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# The Most Likely Futures for US Refining

Ed Arnold

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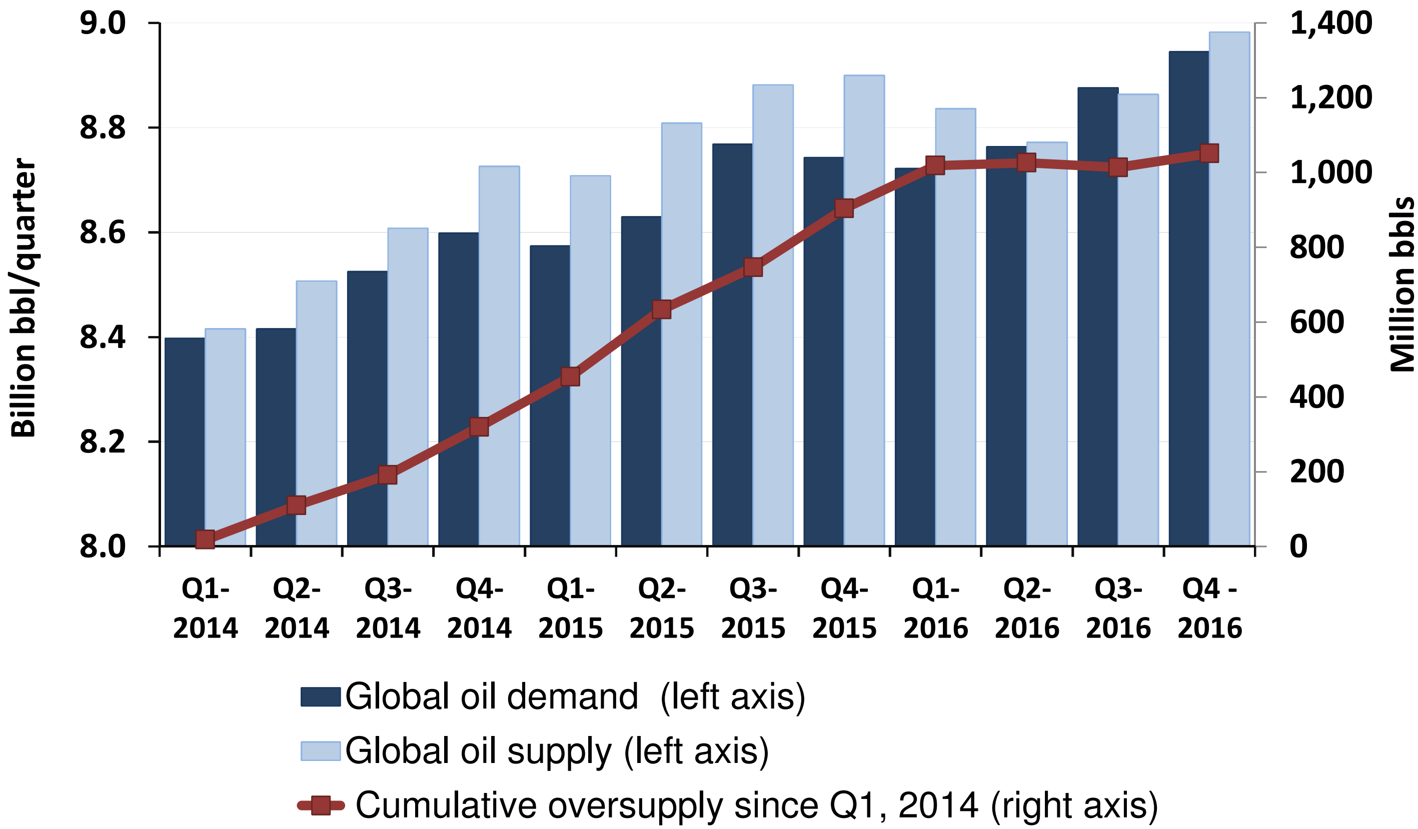
# High level of uncertainty out 5-7 years

- **Oil prices**
  - Shale oil production trends
  - OPEC behavior
  - Asian and Latin American refined products demand
- **MARPOL VI effects**
  - Light-Heavy spread outlook
- **US refined products demand**
  - Domestic demand
  - Export demand
  - G/D demand ratio
- **RFS and CAFE regulations**
- **Border taxes**
- **New pipelines**
- **Alberta bitumen**

# Oil prices: Long term oversupply is the issue

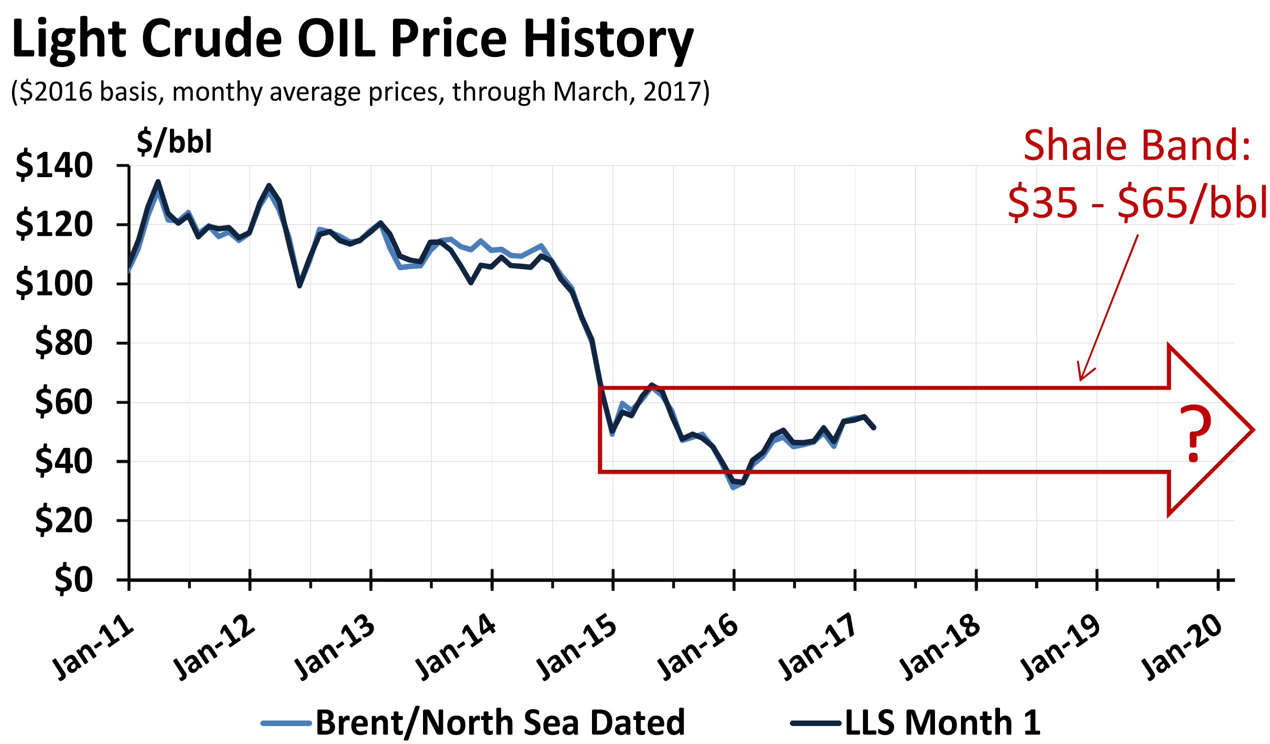
**World Oil Demand, Supply and Cumulative Oversupply**

(Data Source: IEA, March, 2017 Update. Calculations by Argus.)




Early indications are that oil was in oversupply in Q1, 2017.

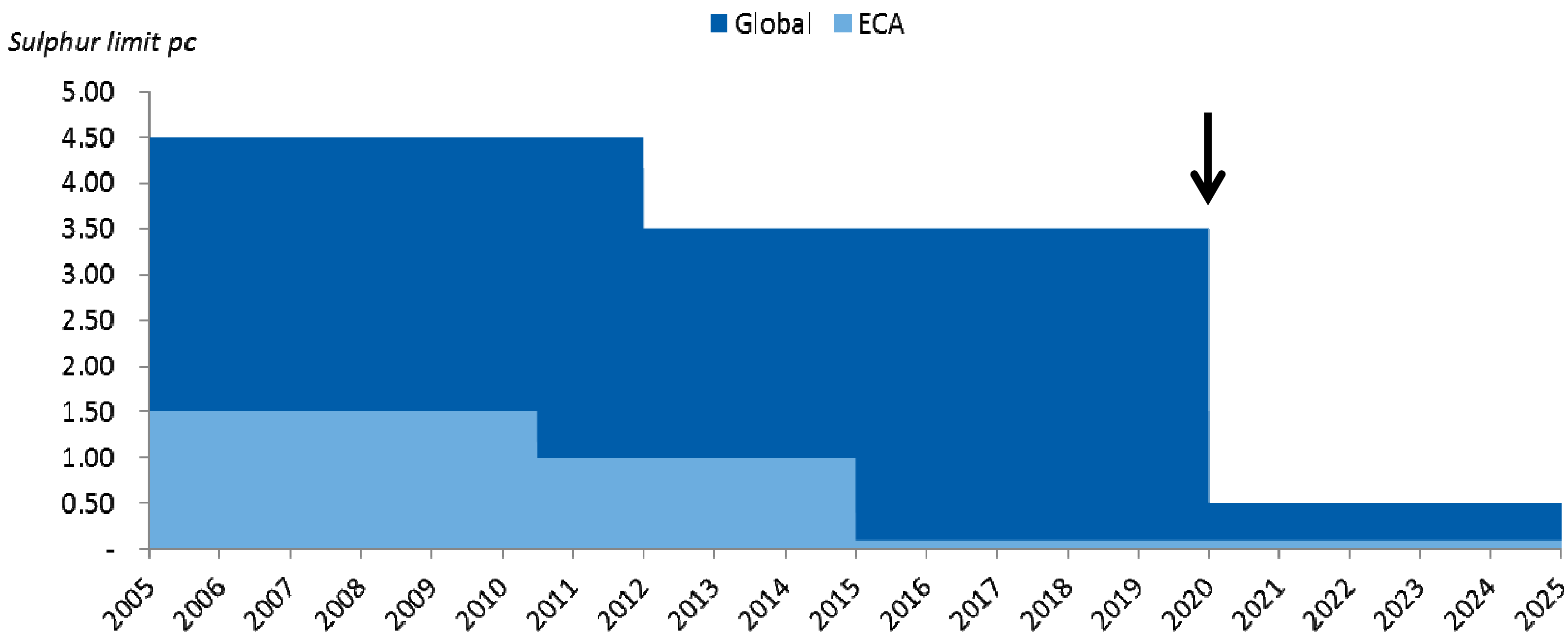
# Most likely scenario: Sticking in the *shale band*




High probability that monthly average prices will remain volatile, and will stay within the *shale band,* until shale oil production can't keep up with demand growth, or until the long-term effects of lower E&P investment take hold.

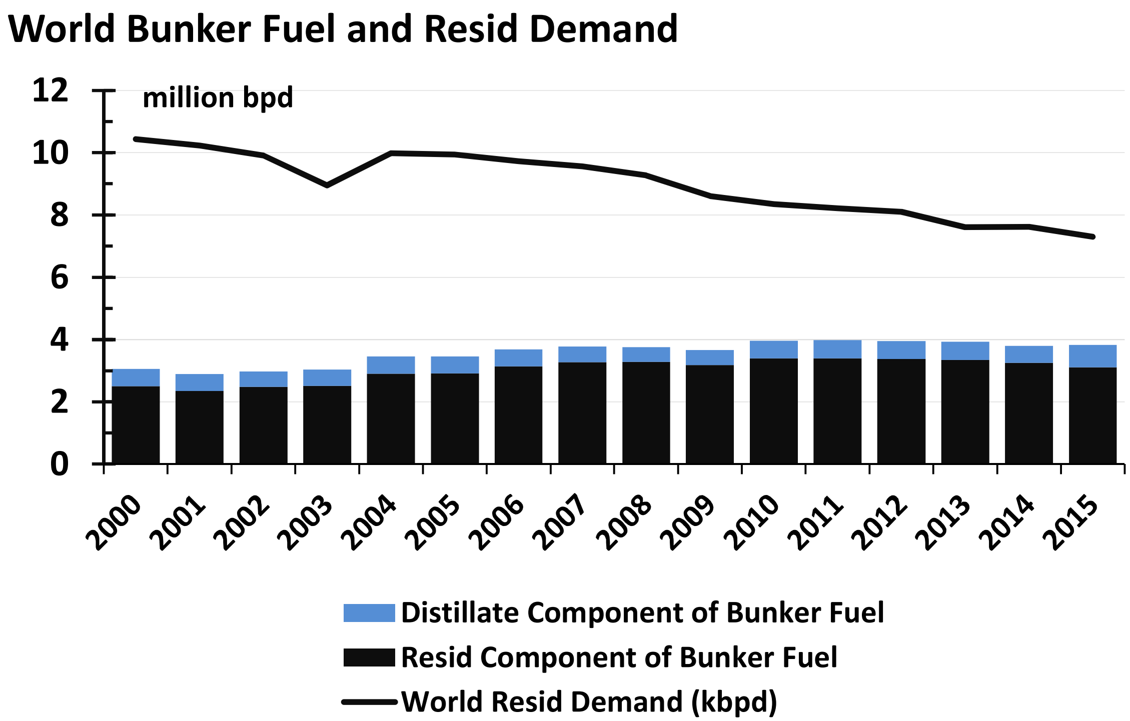
# MARPOL VI

- The 2020 global marine fuel sulphur cap is the latest of a series of regulations enforced by the IMO




Most likely scenario: Impact on US refining will be significant.

# Implementation in 2020 will bring changes




- Unless a ship-based option is *widely* adapted, a significant portion of the ~3mn bpd of high sulphur resid used in bunker fuel will need to find a new home or be converted to low sulphur material
- Demand for low sulfur distillate will, most likely, increase significantly

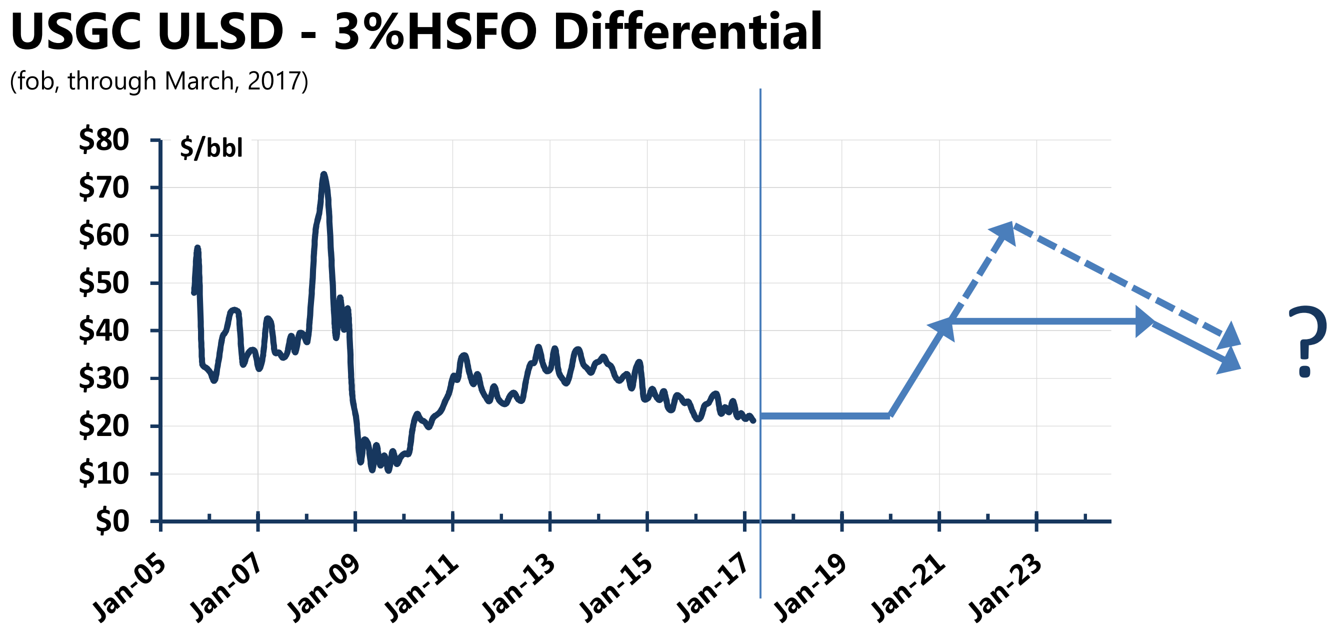
# MARPOL VI: Most likely scenario

- Regional delays in implementation, temporary exemptions, uneven enforcement
- Plan for multi-year widening of light-heavy spreads
- High-sulphur distillate will be an undesirable product
- ULSD distillate demand will increase
- ULSD prices will rise
- No significant pre-emptive conversion or desulfurization investment
- *Eventually,* look for some additional resid conversion investment
- *Slowly* growing shift to marine LNG

- *Wild cards:* Longer term L-H spread differentials*, prolonged phase-in for the regulations, uneven enforcement

* if this occurs, could incentivize major conversion investment

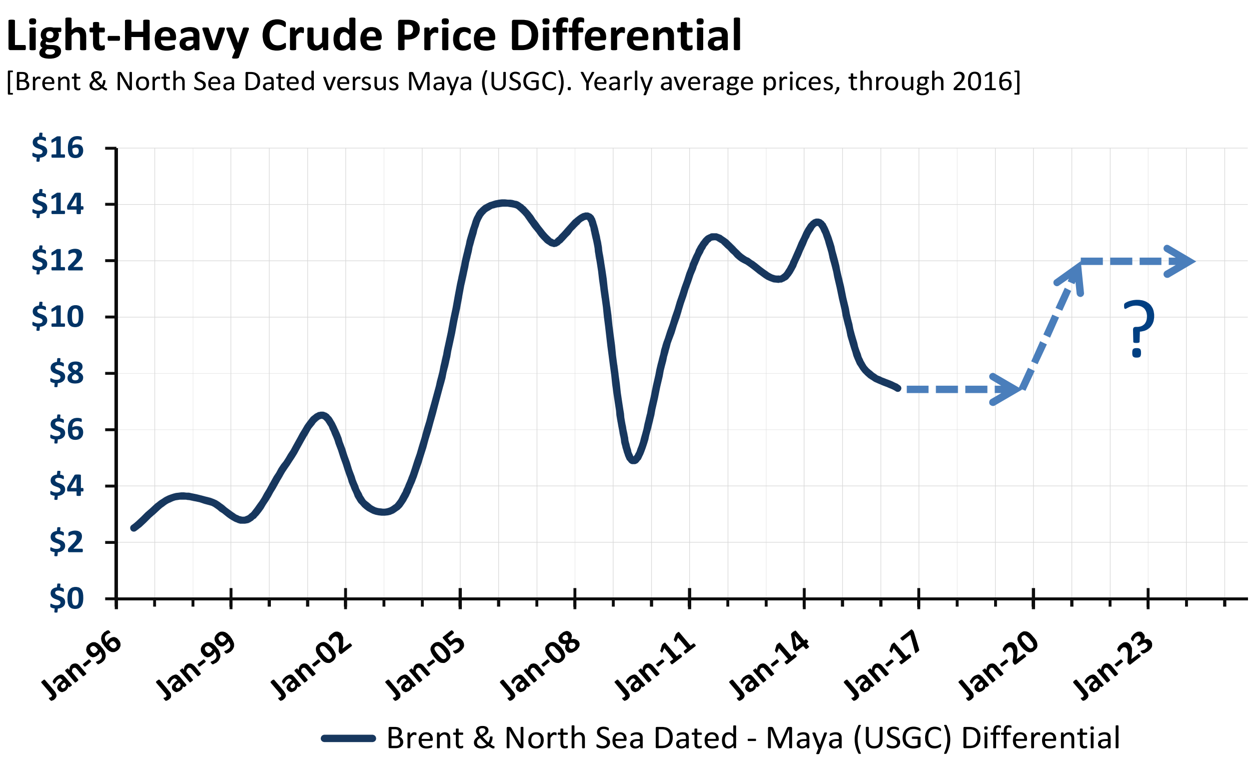
# Light-heavy product differentials will widen




**Our current, most likely scenario →**

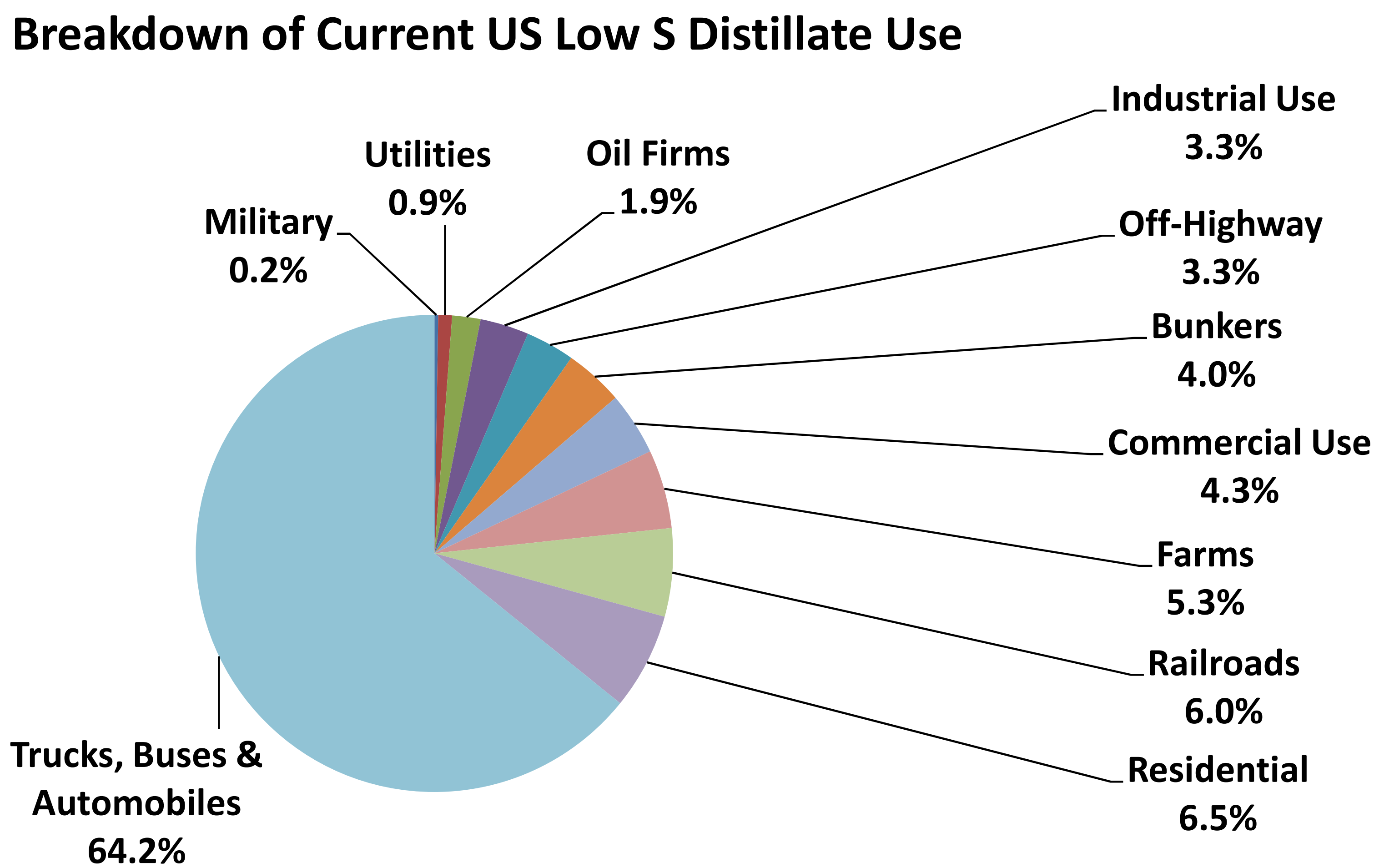
- Initial switch will disrupt normal price relationships.
- Creating a stronger incentive for investment in scrubbing.
- Longer term, prices should return to pre-2020 basis once more vessels are scrubber ready, and as alternative fuel use grows.
- No significant level of preemptive refinery investment, beyond the normal, but will see some additional desulfurization and conversion capacity. (If long term L-H spread diff, expect conversion investment.)

# Light-heavy oil spread will widen, for a while




- But – most likely – not long enough to incentivize significant new US resid conversion investment
- Margins for refiners making HSFO will shrink

# Marine demand to compete for low sulfur distillate

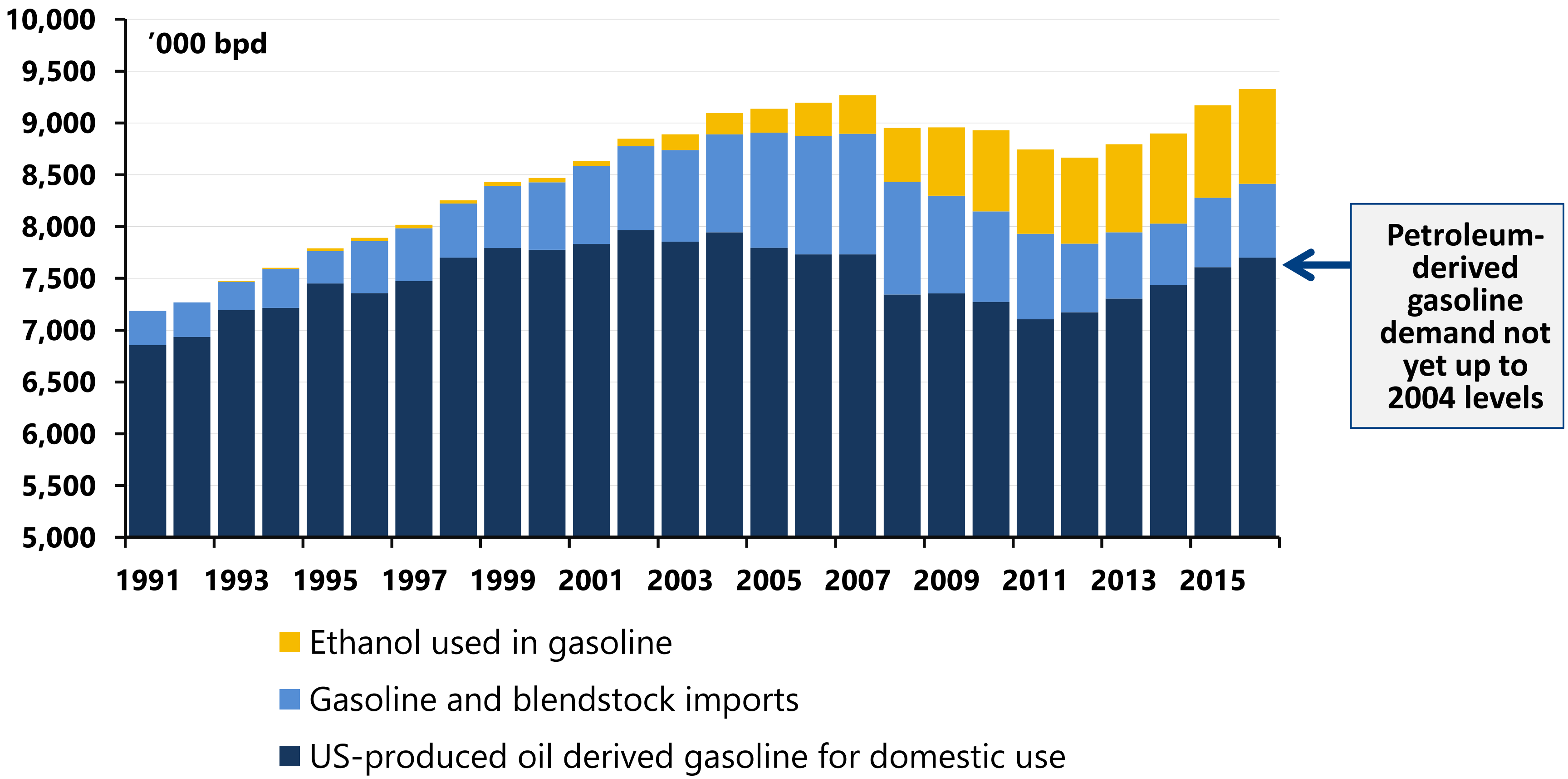


# Ship-board scrubbers

- Different options available
- Total installed costs ("TIC") probably more expensive than most current P50 estimates ($3m to $6m++ for new vessels, and $6m to $10m++ for retrofits)
  - High level of uncertainty with current TIC estimates.
- More likely on new ships versus retrofits
- Space requirement is significant, costing revenue
- Caustic storage (fresh and spent) and other waste will be a major technical issue.
  - Caustic disposal may be the key implementation-cost issue
- Can't install fast enough to fit all large, viable ships
- If resid conversion or resid desulfurization investment is substantial, scrubber investors could be "burned"

# US gasoline demand finally above 2007 levels

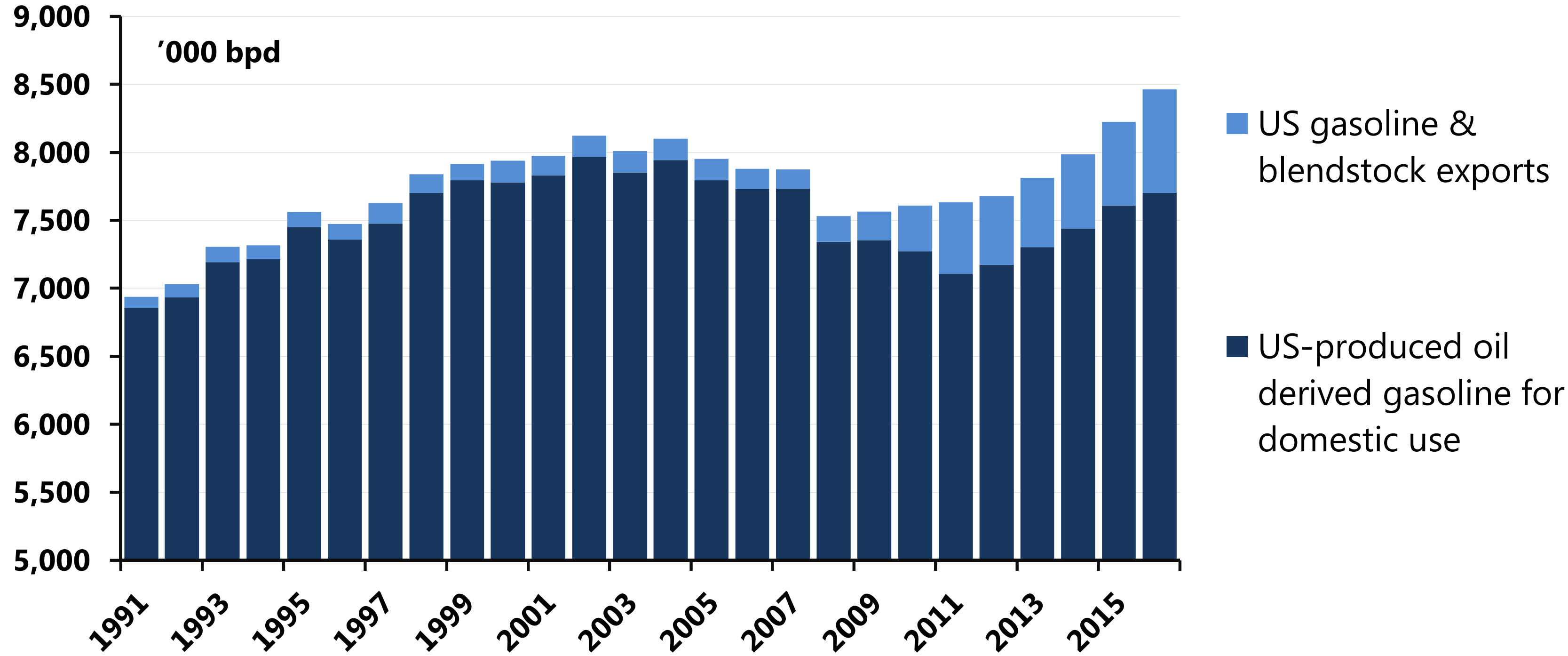
## US - Yearly Domestic Gasoline Component Demand




*-Data from EIA. Calculations by Argus.*

# US gasoline output continues to grow

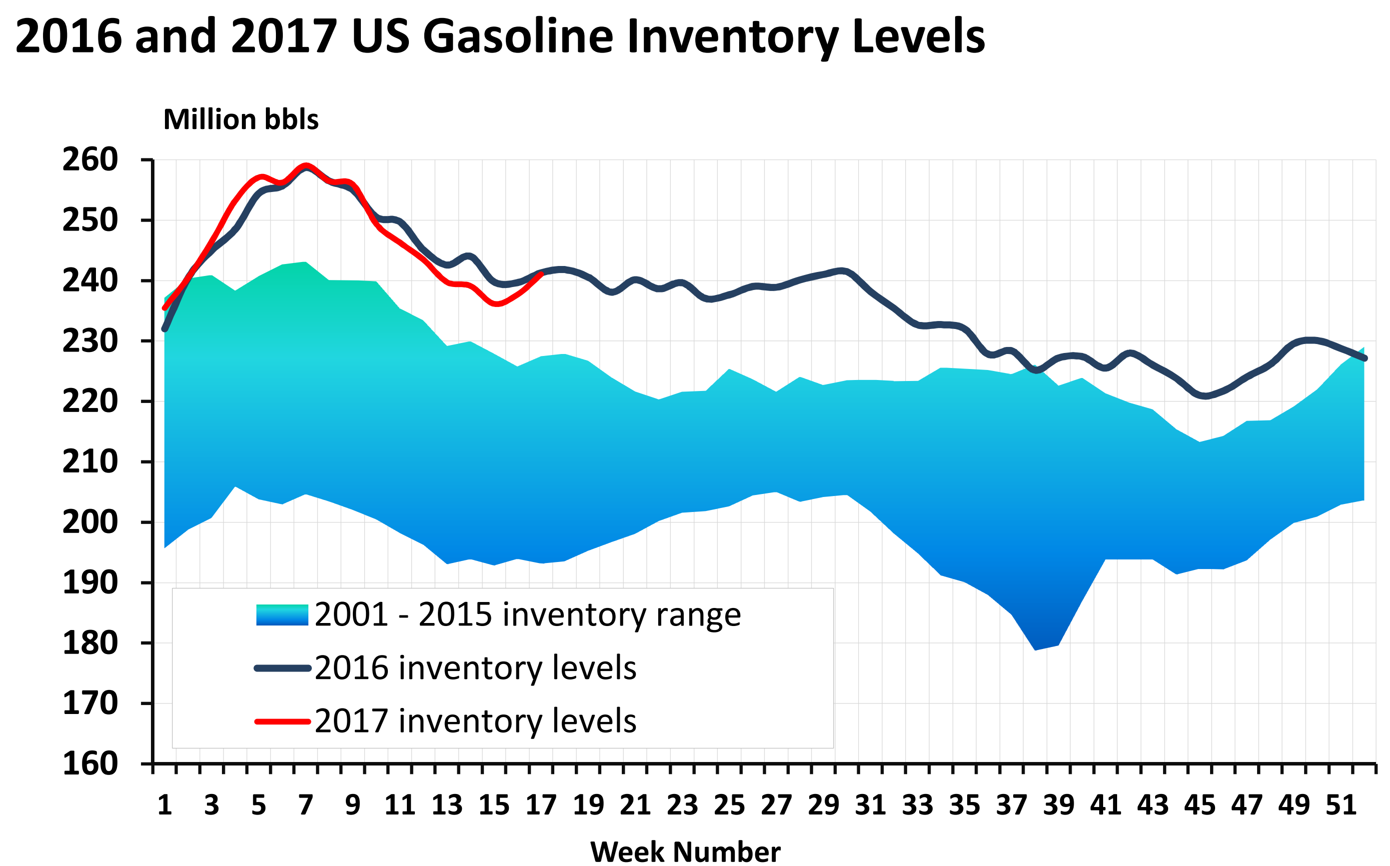
## US- Yearly Refinery Gasoline Production




*- Data from EIA. Calculations by Argus.*

- Gasoline export growth has been accelerating the last 4 years
- **Most likely export demand scenario:** Demand growth rate will gradually shrink
- **Most likely US demand scenario:** RFS continues as is. Only moderate changes to CAFE policy. ("54.5 in 2025"). Demand growth shrinks and eventually disappears.

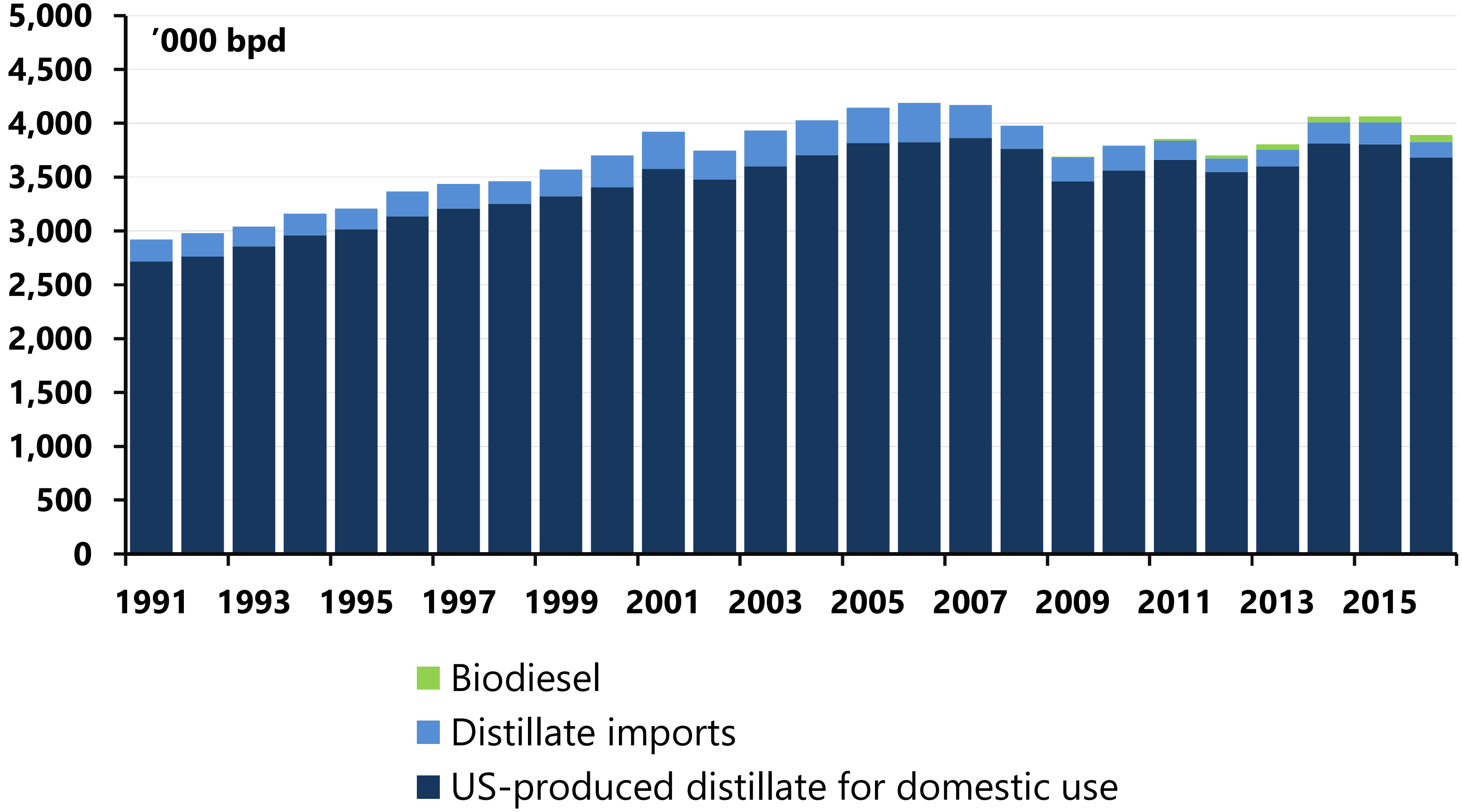
# US gasoline inventories at all time highs




This places downward pressure on gasoline prices (and oil prices)

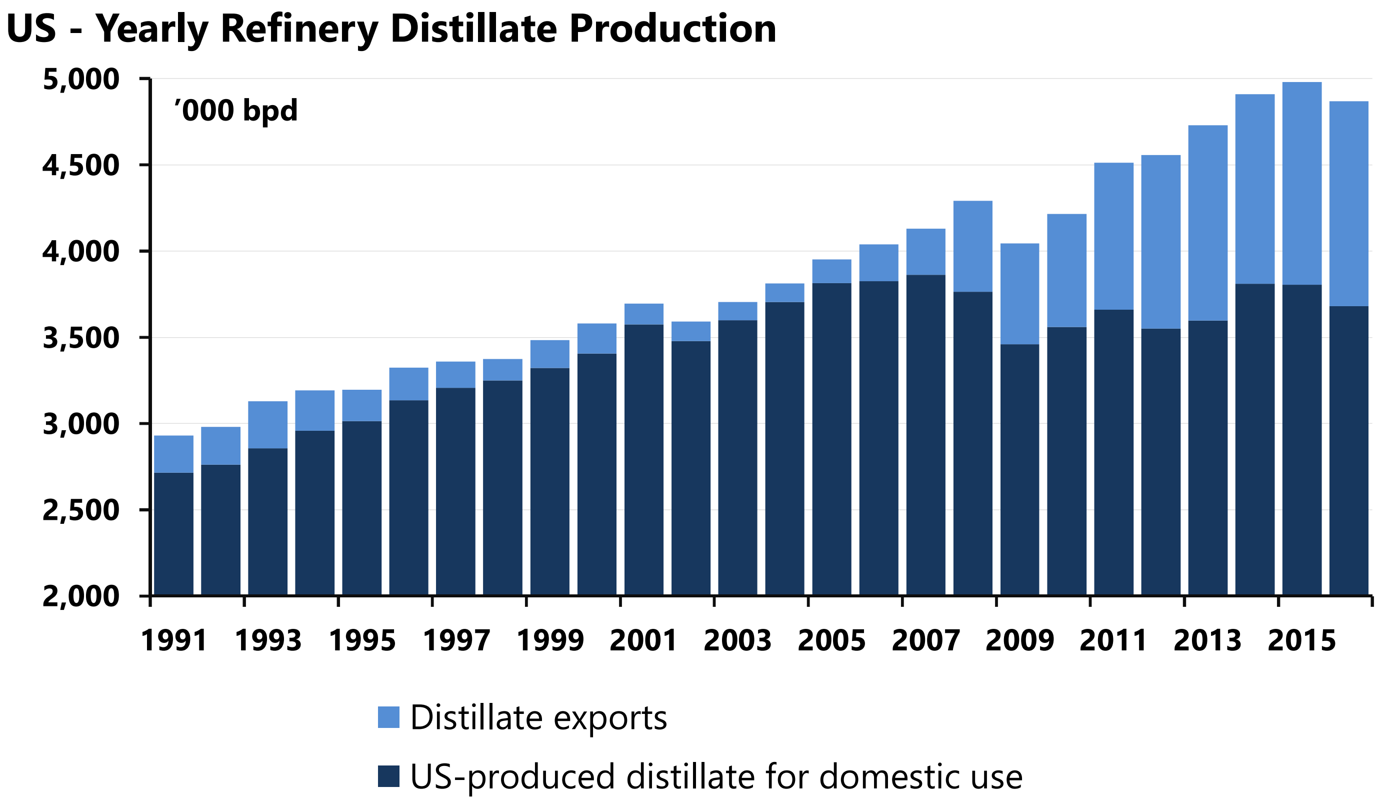
# US distillate demand dropped in 2016

## US- Yearly Domestic Distillate Demand




*-Data from EIA. Calculations by Argus.*

# US total distillate production dropped in 2016

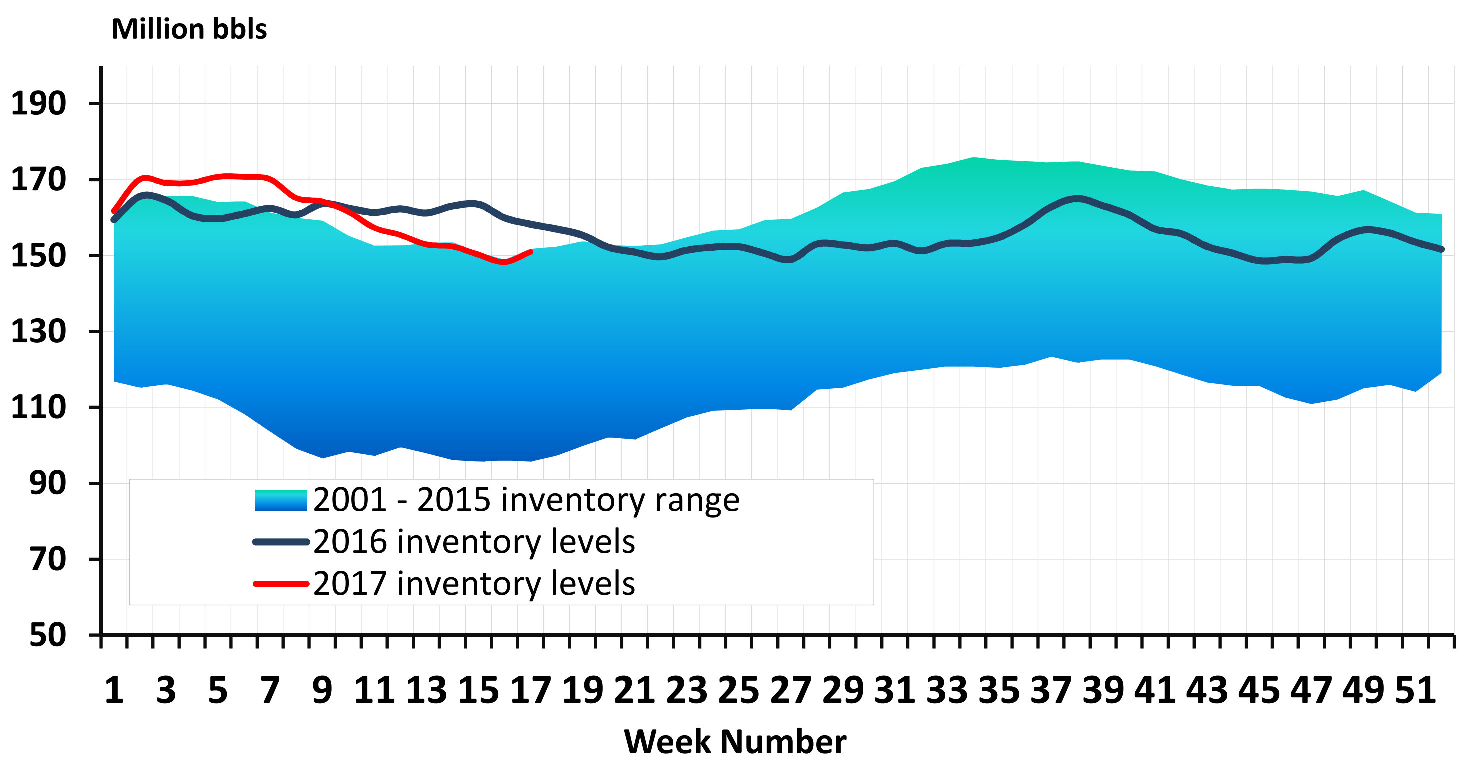



*-Data from EIA. Calculations by Argus.*

- 2016 growth in distillate exports could compensate for loss in domestic demand.
- Most likely scenario: Flat to slowly declining demand, **until MARPOL VI hits, then look for tight market to develop.**

# US distillate inventories near all time highs

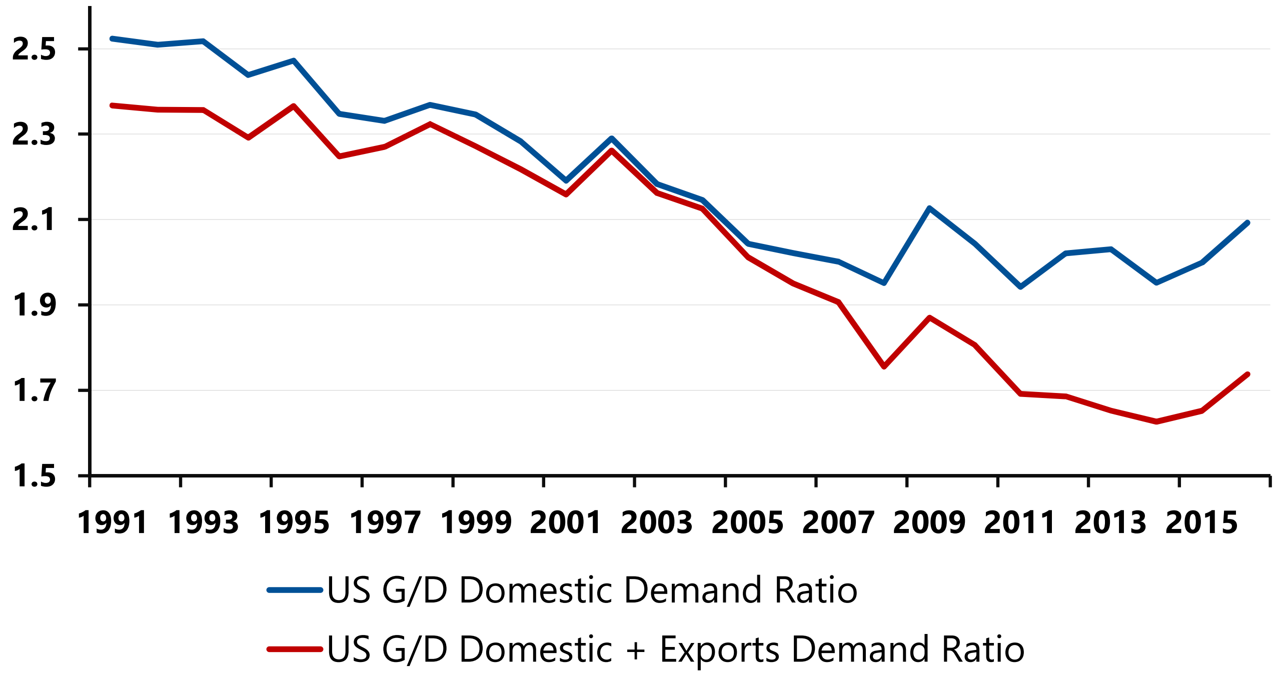
## 2016 and 2017 US Distillate Inventory Levels




This places downward pressure on distillate prices (and oil prices)

# G/D demand ratios have stopped dropping

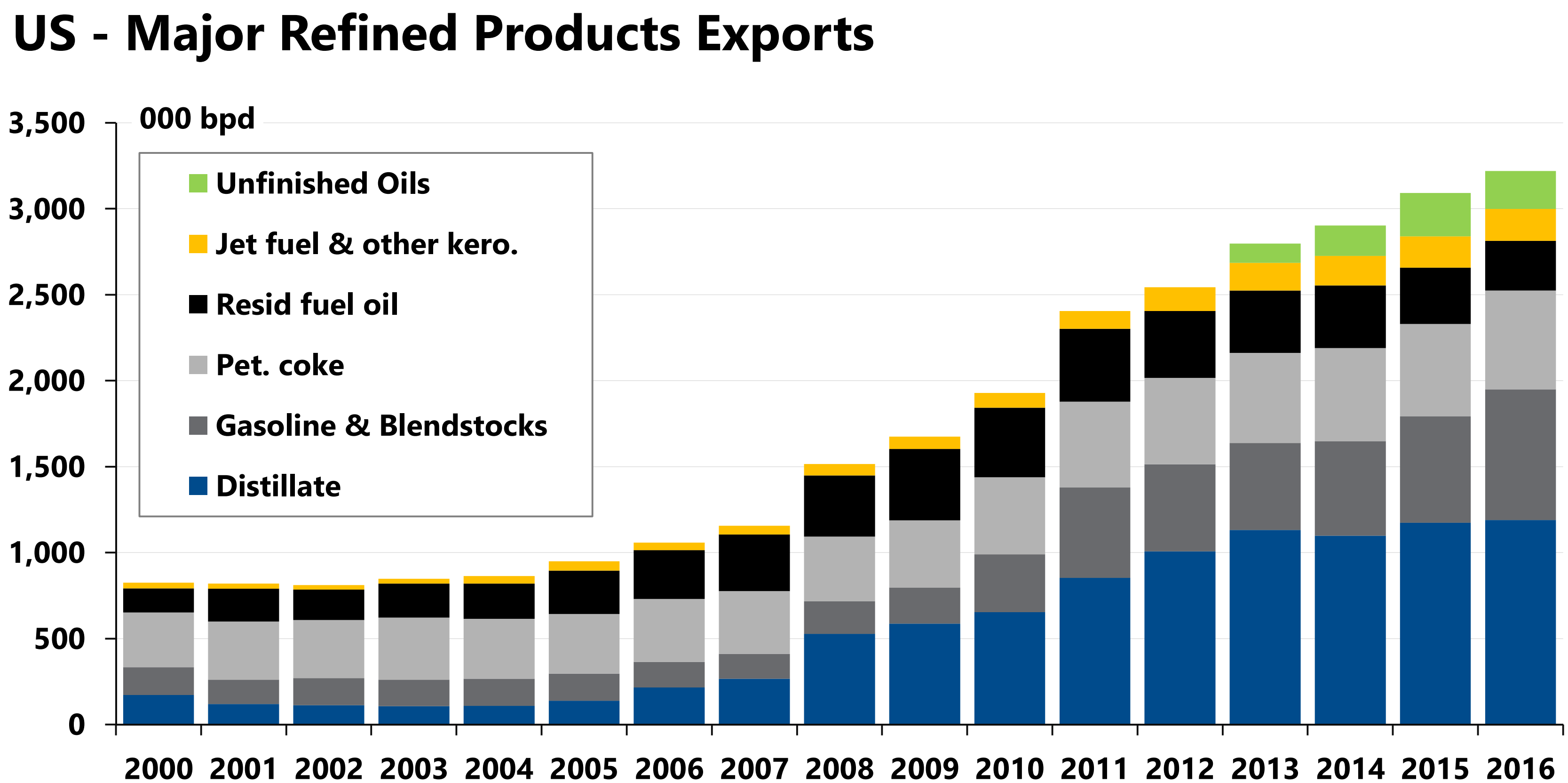
## US - Yearly US G/D Demand Ratios




*-Data from EIA. Calculations by Argus.*

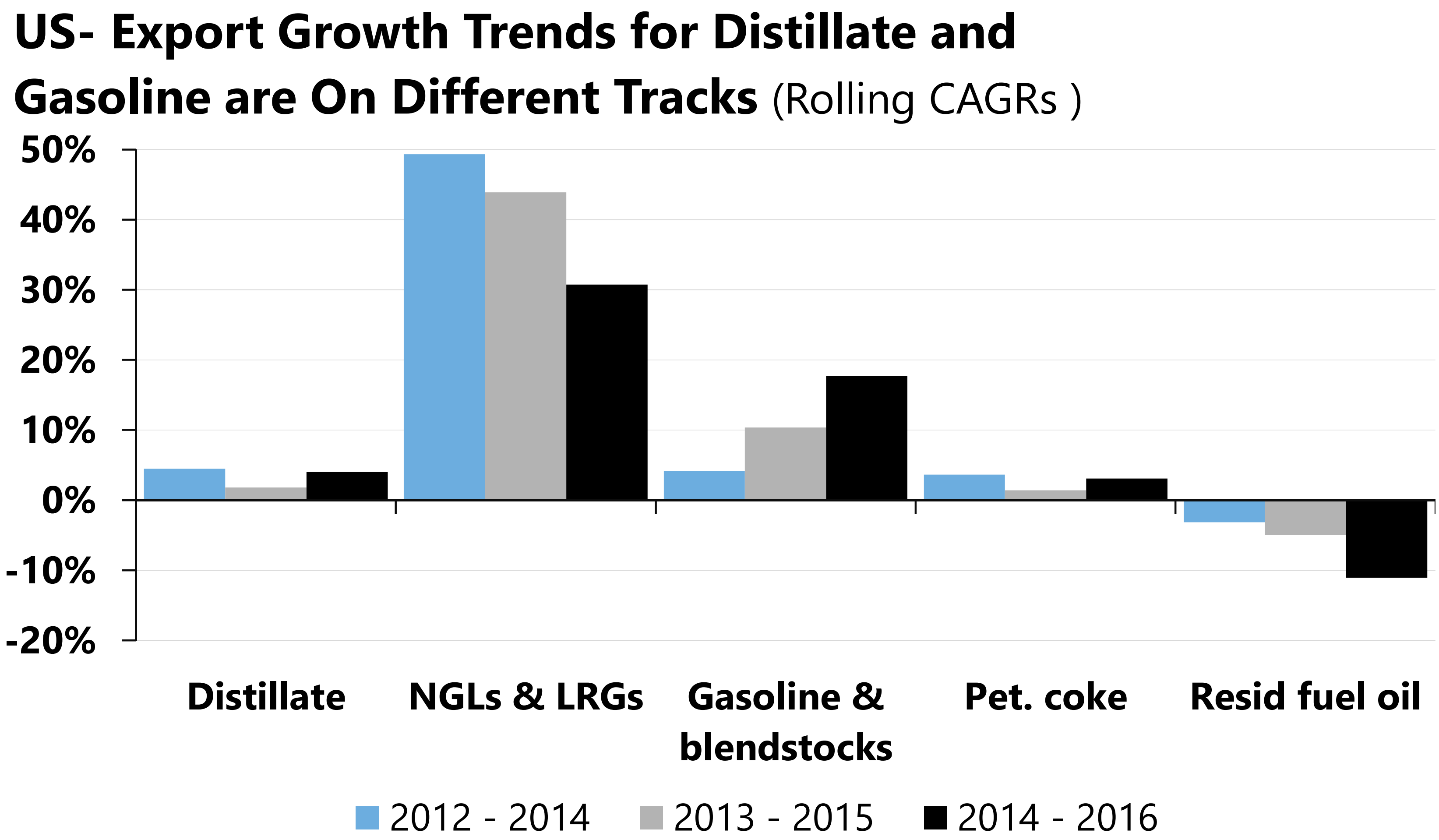
Most likely scenario: This ratio will head back to lower levels once MARPOL VI takes effect

# US refined products exports are still growing




Most likely scenario: This will continue, but expect decelerating growth

# Export product growth rates are variable





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# RFS and CAFE, most likely scenarios

- **RFS**
  - RFS stays at current levels
  - RINS policy does not change
- **CAFE Standards**
  - No significant change
  - CARB has “clout.”
  - Car manufacturers do not want to build multiple vehicle types.

# Border taxes

- Most likely scenario: Minor, measured changes
- Trump administration appears to be listening to US industry leaders
- Regardless, high level of uncertainty

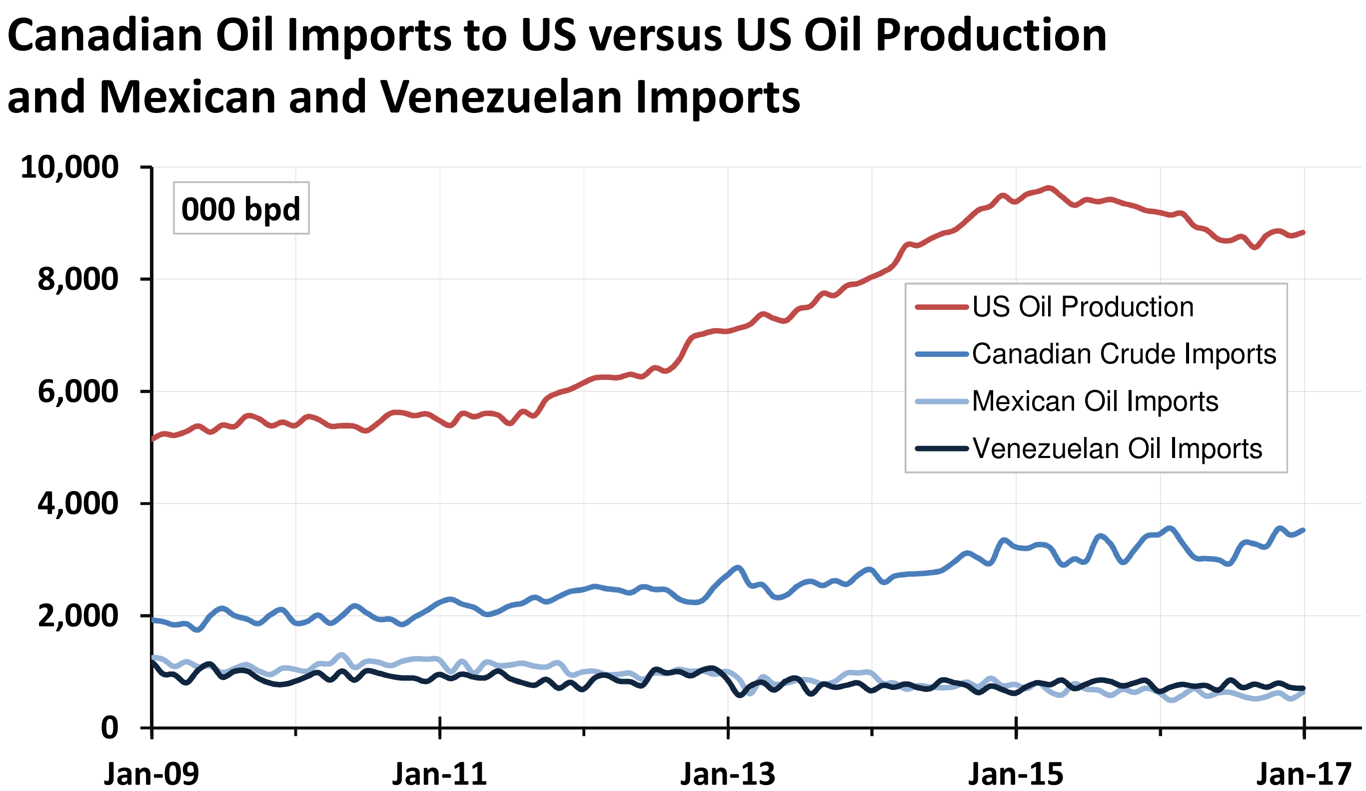
# New Crude Oil Pipelines


- Both Dakota Access and Enbridge's Keystone XL have new life
- Govt. of Canada has approved KM's Trans Mountain pipeline twinning
- Govt. of Canada has approved Enbridge's Line 3 "replacement" (enlargement)
- Probability of completion, for all 4 pipelines, within 2 - 4 years, higher than in 2016
- But numerous lawsuits and hearings are obstacles on the paths to completion

# Keystone XL, Enbridge Line 3 and Alberta bitumen

- Still face hurdles
  - Hearings at *Nebraska Pubic Services Commission*
  - Likely lawsuits: Sierra Club, NRDC and others
- Start of construction for KXL could be months or years off
- KXL less critical than when first envisioned
  - Other pipelines and rail transport have filled the gap
- Alberta Dilbit and Synbit will get to the USGC, regardless
- Supply of Alberta bitumen will continue to grow, slowly
- Most Alberta bitumen majors are in the business for long term
  - SAGD operations cannot easily be turned on and off
  - Despite the flight of foreign capital, ~$14billion in oil sands spending is forecast for 2017
  - Recent permitting requests for multiple new SAGD projects

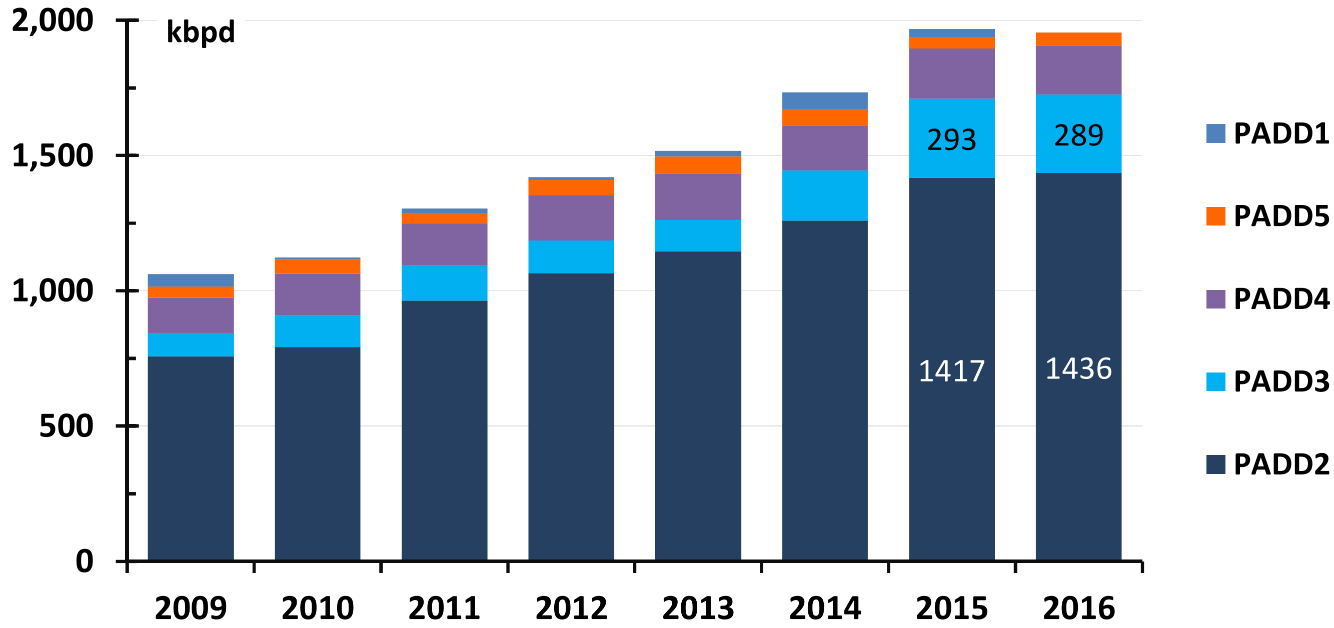
# Alberta heavy oil import growth continues




- Majority of Canadian import growth is Alberta bitumen
- Alberta bitumen import growth will compensate for the loss of Mexican and Venezuelan imports

# Today, most Alberta bitumen heads to US PADD 2

**Canadian heavy sour crude shipments into US**



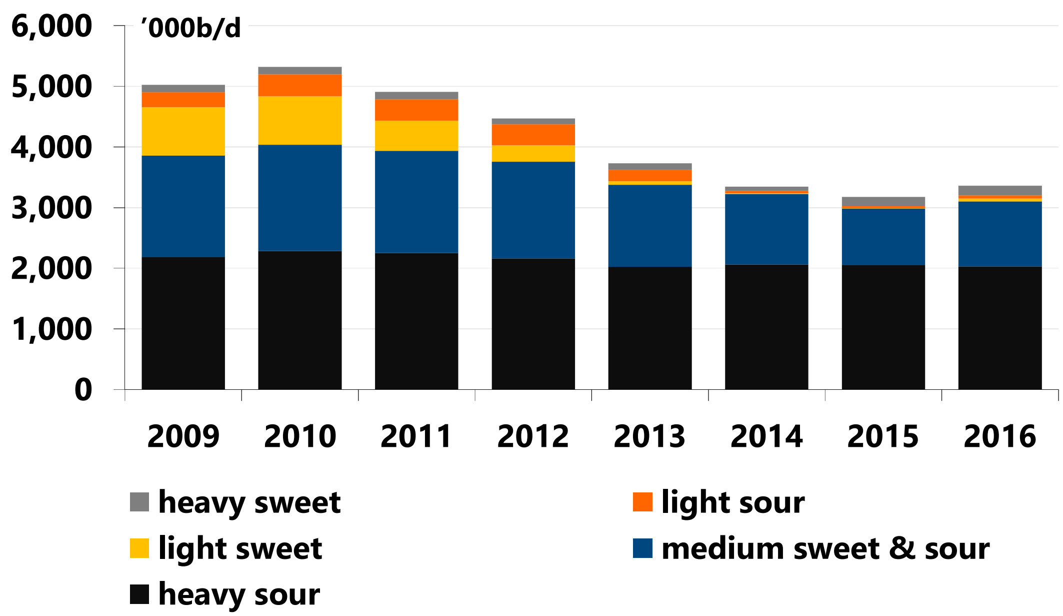

*- Data from EIA. Calculations by Argus.*

- Total US bitumen demand dropped in 2016.
- PADD 2 demand grew slightly. PADD 3 demand dropped.

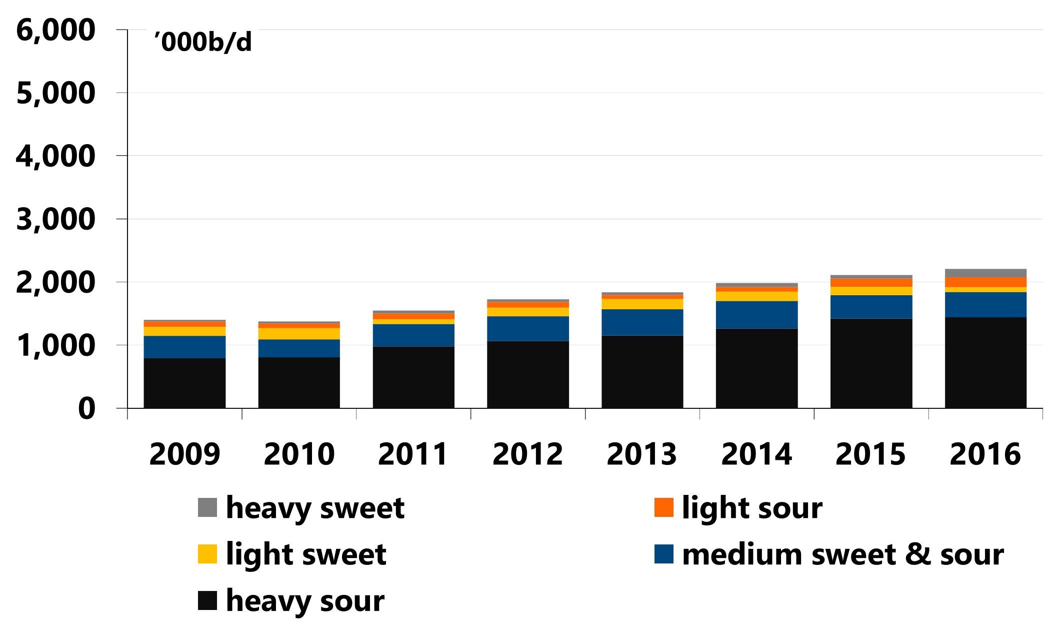
# However, PADD 3 represents the largest opportunity

- Note the relative stability of PADD 3 heavy sour import levels, since 2009
- PADD 2 demand growth is probably close to its peak demand level

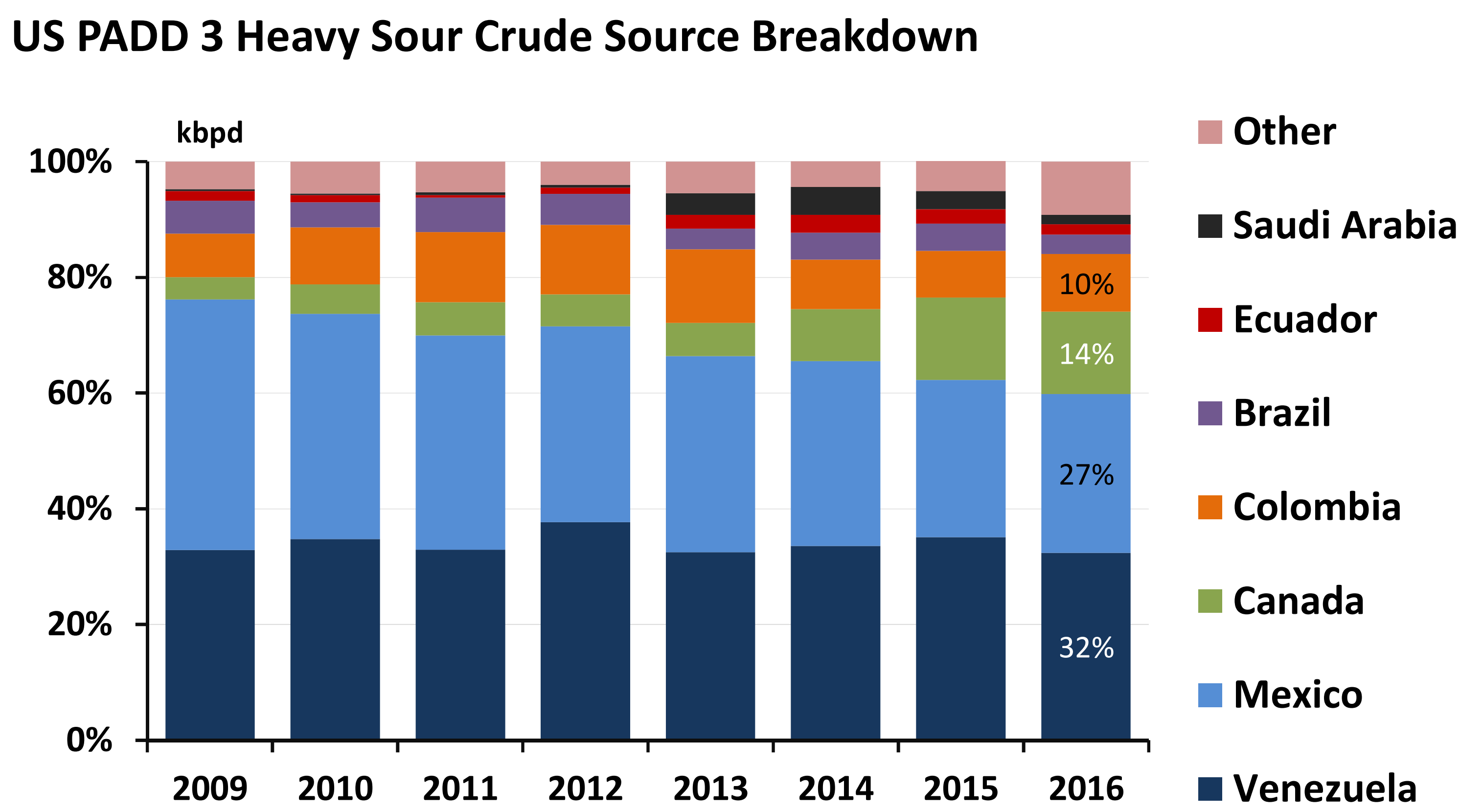
PADD 3 Oil Import Quality Trend by Oil Type




PADD 2 Oil Import Quality Trend by Oil Type



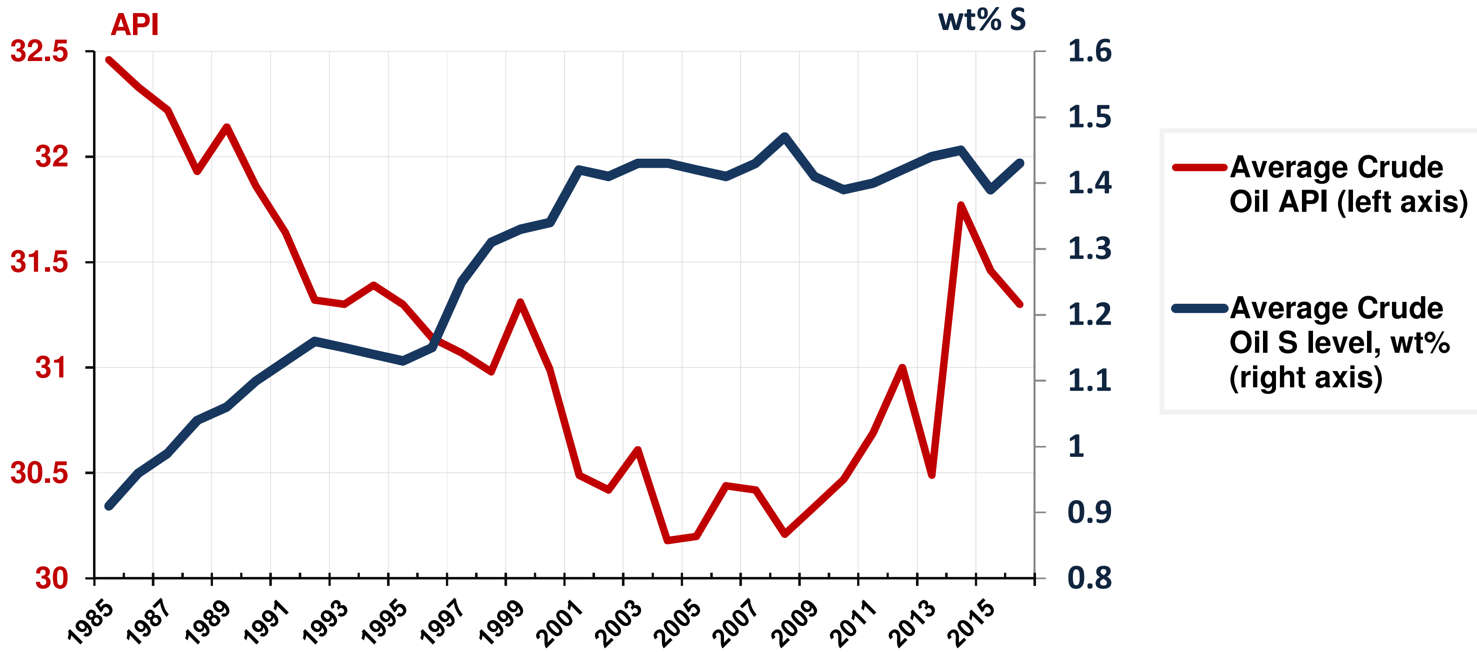
# There is room for additional Canadian bitumen in PADD 3




Much of the Venezuelan heavy sour crude is high TAN and is a obvious candidate for "replacement."

# US refinery crude API to slowly drift lower

## US Average Refinery Crude Oil Input Density and Sulfur Content




....... as US oil logistics systems become less constrained, and as US light oil finds it way to additional export markets.

# Conclusions

- **Oil Prices:**
  - Most Likely in shale band for multiple years
  - Expect volatility
  - *Wild cards:* Supply disruption, demand surprises, or OPEC successfully managing long-term production cuts
- **MARPOL VI:**
  - Plan for multi-year widening of light-heavy spreads
  - High-sulphur distillate will be an undesirable product
  - ULSD distillate demand will increase
  - ULSD prices will rise
  - No significant preemptive conversion of desulfurization investment
  - *Wild cards:* Long term L-H spread differentials (if they materialize, could incentivize major conversion investment), prolonged phase in for the regulations

# Conclusions, continued

- **US Gasoline Demand**
  - Most likely that export demand growth rate will gradually shrink
  - Most likely that US domestic demand growth shrinks and eventually disappears
  - Wild cards: CAFE 54.5 disappears, RFS diminished, RFS increases
- **US Distillate Demand**
  - 2016 growth in distillate exports was not enough to compensate for the loss in domestic demand
  - Most likely scenario: Flat to slowly declining domestic + export demand, until MARPOL VI hits, then look for tight market to develop
  - Wild Cards: Marpol timing delays, major jump in GDP growth rates in developing or developed countries

# Conclusions, continued

- **Pipelines & Alberta Bitumen**
  - DAPL, KXL, Trans-Mount. twinning & Enbridge Line 3 all have new life
  - Most likely years of lawsuits and hearing for some of these
  - Additional Alberta bitumen will come into PADD 3 regardless (and a small additional amount into PADD 2)
  - Although the game has changed, Alberta majors are in the game for the long run
  - *Wild cards:* Successful law suits, major spills, technology breakthroughs

# Conclusions, continued

- **RFS and CAFE Standards**
  - Most likely, RFS stays at current levels
  - Most likely, RINS policy does not change
  - Most likely, CAFE policy sees no significant change
  - *Wild cards*: Near-term political-control shifts in DC, Trump administration policy shifts

- **Border Taxes**
  - Most likely scenario: Minor, measured changes
  - Trump administration appears to be listening to US industry
  - Regardless, high level of uncertainty

# Argus Consulting Services

Ed Arnold, Senior Consultant
edward.arnold@argusmedia.com
630 544 6492
Houston
www.argusmedia.com
http://blog.argusmedia.com

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