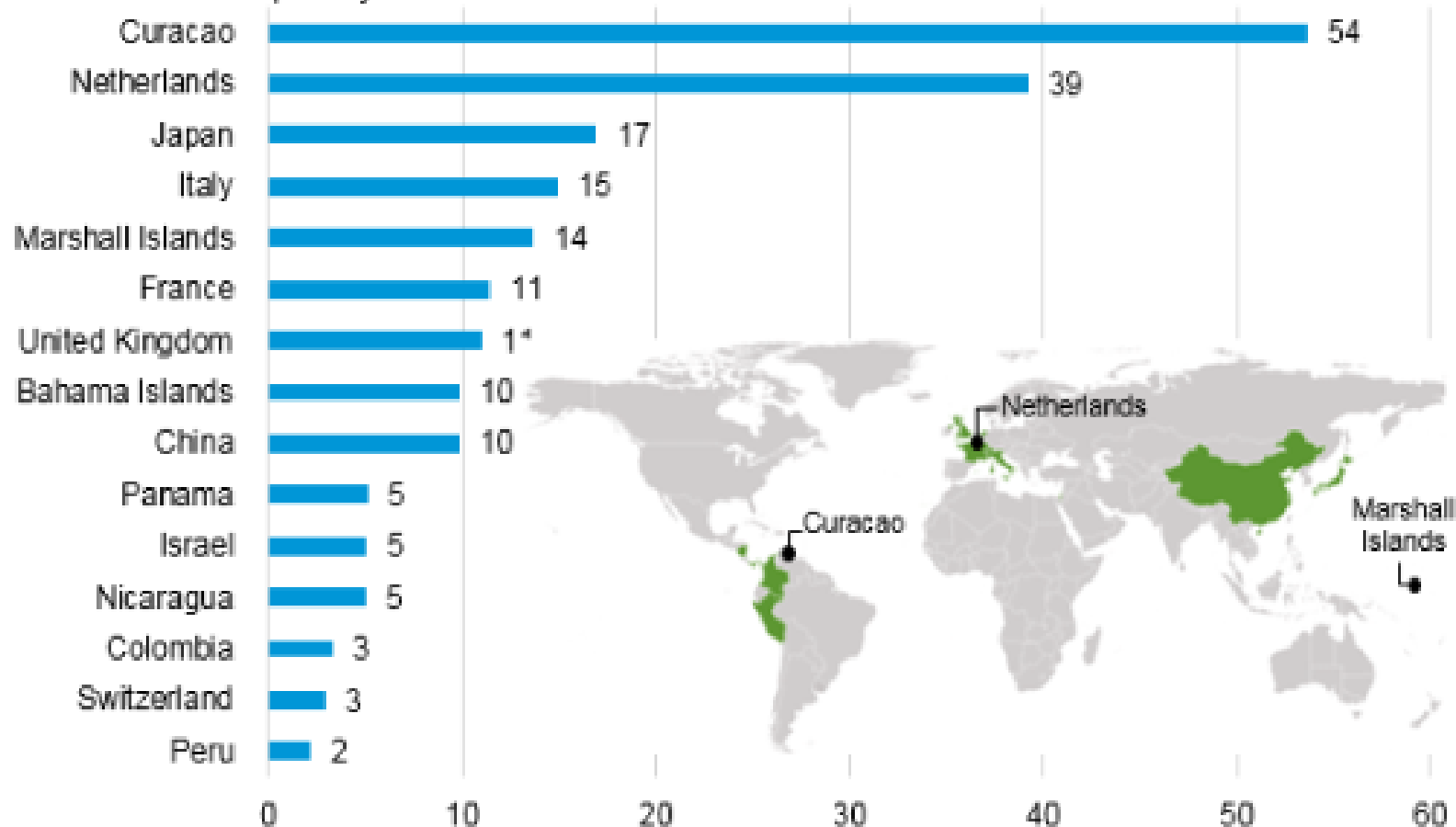


Source: U.S. Energy Information Administration

**Figure 3. U.S. Crude oil exports January through May 2016  
(excludes Canada)**




thousand barrels per day

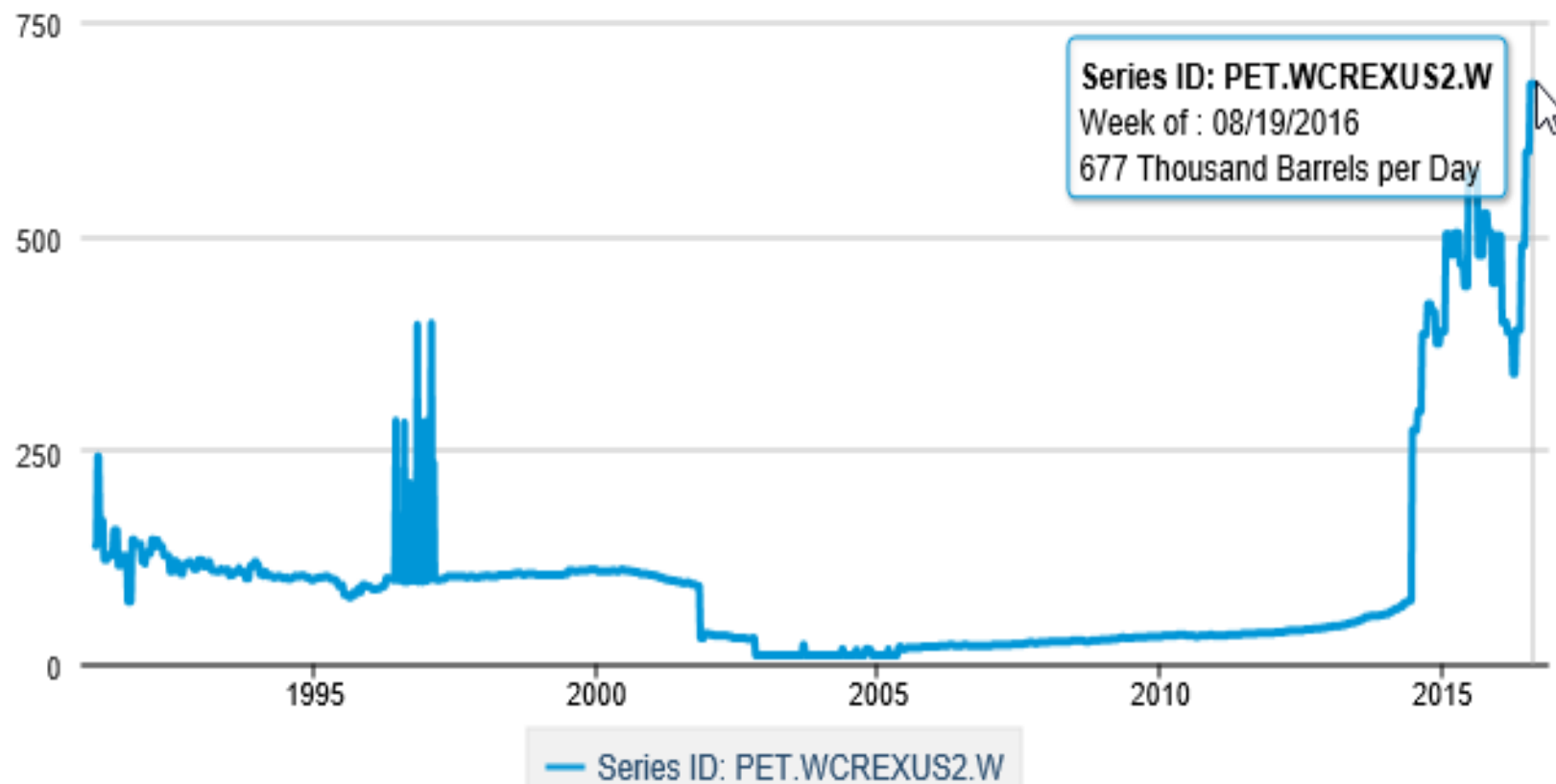


Source: U.S. Energy Information Administration

## U.S. Exports of Crude Oil, Weekly

 [DOWNLOAD](#)

Thousand Barrels per Day



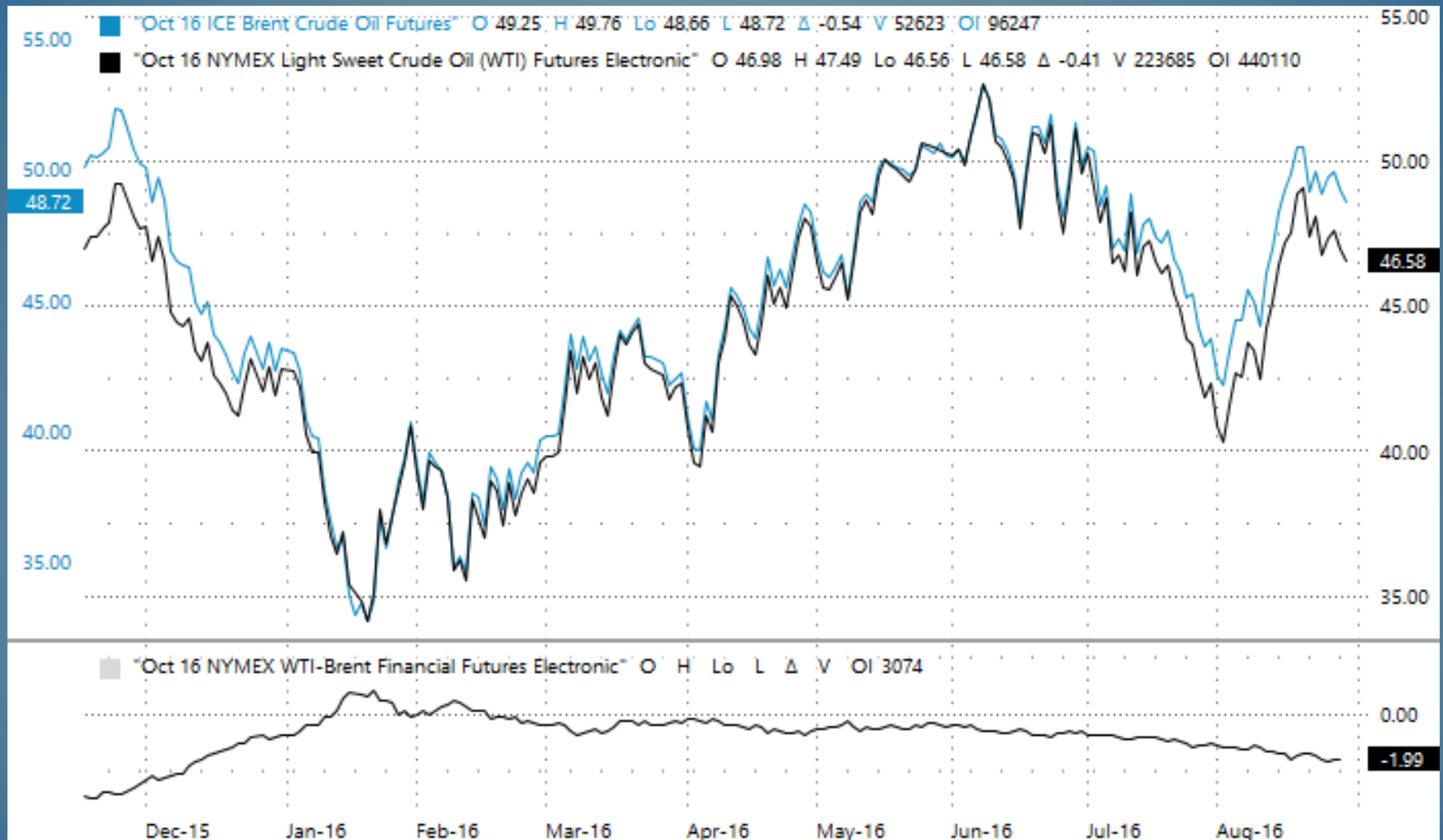
Source: Energy Information Administration

# US Oil Export Issues

- Transport costs
  - WTI needs to be (\$2.50 - \$3.00) less than Brent to make exportation economical, esp., to Asia
  - Shipments going to Latin America, Europe primarily
- Infrastructure
  - “re-purposing” terminal facilities (unloading vs. loading)
    - Magellan Midstream & Enterprise Products Partners
  - Expansion projects – storage, pipelines, loading terminals
    - Corpus Christi/East Houston/Brownsville
  - Can’t load “VLCCs” at this time.
    - Can’t dock them.
    - 600 million Bbl/d max loading rates except for Corpus Christi
  - Major pipeline re-configurations & new projects
    - Move more domestic crude to export terminals.

# Pricing Implications

## Brent vs. WTI



## U.S. crude oil storage capacity utilization rises even as storage capacity grows

**Crude oil storage capacity utilization rates (Jan 2012 - Jun 2016)**  
percent of working storage capacity



Source: U.S. Energy Information Administration, [Weekly Petroleum Status Report](#)

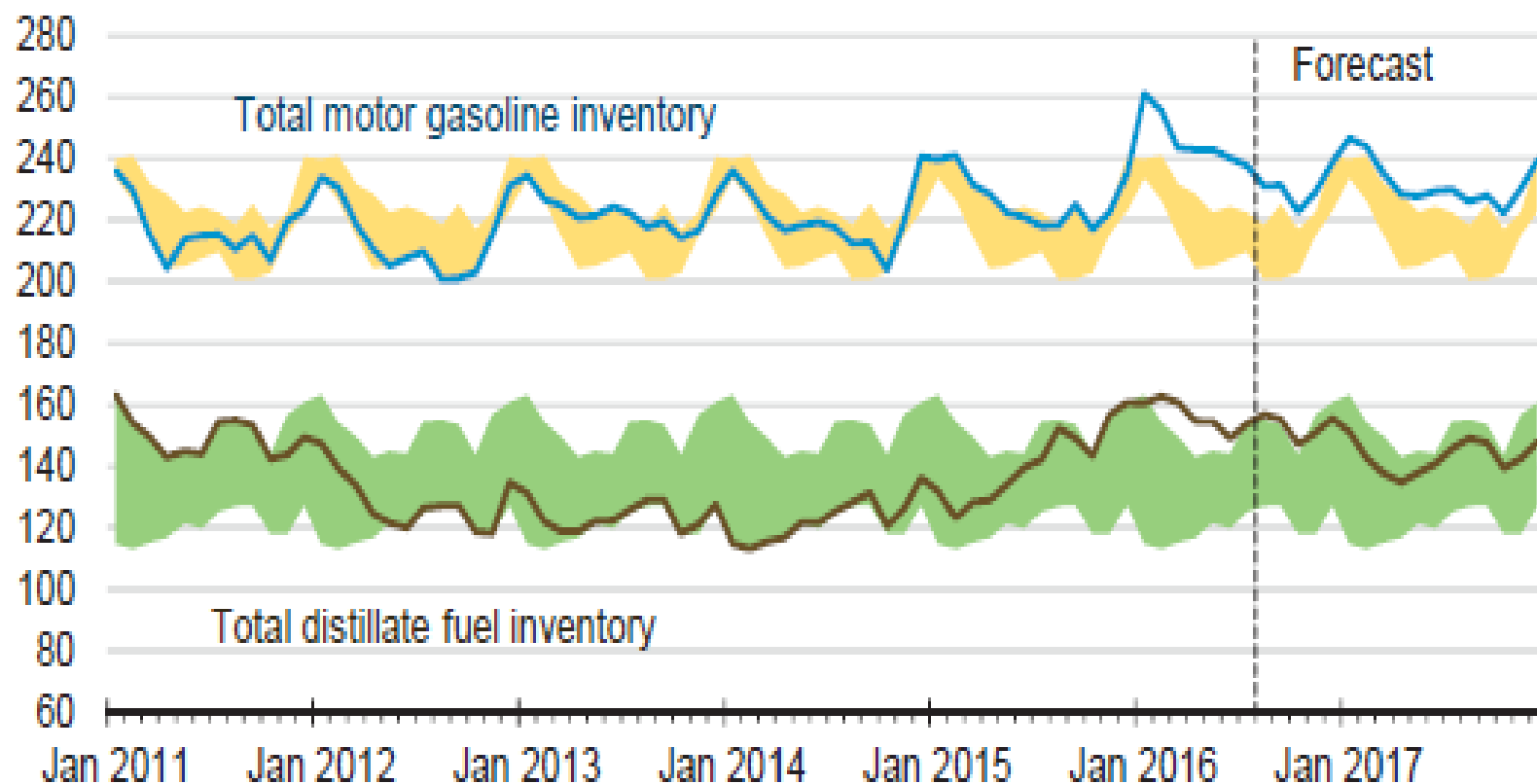
Weekly U.S. commercial crude oil inventories have increased by more than 71 million barrels (15%) since the end of September, pushing crude oil storage capacity utilization to a near record high of 73% for the week ending June 10.

The U.S. Energy Information Administration measures crude oil storage capacity twice each year. From September 2015 to March 2016, the United States added 34 million barrels (6%) of working crude oil storage capacity, the largest expansion of commercial crude oil storage capacity since EIA began tracking such data in 2011.



## U.S. Gasoline and Distillate Inventories

million barrels



Note: Colored bands around storage levels represent the range between the minimum and maximum from Jan. 2011 - Dec. 2015.

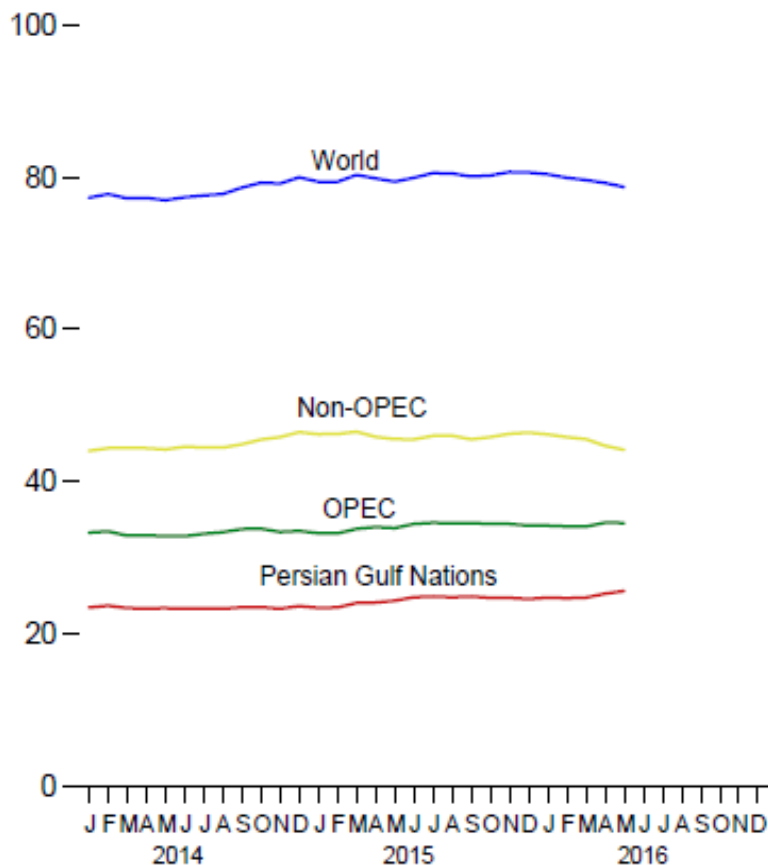
Source: Short-Term Energy Outlook, August 2016.

# Global Crude Oil

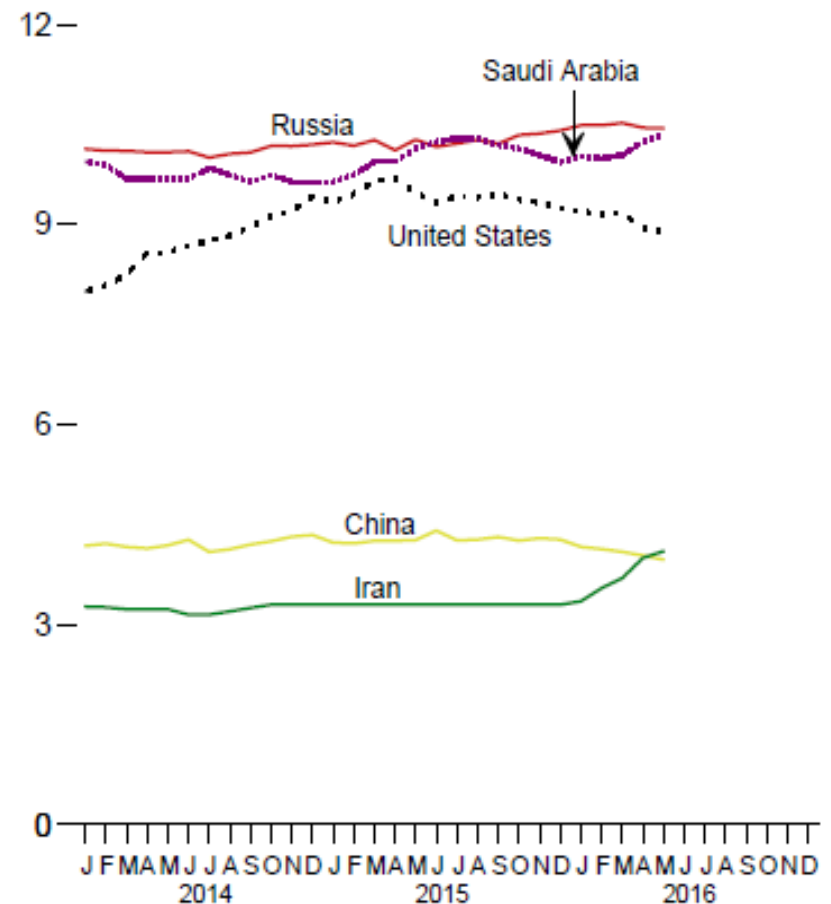
- Supply growth: +4.1 mb/d 2016 – 2021  
(vs. +11.0 2009 – 2015)
- Lower capex: -24% 2016; -17% 2017
- Demand growth: 1.2 mb/d per annum  
through 2021
  - Est total = 100 million Bbld by 2020
  - India/China/Asia

# Global Crude Oil Production

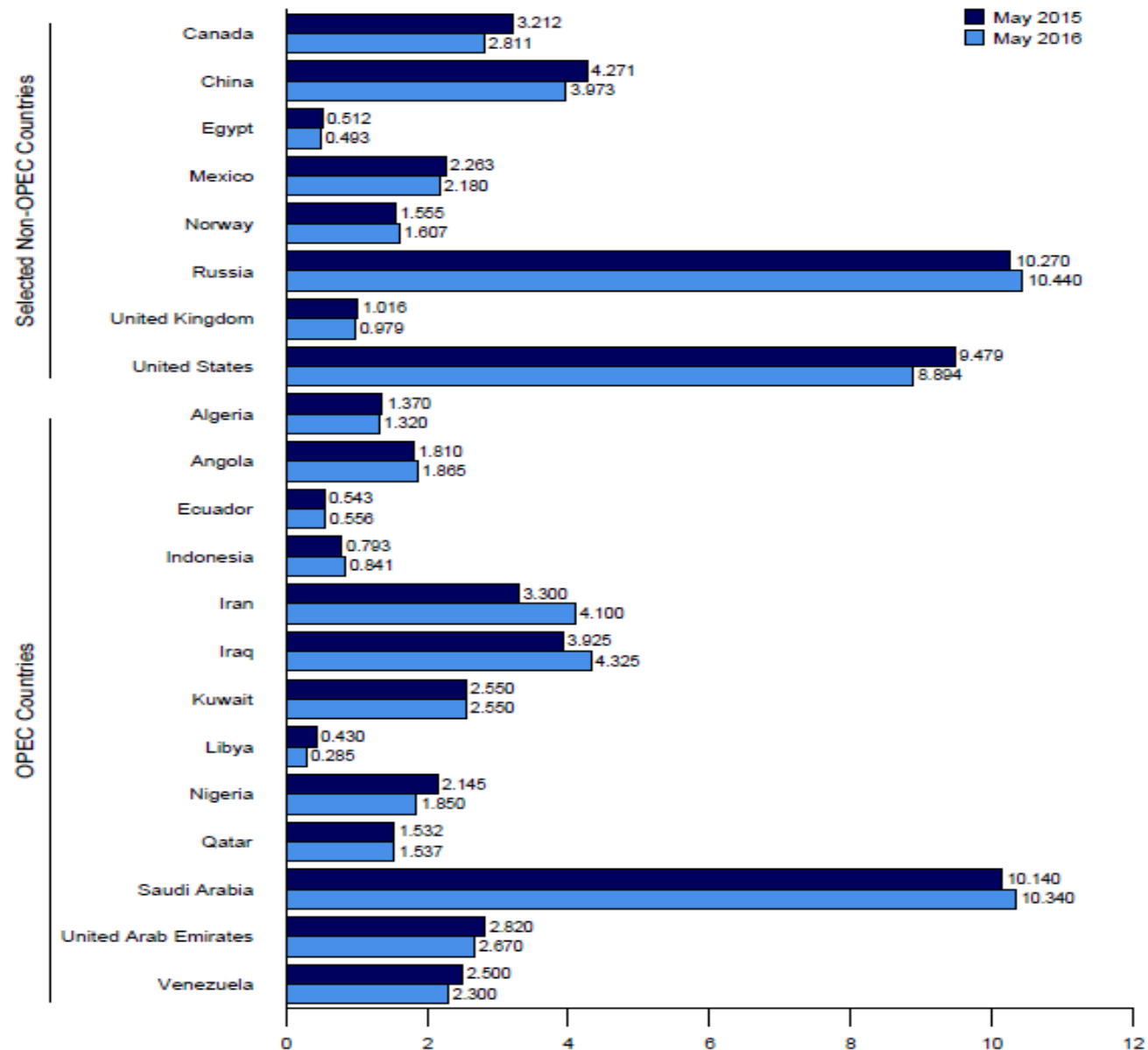
World Production, Monthly



Selected Producers, Monthly



**Figure 11.1b World Crude Oil Production by Selected Countries**  
(Million Barrels per Day)



# Key Market Drivers

## ■ “Bullish”

- Economic growth in China & India
- Declining US production
- Driving season = strong gasoline demand
- Lower CAPEX for 2016
- Crude exports
- OPEC Meeting(s) (psychological impact)
- Terrorist attacks – ISIS, MEND, NDA

# Key Market Drivers

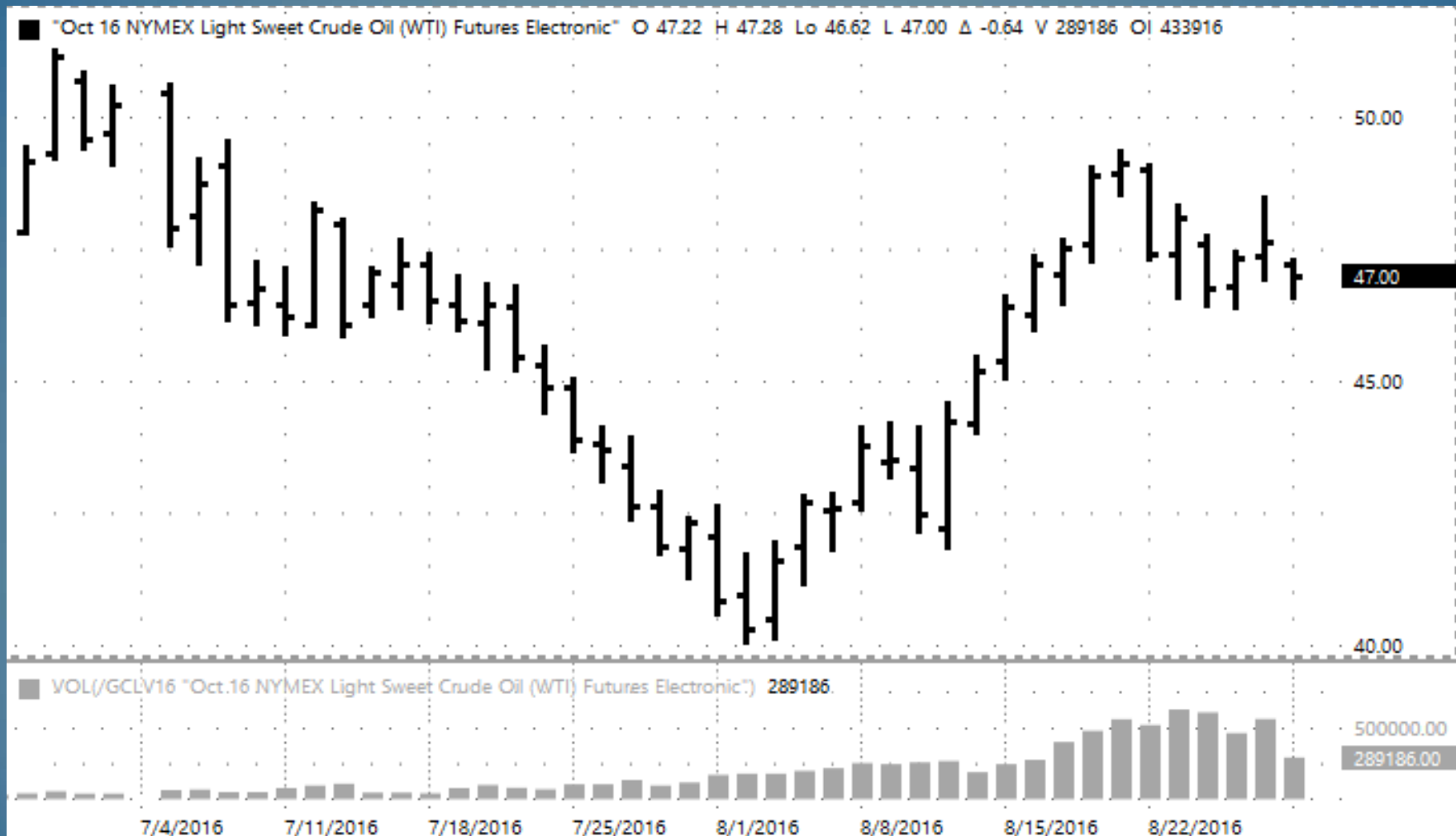
- “Bearish”
  - Global oversupply – Crude & Distillates
  - 86-year High US inventory level
  - Rising imports to meet blending demand
  - Increasing rig count
  - Failure of “freeze” agreement by OPEC/Non-OPEC producers
  - Saudi-Arabia
  - Iran

# New York Mercantile Exchange

## Crude Oil Futures Contract

Description	Last	Net Chan...	Open	High	Low	Close	Volume
Oct 16 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	46.55	-0.43	46.98	47.49	46.52	46.98	227619
Nov 16 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	47.18	-0.47	47.64	48.11	47.15	47.65	56977
Dec 16 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	47.77	-0.52	48.26	48.73	47.76	48.29	37607
Jan 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	48.39	-0.54	48.93	49.34	48.37	48.93	19557
Feb 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	48.91	-0.60	49.55	49.91	48.91	49.51	11946
Mar 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	49.40	-0.59	50.05	50.33	49.39	49.99	12564
Apr 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	49.90	-0.30	50.47	50.67	50.08	50.38	5500
May 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	50.18	-0.30	50.91	50.92	50.39	50.69	2122
Jun 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	50.34	-0.59	50.92	51.24	50.34	50.93	6174
Jul 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	50.71	-0.42	51.42	51.42	50.71	51.13	2863
Aug 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	50.75	-0.32	51.52	51.52	50.99	51.31	1497
Sep 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	51.72	0.23	51.68	51.72	51.64	51.49	1315
Oct 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic						51.68	486
Nov 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic						51.89	249
Dec 17 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	51.50	-0.62	52.14	52.41	51.50	52.12	5770
Jan 18 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic						52.28	279
Feb 18 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic						52.43	2
Mar 18 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic						52.56	38
Apr 18 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic						52.70	
May 18 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic						52.84	
Jun 18 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic	52.64	-0.35	53.13	53.13	52.64	52.99	116
Jul 18 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic						53.10	
Aug 18 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic						53.22	
Sep 18 NYMEX Light Sweet Crude Oil (WTI) Futures Electronic						53.35	

# New York Mercantile Exchange Crude Oil Futures Contract



# “Hedge, baby, hedge!”

- \$45 - \$50 per Bbl = stability...?
  - Permian/SCOOP/STACK = \$40?
- \$50+ = profitability....?
- Doesn't matter why prices are what they are. Do they work for you?
  - New completions? (EIA ~ 4000 wells waiting)
  - New E&P?
- “rule-of-thumb” = hedge 50% of production minimally, no more than 80%
- “Heroes” - companies which hedged through 2016 & 2017 (e.g. – Range Resources, Devon Energy, Antero Resources)

# Possible Hedge Strategies

- Sell NYMEX Crude Oil Futures contracts
  - Establishes fixed-price for set volume & term
- Sell “over-the-counter” Swaps
  - Similar to NYMEX hedge
- Buy NYMEX/OTC “Put” Option
  - Owns *right to sell* NYMEX Futures contracts
- Execute “costless collar” Option
  - Buy Put Option
  - Sell Call Option @ same premium as Put cost