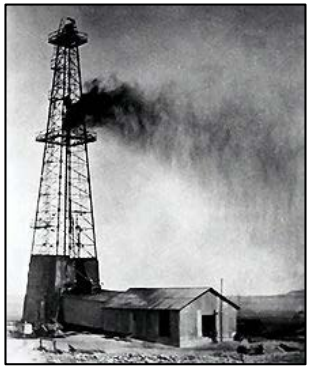



# ERCE Oil Price Review – 2017 Q4

## 17 October 2017





This document reports and summarises the findings of a review and assessment of recent historical and assumed future oil prices based upon literature published in the public domain

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*In the absence of guidance from a client in relation to oil price assumptions, ERCE would assume the oil price scenarios presented in this slide pack. These oil price scenarios are derived in context of the information available in the public domain and should not be construed as oil price forecasts, predictions or projections by ERCE.*

*Readers should be aware that any final assumptions represented herein are based on currently available data, which, however, due to the highly volatile characteristic of the oil market, are only temporary and subject to change. ERCE reserves the right to modify this report at any time, and revised values may differ significantly from previous estimates.*

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*Images (top left to bottom right): Deepwater Horizon semi-sub, Methane Princess (first LNG carrier launched in 1964), Piper Alpha platform, Egyptian forces crossing Suez Canal (1973), Damman-7 well (Saudi Arabia, 1937), a nodding donkey on the Eagleford shale, fracking compressor trucks, Oklahoma (U.S.), OPEC member states.*

# Welcome to the ERC Equipoise Oil Price Review for 4Q 2017

**Powering through the 50s.** Oil prices strengthened through Q3 and in to Q4. Brent futures have moved into backwardation, indicating a tightening market. Expectations for oil demand growth for 2017 have been revised up by the IEA, EIA and OPEC, decreasing oil inventories and indications of an extension to the OPEC deal provide additional support to prices. Geopolitical risks (Iraq-Kurdistan and rising US-Iran tensions) has resulted in a risk premium returning to oil markets.

**Too strong, too concentrated.** Money managers turned bullish through Q3 increasing their net long positions through decreased shorts and increased longs. However, this bullishness has subsided in recent weeks (slide 7). Strong and concentrated positioning of speculators' money on crude has itself become an additional source of downside risk as money managers take profit on their positions in the short run.

**The heavy weights step in to the ring.** While OPEC members ponder the pros and cons of extending their production freeze, heavy weights Saudi Arabia and Russia have strengthened their ties. Both countries suggested the possibility of the production freeze running to the end of 2018 showing their determination and support for rebalancing oil markets. OPEC will decide on whether to further extend or not at its next meeting, which takes place in Vienna next month.

**Signs of fatigue.** Shale production continues to climb but the number of rigs drilling for oil onshore the US is showing deceleration in recent months. Oil inventories decline and move closer to their 5-year average. While much progress has been made in rebalancing the oil markets, further discipline through 2018 will be required to build on this success. All eyes will be on Vienna on November 30th.

Welcome to the **ERC Equipoise Oil Price Review.** This report reviews current oil and gas prices and looks at some of the global macro indicators influencing these trends. In addition, we provide our current oil price decks and review oil price assumptions presented by other petroleum consultants and analysts. To subscribe/unsubscribe please drop me an email at jho@ercequipoise.com.

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# A Review of Crude Oil and Global Natural Gas Prices

## All prices as at 13th October 2017

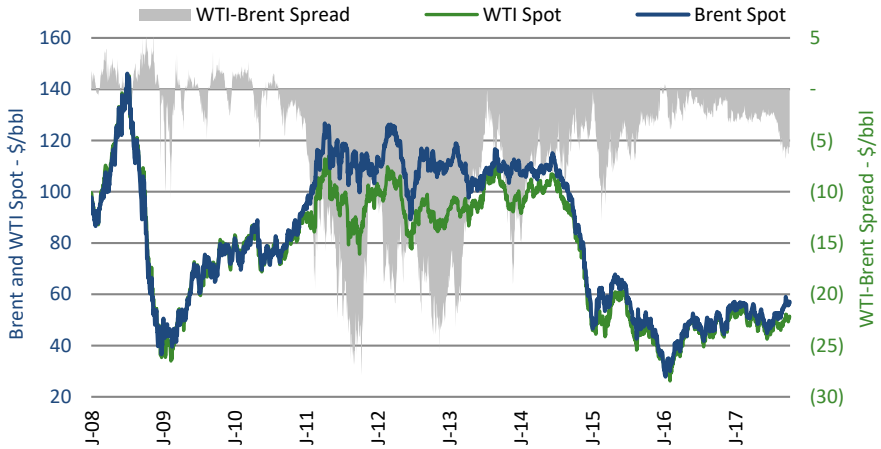
All dollar amounts are in U.S. dollars unless otherwise indicated

# Brent and WTI Crude Spot Price Review

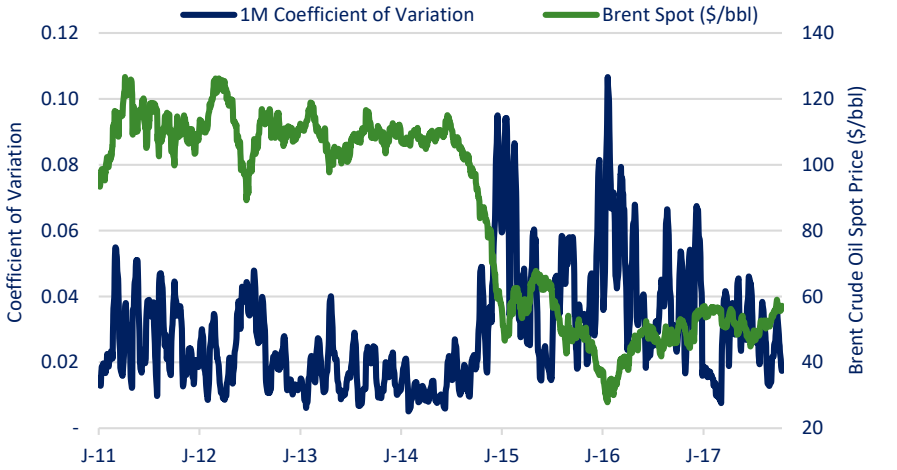
| Brent and WTI Crude Oil Spot Price: Current Vs. Historical | Brent | | WTI | |
|---|---|---|---|---|
| | $/bbl | %Chg vs Current | $/bbl | %Chg vs Current |
| **13-Oct-17** | **57** | - | **51** | - |
| 1M Ago | 55 | 4% | 49 | 4% |
| 3M Ago | 48 | 18% | 46 | 12% |
| 6M Ago | 56 | 2% | 53 | -3% |
| 1Yr Ago | 52 | 10% | 50 | 2% |
| YTD Low | 44 | 29% | 42 | 22% |
| YTD High | 59 | -4% | 55 | -7% |
| **2017 YTD Average** | **53** | **8%** | **49** | **4%** |
| *3Q2017 Avg* | *52* | ***10%*** | *52* | ***10%*** |
| *2Q2017 Avg* | *51* | ***12%*** | *49* | ***16%*** |
| *1Q2017 Avg* | *55* | ***5%*** | *45* | ***27%*** |
| *4Q2016 Avg* | *51* | ***12%*** | *46* | ***25%*** |

## Brent Crude Daily Spot Price: 6M Candlestick Chart (Apr to Oct YTD 2017)


## WTI-Brent Spot Price and Spread (Jan 2008+)




## Brent Crude Oil Spot Price Volatility (Coefficient of Variation - 1M)

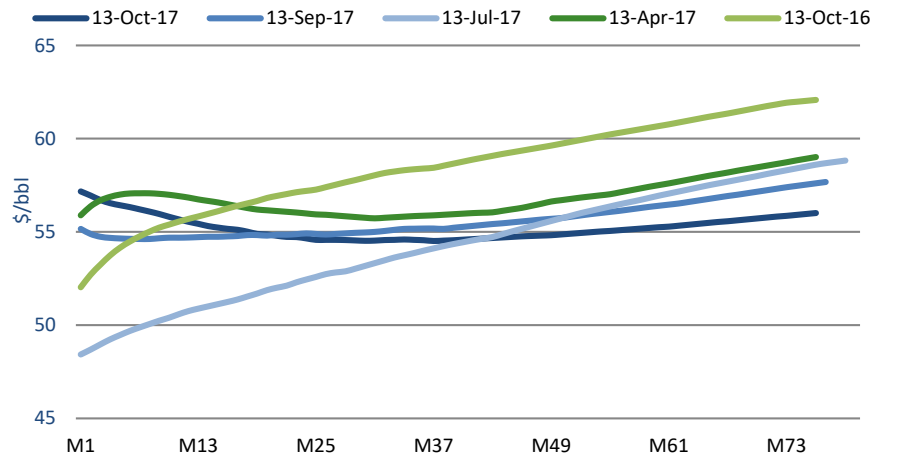



**Oil prices are most often referenced to the Brent oil price in the UK, or the WTI oil price in the USA.** These oil prices are determined on the futures market (electronic financial exchange). Some of the factors that influence oil prices include demand/supply dynamics, storage levels and costs, interest rates, insurance costs, marginal cost of supply, foreign exchange rates, potential geopolitical risks disrupting supply, the ability to deal with the supply shock (OPEC spare capacity and inventory levels) and the markets views and future expectations of all of this and more. **Commodity prices are notoriously volatile** creating instability in global commodity markets. Empirical support for this argument typically relies upon the **standard deviation of price or the coefficient of variation** as a measure of volatility. High price volatility has been used to rationalise commodity stabilisation programmes, such as price supports, buffer stock programs and producer subsidies.

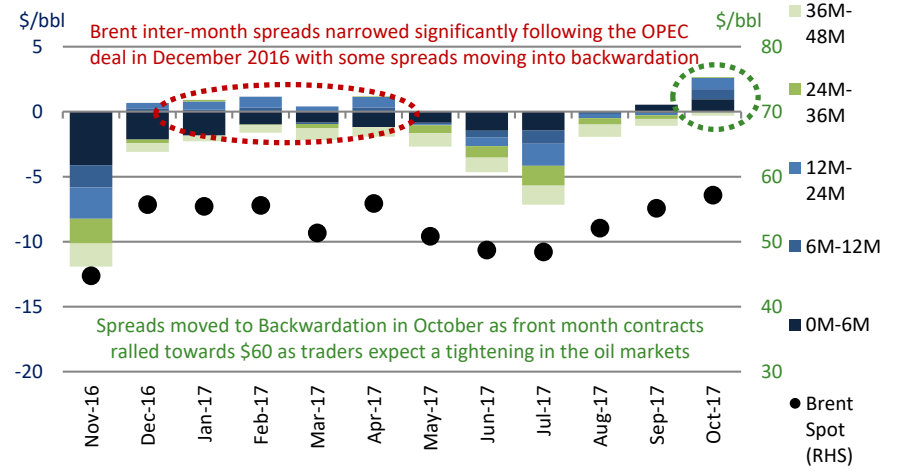
*Source: Intercontinental Exchange, ERCE Estimates.*

# Brent Crude Oil Futures Curve Review

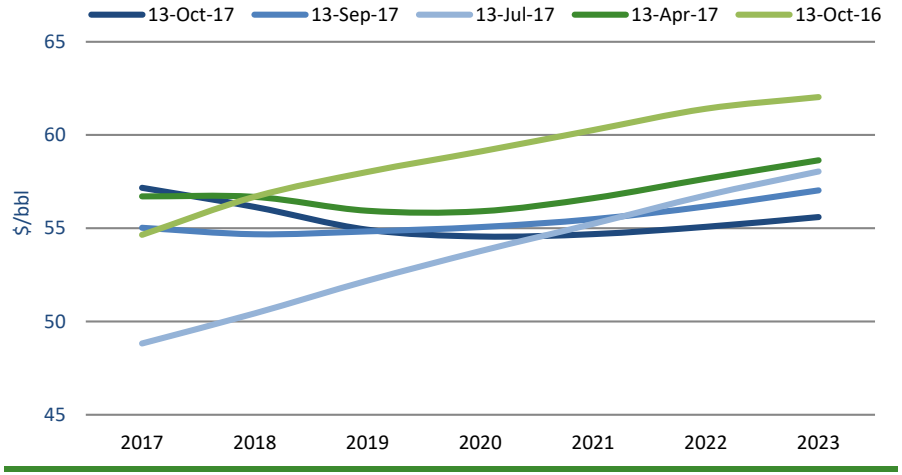
## Brent Crude Futures Curve: Current, 1M, 3M, 6M and 1Yr Ago




## Brent Futures Curve Spread (12M Ago to Current)




## Brent Curve: Annual Averages - Current, 1M, 3M, 6M and 1Yr Ago




## Annual Averages of Brent Futures Contracts (Current Vs 1M, 3M, 6M and 1Yr Ago)

| $/bbl | 2017* | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|
| 13-Oct-17 | 57 | 56 | 55 | 55 | 55 | 55 | 56 |
| 13-Sep-17 | 55 | 55 | 55 | 55 | 55 | 56 | 57 |
| 13-Jul-17 | 49 | 50 | 52 | 54 | 55 | 57 | 58 |
| 13-Apr-17 | 57 | 57 | 56 | 56 | 57 | 58 | 59 |
| 13-Oct-16 | 55 | 57 | 58 | 59 | 60 | 61 | 62 |

*(The latest Brent Futures 2017 figure is the arithmetic average of the futures prices for the remaining year's balance)*

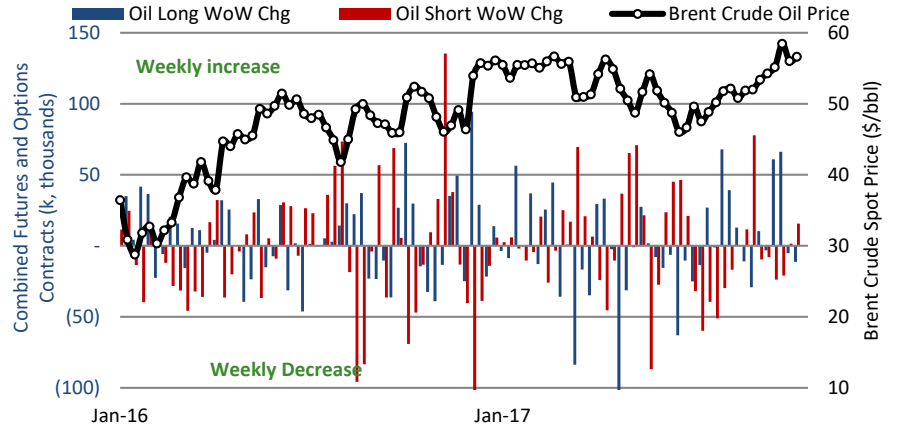
**The 'spot price' of an asset is the price of buying or selling the asset today. The 'futures price' of an asset is the price of entering into a contract today to buy or sell the asset on some agreed future date. The set of prices for all future dates is then called the 'futures curve'. The futures curve is not a forecast of future spot prices by the market. A commodity futures contract is a binding agreement that gives one the right to purchase that commodity at a predefined price on a predefined date in the future. Under a futures contract, both the buyer and the seller are obligated to fulfil their side of the transaction on the specified date. The futures curve shows the price at which it is possible to buy/sell futures contracts for a forward date at a price agreed today (or on a particular date in the past).**

*Source: Intercontinental Exchange, ERCE Estimates. Note: *Brent Futures 2017 is the arithmetic average of the futures prices for the remaining year's balance.*

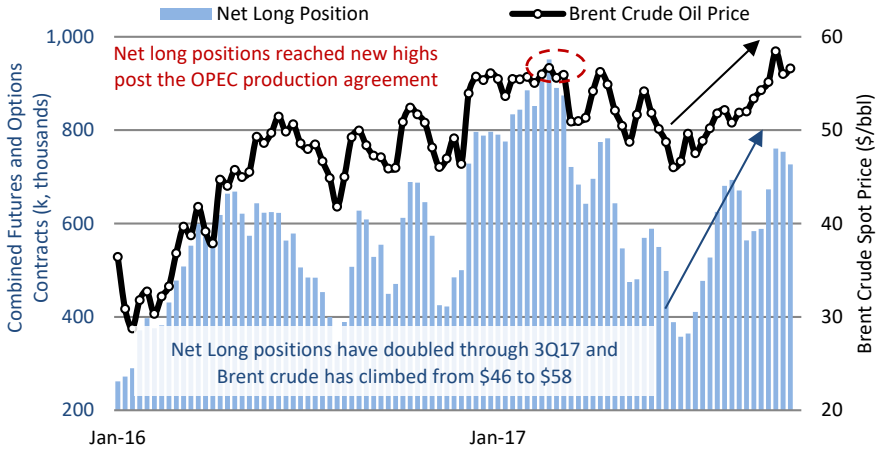
# Commitment of Traders Report: Money Managers' Positions on Brent and WTI Futures and Options

**Money Managers have turned bullish through 3Q17 increasing their net long positions through decreased short positions and increased long positions. Strong and concentrated positioning of speculators' money on crude has itself become an additional source of downside risk as money managers take profit on their positions in the short run.**

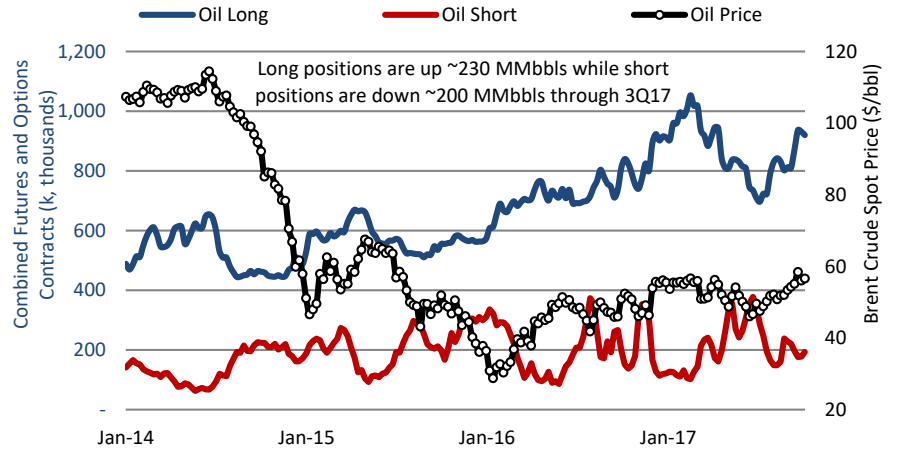
## Oil Long and Short Positions Week on Week Change Vs. Brent Crude Price



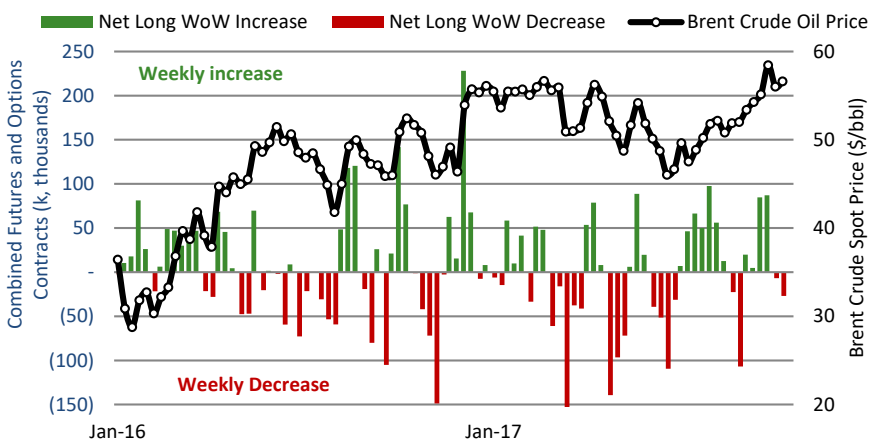

## Money Managers' Net Long Position of Brent & WTI Vs Brent Crude Oil Price




## Money Managers Positions on WTI & Brent Crude Contracts (ICE & NYMEX)




## Money Managers' Net Long Position of Brent & WTI: Week on Week Chg

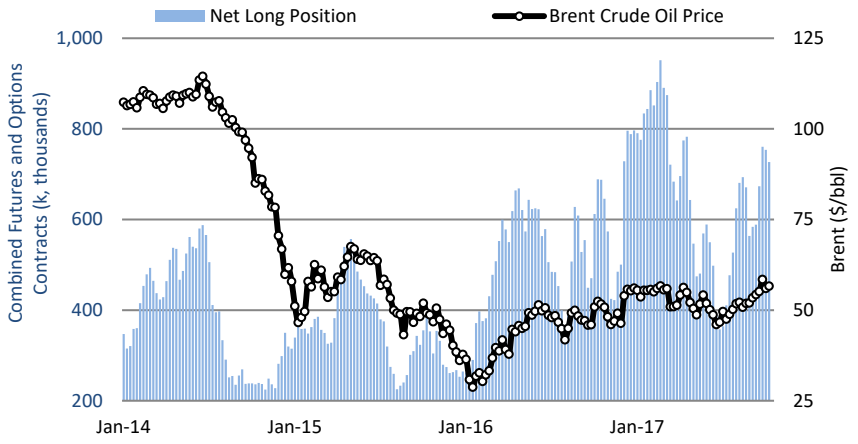



*Source: Commodity Futures Trading Commission, ICE, NYMEX, Reuters, ERCE Estimates. Note: each contract represents 1,000 bbls.* Longs are bets on higher prices while shorts are wagers on price drops. The net position squares off the two.

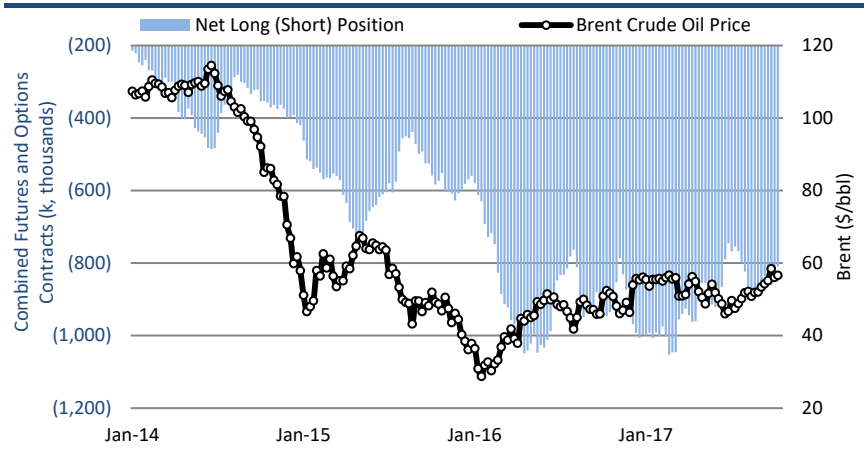
# Producers' Positions on Oil Contracts and Notes to Commitment of Traders Report

**The Commitment of Traders (COT) report is released on a weekly basis and provides a glimpse in to positions of commercial users, large institutional traders and speculators of commodities, giving information about the trend and the strength of the commitment traders have towards that trend.**

**Money Managers' Net Long Position of Brent & WTI Vs Brent Crude Oil Price**




**Producers' Net Short Position of Brent & WTI Vs Brent Crude Oil Price**




The net long or short positions for each available futures contract the various types of traders can be derived from the COT report.

- **Managed Money (Non-Commercial Traders) –** entities managing futures on behalf of clients and include hedge funds, pension funds, commodity trading advisors. Most attention is focused to this category as this group trades in the futures market for investment and growth.

- **Producer/Merchant/Processor/User (Commercial Traders) –** entities with exposure to underlying physical market for the commodity which use the futures market to hedge the risks associated with such exposure. Commercial traders are mostly hedging and will often be positioned in the opposite direction of the non-commercial investors or speculator.

If traders are overwhelmingly long or increasing their long positions then we will have a bullish bias on that market.

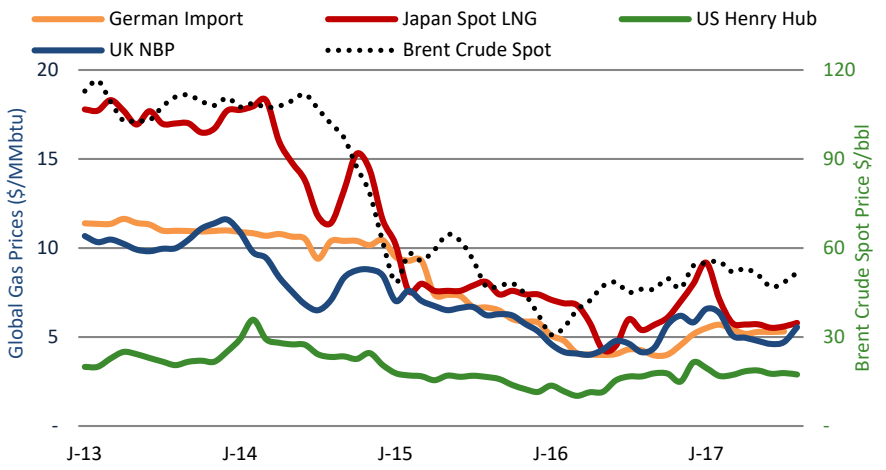
Similarly, if traders are short or increasing their short positions then we will have a bearish bias.

The change in long or short positions can reveal a little bit about the trend in investor sentiment. Declines in long positions have and increase in short positions indicate that there is some decline in bullish sentiment, and vice versa.

*Source: Commodity Futures Trading Commission, ICE, NYMEX, Reuters, ERCE Estimates. Note: each contract represents 1,000 bbls.* Longs are bets on higher prices while shorts are wagers on price drops. The net position squares off the two.

# Global and UK Natural Gas Spot Prices

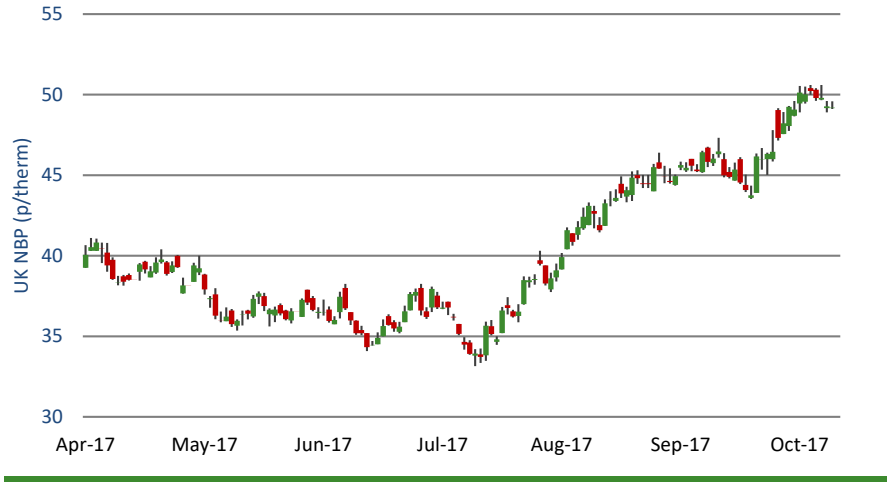
## Global Gas Prices (Jan 2013 to Aug 2017) Monthly Average Prices



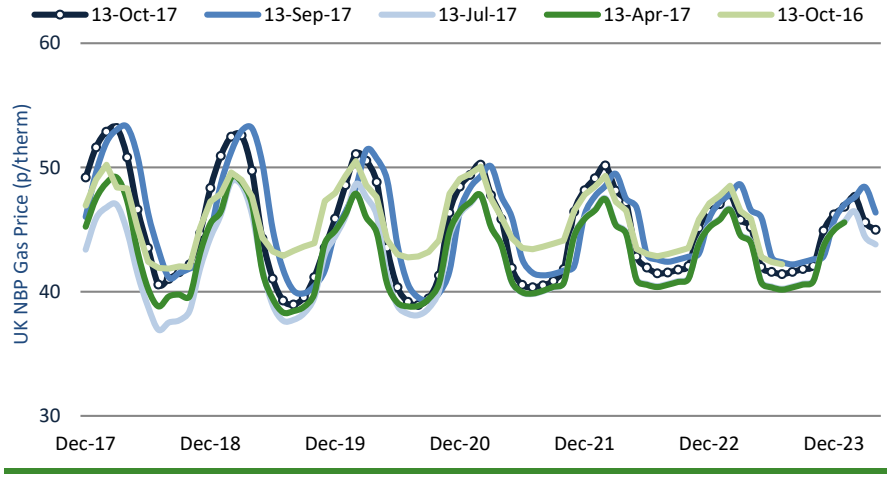

| Global Gas: Monthly Average Spot Prices | Jan-17 ($/MMbtu) | Aug-17 ($/MMbtu) | Jan to Aug 2017 % Chg |
|---|---|---|---|
| UK NBP | 6.6 | 5.6 | *-16%* |
| German Import | 5.5 | 5.3 | *-3%* |
| US Henry Hub | 3.3 | 2.9 | *-11%* |
| Japan LNG | 9.2 | 5.8 | *-37%* |
| Brent Crude ($/stb) | 54.9 | 51.7 | *-6%* |

| UK NBP Futures Prices (p/therm) | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|
| 13-Oct-17 | 49 | 46 | 45 | 45 | 44 | 45 | 44 |
| 13-Sep-17 | 50 | 47 | 45 | 45 | 45 | 45 | 45 |
| 13-Jul-17 | 44 | 42 | 42 | 43 | 43 | 43 | 43 |
| 13-Apr-17 | 44 | 43 | 43 | 43 | 43 | 43 | - |
| 13-Oct-16 | 45 | 46 | 46 | 46 | 45 | - | - |

## UK Natural Gas NBP Daily Spot Price: 6 Month Candlestick Chart




## UK Natural Gas NBP Futures Curve (Current Vs 1M, 3M, 6M and 1Yr Ago)



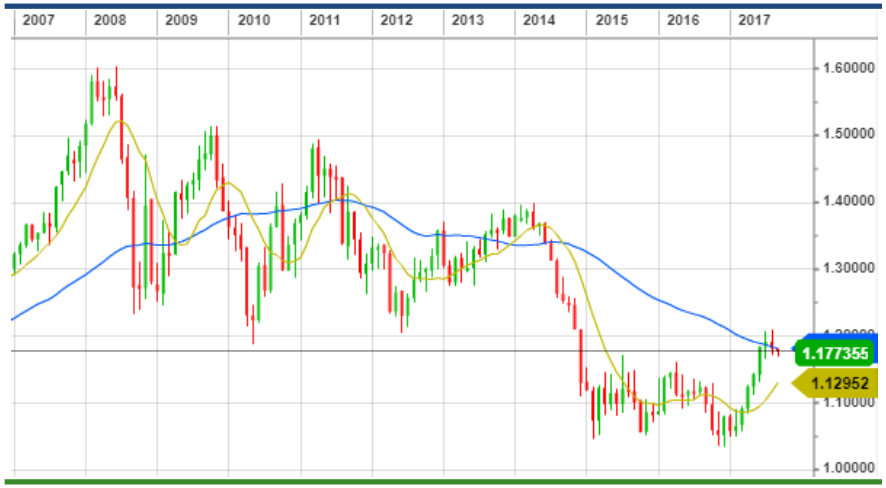

**The Gas Spot Price is the current price in a marketplace at which natural gas can be traded for immediate delivery.** Gas prices in the UK are commonly referenced to the UK National Balancing Point (NBP) price. In this model, gas anywhere in the national transmission system within the UK counts as NBP gas which allows simplification of trading as buyers and sellers are united in the same marketplace. The UK gas market is supplied from a wide range of sources including the liquefied natural gas tankers, imports piped from Norway and continental Europe, storage and the UK's own natural gas production.

*Source: Intercontinental Exchange, IMF, EIA, METI, Platts, Institute of Energy Economics (Japan), ERCE Estimates*

# Historical (10-year) Foreign Exchange (Spot) Rates

## GBP/USD Monthly Candlestick Chart (12MMA; 6MMA)


## EUR/USD Monthly Candlestick Chart (12MMA; 6MMA)




## CAD/USD Monthly Candlestick Chart (12MMA; 6MMA)


## NOK/USD Monthly Candlestick Chart (12MMA; 6MMA)


**Candlestick charts: each bar in the candlestick chart represents a month's opening, closing and intraday range. A green candlestick indicates a closing price above the opening price for that month and a red candlestick represents the opposite. The thin line above/below the bar indicates the intra-period trading range.**

*Source: CMC Markets, ERCE Estimates.*

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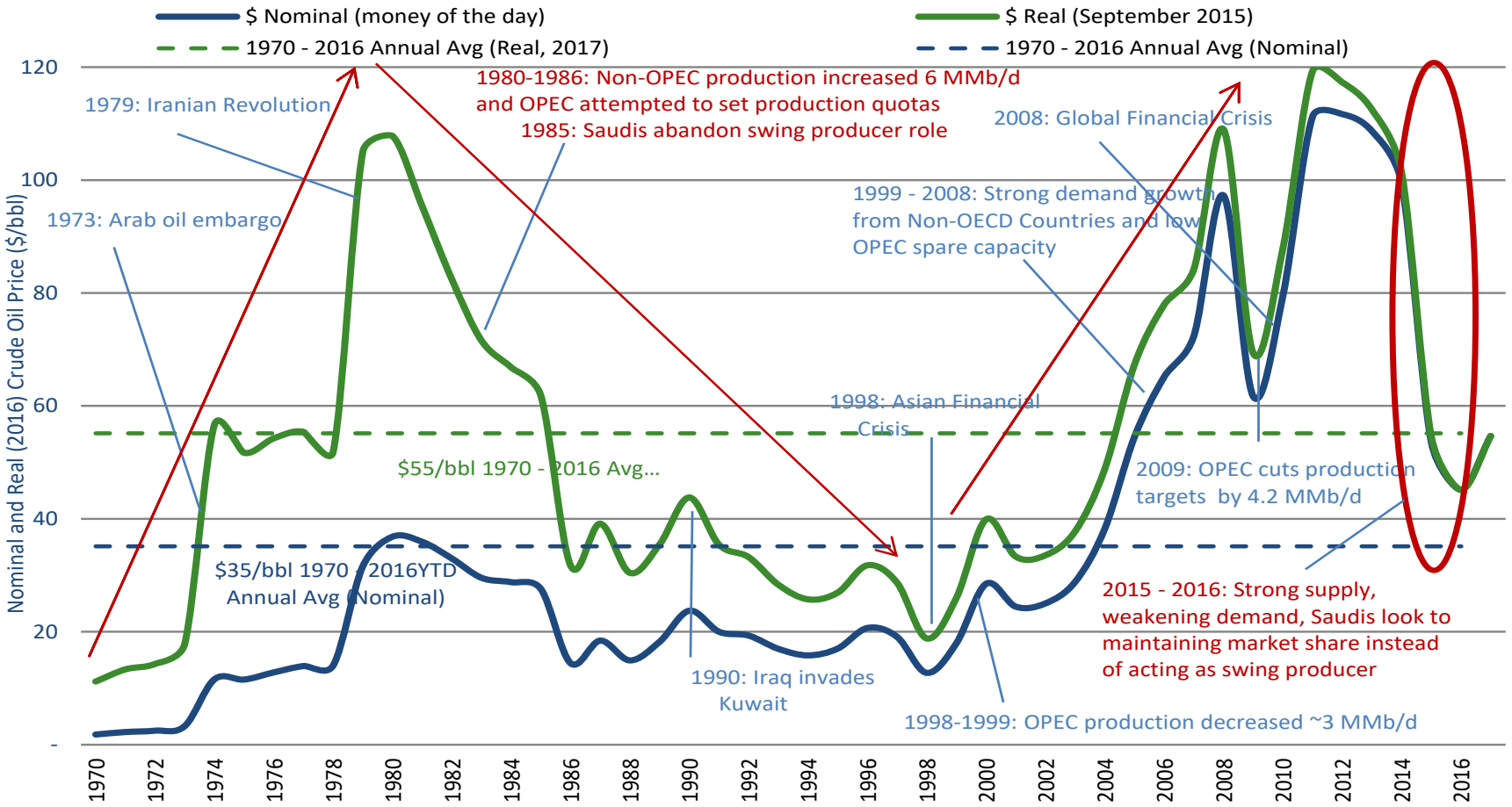
# Brent Crude Oil Spot Price Heat Map

| Year | Brent Crude Spot Price Monthly Average ($/bbl) | | | | | | | | | | | | Yearly Avg | Yearly Chg ($) | Yearly % Chg |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | | | |
| 1988 | 17 | 16 | 15 | 17 | 16 | 16 | 15 | 15 | 13 | 12 | 13 | 15 | 15 | (3) | -19% |
| 1989 | 17 | 17 | 19 | 20 | 19 | 18 | 18 | 17 | 18 | 19 | 19 | 20 | 18 | 3 | 22% |
| 1990 | 21 | 20 | 18 | 17 | 16 | 15 | 17 | 27 | 35 | 36 | 33 | 28 | 24 | 5 | 30% |
| 1991 | 24 | 20 | 19 | 19 | 19 | 18 | 19 | 20 | 21 | 22 | 21 | 18 | 20 | (4) | -15% |
| 1992 | 18 | 18 | 18 | 19 | 20 | 21 | 20 | 20 | 20 | 20 | 19 | 18 | 19 | (1) | -4% |
| 1993 | 17 | 18 | 19 | 19 | 19 | 18 | 17 | 17 | 16 | 17 | 15 | 14 | 17 | (2) | -12% |
| 1994 | 14 | 14 | 14 | 15 | 16 | 17 | 18 | 17 | 16 | 16 | 17 | 16 | 16 | (1) | -7% |
| 1995 | 17 | 17 | 17 | 19 | 18 | 17 | 16 | 16 | 17 | 16 | 17 | 18 | 17 | 1 | 8% |
| 1996 | 18 | 18 | 20 | 21 | 19 | 18 | 20 | 21 | 23 | 24 | 23 | 24 | 21 | 4 | 21% |
| 1997 | 24 | 21 | 19 | 18 | 19 | 18 | 18 | 19 | 18 | 20 | 19 | 17 | 19 | (2) | -7% |
| 1998 | 15 | 14 | 13 | 14 | 14 | 12 | 12 | 12 | 13 | 13 | 11 | 10 | 13 | (6) | -33% |
| 1999 | 11 | 10 | 13 | 15 | 15 | 16 | 19 | 20 | 23 | 22 | 25 | 25 | 18 | 5 | 40% |
| 2000 | 26 | 28 | 27 | 23 | 28 | 30 | 29 | 30 | 33 | 31 | 33 | 26 | 29 | 11 | 60% |
| 2001 | 26 | 28 | 25 | 26 | 28 | 28 | 25 | 26 | 26 | 21 | 19 | 19 | 24 | (4) | -14% |
| 2002 | 19 | 20 | 24 | 26 | 25 | 24 | 26 | 27 | 28 | 28 | 24 | 28 | 25 | 1 | 2% |
| 2003 | 31 | 33 | 31 | 25 | 26 | 28 | 28 | 30 | 27 | 30 | 29 | 30 | 29 | 4 | 16% |
| 2004 | 31 | 31 | 34 | 34 | 38 | 35 | 38 | 43 | 43 | 50 | 43 | 40 | 38 | 9 | 32% |
| 2005 | 45 | 45 | 53 | 52 | 49 | 54 | 58 | 64 | 63 | 59 | 55 | 57 | 54 | 16 | 42% |
| 2006 | 63 | 60 | 62 | 70 | 70 | 69 | 74 | 73 | 62 | 58 | 59 | 62 | 65 | 11 | 20% |
| 2007 | 54 | 58 | 62 | 67 | 67 | 71 | 77 | 71 | 77 | 82 | 92 | 91 | 72 | 7 | 11% |
| 2008 | 92 | 95 | 104 | 109 | 123 | 132 | 133 | 113 | 97 | 72 | 52 | 40 | 97 | 24 | 34% |
| 2009 | 43 | 43 | 47 | 50 | 57 | 69 | 64 | 73 | 68 | 73 | 77 | 74 | 61 | (35) | -37% |
| 2010 | 76 | 74 | 79 | 85 | 76 | 75 | 76 | 77 | 78 | 83 | 85 | 91 | 80 | 18 | 29% |
| 2011 | 97 | 104 | 115 | 123 | 115 | 114 | 117 | 110 | 113 | 110 | 111 | 108 | 111 | 32 | 40% |
| 2012 | 111 | 119 | 125 | 120 | 110 | 95 | 103 | 113 | 113 | 112 | 109 | 109 | 112 | 0 | 0% |
| 2013 | 113 | 116 | 108 | 102 | 103 | 103 | 108 | 111 | 112 | 109 | 108 | 111 | 109 | (3) | -3% |
| 2014 | 108 | 109 | 107 | 108 | 110 | 112 | 107 | 102 | 97 | 87 | 79 | 62 | 99 | (10) | -9% |
| 2015 | 48 | 58 | 56 | 60 | 64 | 61 | 57 | 47 | 48 | 48 | 44 | 38 | 52 | (47) | -47% |
| 2016 | 31 | 32 | 38 | 42 | 47 | 48 | 45 | 46 | 47 | 50 | 45 | 53 | 44 | (9) | -17% |
| 2017 | 56 | 56 | 52 | 54 | 51 | 48 | 49 | 52 | 55 | 56 | | | 53 | 9 | 22% |
| Monthly Chg: Increase (+) | 18 | 17 | 16 | 21 | 15 | 12 | 18 | 17 | 17 | 14 | 10 | 13 | 17 | | |
| Monthly Chg: Decrease (-) | 12 | 13 | 14 | 9 | 15 | 18 | 12 | 12 | 12 | 15 | 19 | 16 | 12 | | |
| Delta: Increase Less Decrease Count | 6 | 4 | 2 | 12 | - | (6) | 6 | 5 | 5 | (1) | (9) | (3) | 5 | | |
| Average MoM Chg ($) | 0.0 | 1.0 | 1.3 | 1.1 | 0.4 | 0.0 | 0.7 | 0.1 | (0.4) | (0.9) | (1.4) | (1.1) | 1.31 | | |
| Average MoM Chg (%) | 0.5% | 0.8% | 2.9% | 3.0% | 2.0% | -0.8% | 1.7% | 2.8% | 1.3% | -0.3% | -3.3% | -2.4% | 7.7% | | |

*Source: Intercontinental Exchange, U.S. Energy Information Administration, BP Statistical Review, ERCE Estimates*

# Long Term Crude Oil Price - Annual Average (1970 – 2017YTD)

## Oil Price History: Long-Term Crude Oil Price (Real Vs. Nominal)




- *Nominal - economic value expressed in historical nominal monetary terms, also known as "money-of-the-day".*
- *Real - Economic value that has been adjusted from a nominal value to remove the effects of general price level changes over time (using the CPI from US Bureau of Labour Statistics) and is thus measured in terms of the general price level in some reference year (the base year in this case 2016).*
- *1970-1983 Arabian Light posted at Ras Tanura; 1984-2013 Brent dated; 2014+ Brent spot.*

*Source: Intercontinental Exchange, U.S. Energy Information Administration, BP Statistical Review, ERCE Estimates*

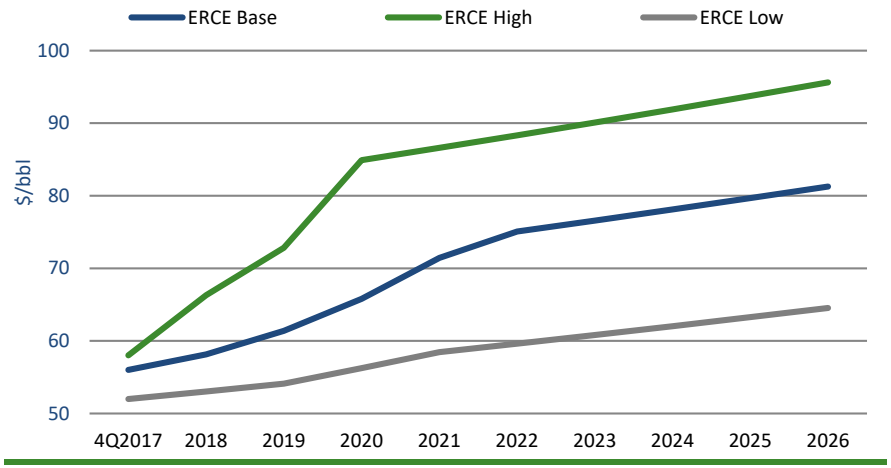
# ERCE Brent Oil Price Assumptions And Price Decks Assumed by Petroleum Consultants and Analysts

*In the absence of guidance from a client in relation to oil price assumptions, ERCE would assume the oil price scenarios presented in the following slide. These oil price scenarios are derived in context of the information available in the public domain and should not be construed as oil price forecasts, predictions or projections by ERCE.*

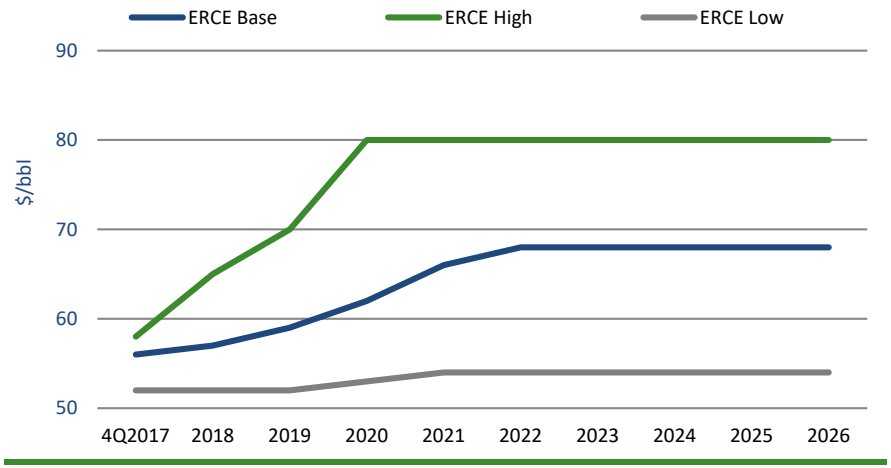
*The low and high oil price paths depicted in the following slide(s) are not intended to provide lower and upper bounds for future oil prices but rather to allow the analysis of possible future world oil market conditions that differ significantly from those assumed in the base case.*

# ERCE Brent Oil Price Assumptions: Low, Base and High

## ERCE Nominal Brent Oil Price Assumptions




## ERCE Real (Real 2017) Brent Oil Price Assumptions




| Low Case ERCE Brent Assumptions ($/bbl) | 4Q2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2026E+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Real (Constant $, 2017) | 52 | 52 | 52 | 53 | 54 | 54 | 54 | 54 | 54 | 54 | 54 |
| Nominal ($ of the day) | 52 | 53 | 54 | 56 | 58 | 60 | 61 | 62 | 63 | 65 | +2.0% pa |
| *Escalation rate p.a.* | *2.00%* | | | | | | | | | | |

| Base Case ERCE Brent Assumptions ($/bbl) | 4Q2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2026E+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Real (Constant $, 2017) | 56 | 57 | 59 | 62 | 66 | 68 | 68 | 68 | 68 | 68 | 68 |
| Nominal ($ of the day) | 56 | 58 | 61 | 66 | 71 | 75 | 77 | 78 | 80 | 81 | +2.0% pa |
| *Escalation rate p.a.* | *2.00%* | | | | | | | | | | |

| High Case ERCE Brent Assumptions ($/bbl) | 4Q2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2026E+ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Real (Constant $, 2017) | 58 | 65 | 70 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| Nominal ($ of the day) | 58 | 66 | 73 | 85 | 87 | 88 | 90 | 92 | 94 | 96 | +2.0% pa |
| *Escalation rate p.a.* | *2.00%* | | | | | | | | | | |

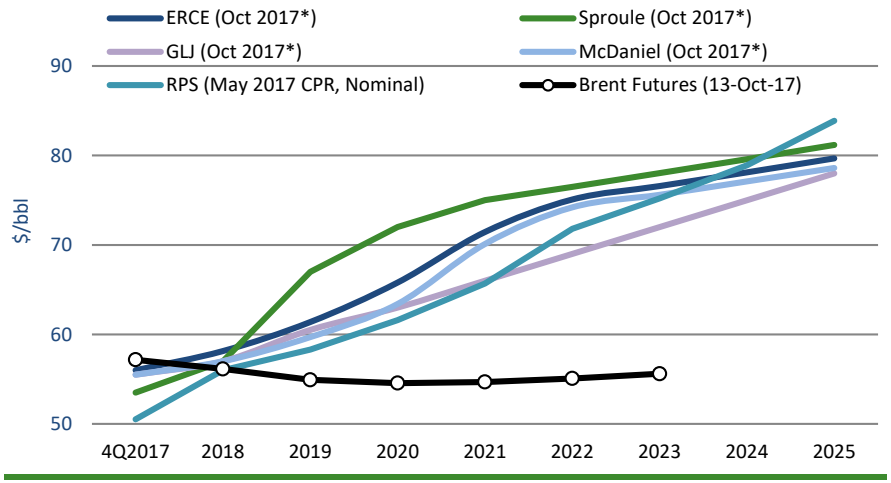
| Brent Futures (13-Oct-17) | 57 | 56 | 55 | 55 | 55 | 55 | 56 |
|---|---|---|---|---|---|---|---|

*(Brent Futures 2017 combines a weighted average of the historical spot prices and future price for the remaining year's balance)*

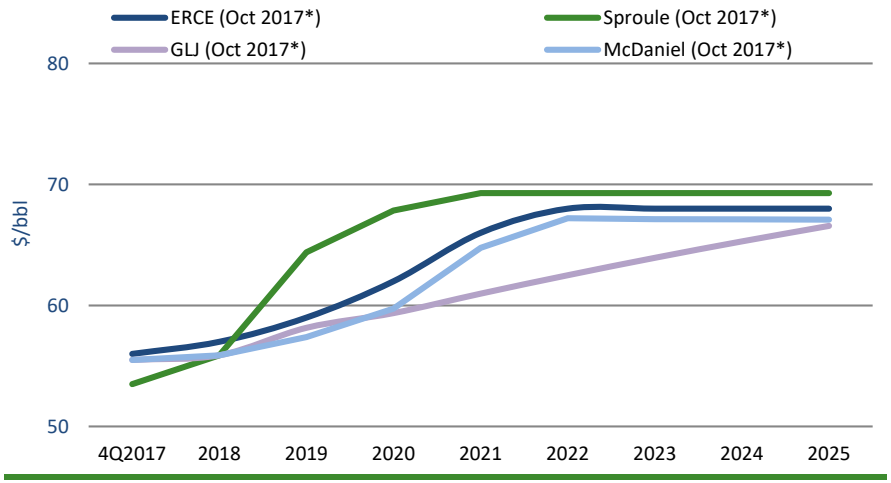
*Source: Intercontinental Exchange, ERCE Estimates.*

# Brent Oil Price Assumptions by Petroleum Consultants

## Nominal (Money of the Day) Brent Oil Price Assumptions




## Real 2017 (Constant US$) Brent Oil Price Assumptionss




| Brent Nominal ($/bbl) | 4Q2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|
| ERCE (Oct 2017*) | 56 | 58 | 61 | 66 | 71 | 75 | 77 | 78 | 80 | +2.0% pa |
| Sproule (Oct 2017*) | 54 | 57 | 67 | 72 | 75 | 77 | 78 | 80 | 81 | +2.0% pa |
| GLJ (Oct 2017*) | 56 | 57 | 61 | 63 | 66 | 69 | 72 | 75 | 78 | +2.0% pa |
| McDaniel (Oct 2017*) | 56 | 57 | 60 | 63 | 70 | 74 | 76 | 77 | 79 | +2.0% pa |
| *Average* | *55* | *57* | *62* | *66* | *71* | *74* | *76* | *77* | *79* | |
| **Brent Futures (13-Oct-17)** | 57 | 56 | 55 | 55 | 55 | 55 | 56 | | | |

| Brent Real ($/bbl) | 4Q2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|
| ERCE (Oct 2017*) | 56 | 57 | 59 | 62 | 66 | 68 | 68 | 68 | 68 | 68 |
| Sproule (Oct 2017*) | 54 | 56 | 64 | 68 | 69 | 69 | 69 | 69 | 69 | 69 |
| GLJ (Oct 2017*) | 56 | 56 | 58 | 59 | 61 | 62 | 64 | 65 | 67 | 75 |
| McDaniel (Oct 2017*) | 56 | 56 | 57 | 60 | 65 | 67 | 67 | 67 | 67 | 73 |
| *Average* | *55* | *56* | *60* | *62* | *65* | *67* | *67* | *67* | *68* | *71* |

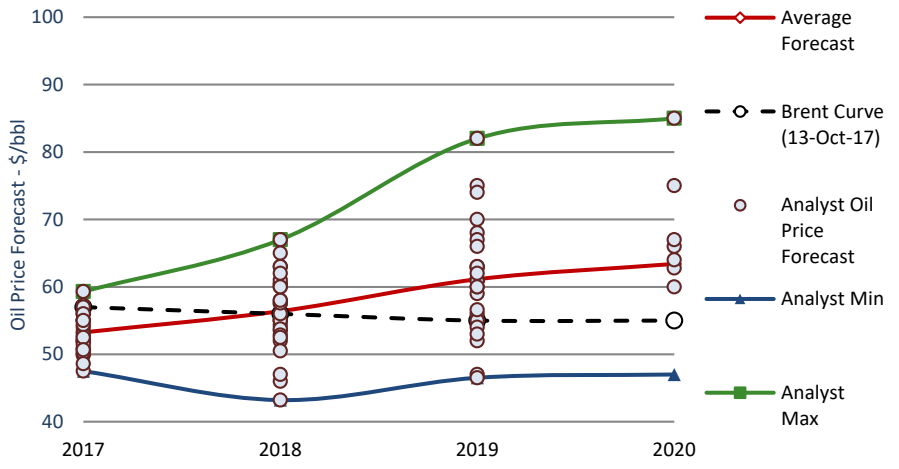
| | ERCE | Sproule | GLJ | McDaniel | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Escalation rate p.a.* | *2.00%* | *2.00%* | *2.00%* | *2.00%* | | | | | |
| *RPS (May 2017 CPR, Nominal)* | *51* | *56* | *58* | *62* | *66* | *72* | *75* | *79* | *84* |

*Source: Sproule, GLJ, McDaniel, ERCE Estimates. Note: *publication date. Note: *Estimates for 2017 are for the remaining year's balance. RPS May 2017 CPR profile is taken from Hurricane Energy CPR.*

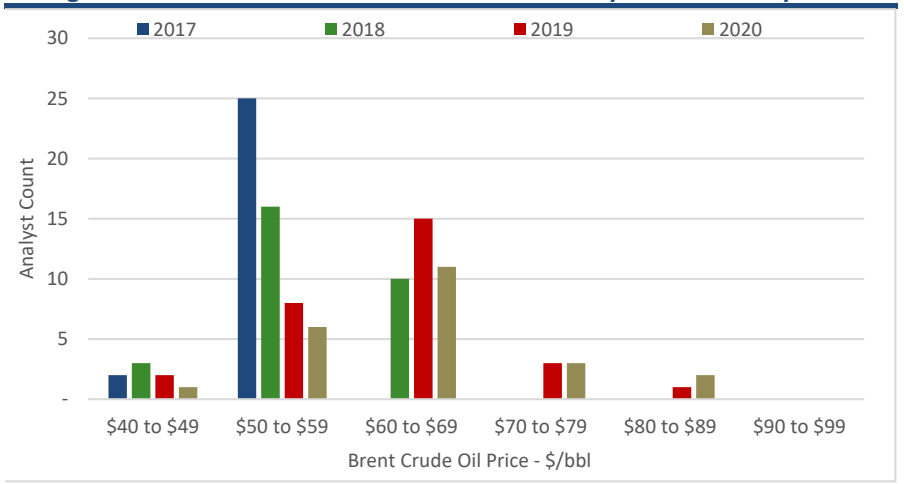
# Brent Crude Oil Price Forecasts by Oil Analysts

| Source: Bloomberg | 2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| ABN AMRO Bank NV | 55 | 63 | 68 | | |
| Bank of Nova Scotia/The | 53 | 56 | 61 | 66 | |
| Barclays PLC | 56 | 67 | 82 | 85 | |
| BMI Research | 54 | 55 | 61 | 67 | 69 |
| Cantor Fitzgerald | 50 | 65 | 75 | 75 | 75 |
| Citigroup Inc | 52 | 52 | 52 | | |
| Credit Suisse | 59 | 60 | 63 | 63 | |
| Danske Bank A/S | 52 | 58 | 61 | | |
| Deutsche Bank | 53 | 54 | 56 | 60 | 60 |
| Goldman Sachs | 48 | 55 | 55 | | |
| Guggenheim Securities LLC | 51 | 58 | 67 | 64 | |
| HSH Nordbank AG | 53 | 46 | 55 | 53 | 55 |
| Intesa Sanpaolo SpA | 52 | 54 | 59 | 63 | 64 |
| Itau Unibanco Holding SA | 50 | 47 | 47 | 47 | 47 |
| JP Morgan | 55 | 55 | 60 | 60 | 60 |
| Macquarie | 57 | 56 | 61 | 70 | 70 |
| Market Risk Advisory | 51 | 54 | 61 | 65 | 67 |
| Natixis SA | 57 | 61 | 70 | 80 | 90 |
| NE Nomisma Energia Srl | 50 | 53 | 57 | 59 | 60 |
| NLG | 55 | 60 | 63 | | |
| Promsvyazbank PJSC | 54 | 58 | 61 | 56 | 60 |
| Raiffeisen Bank | 56 | 58 | 63 | 65 | 70 |
| RBC | 57 | 63 | 74 | | |
| Santander UK PLC | 52 | 53 | 54 | 55 | 55 |
| Standard Chartered Bank | 56 | 61 | 62 | 65 | |
| Stifel | 53 | 60 | 60 | 60 | 60 |
| VTB Capital PLC | 55 | 62 | 66 | 70 | 70 |
| Wells Fargo Securities LLC | 51 | 51 | 53 | 55 | |
| Westpac Banking Corp | 49 | 43 | 47 | 55 | |
| **Mean** | **53** | **56** | **61** | **63** | **65** |
| **Median** | **53** | **56** | **61** | **63** | **62** |
| **Max** | **59** | **67** | **82** | **85** | **90** |
| **Min** | **48** | **43** | **47** | **47** | **47** |
| **Brent Curve (13-Oct-17)** | **57** | **56** | **55** | **55** | **55** |

**Oil Price Forecasts by Financial Analysts**



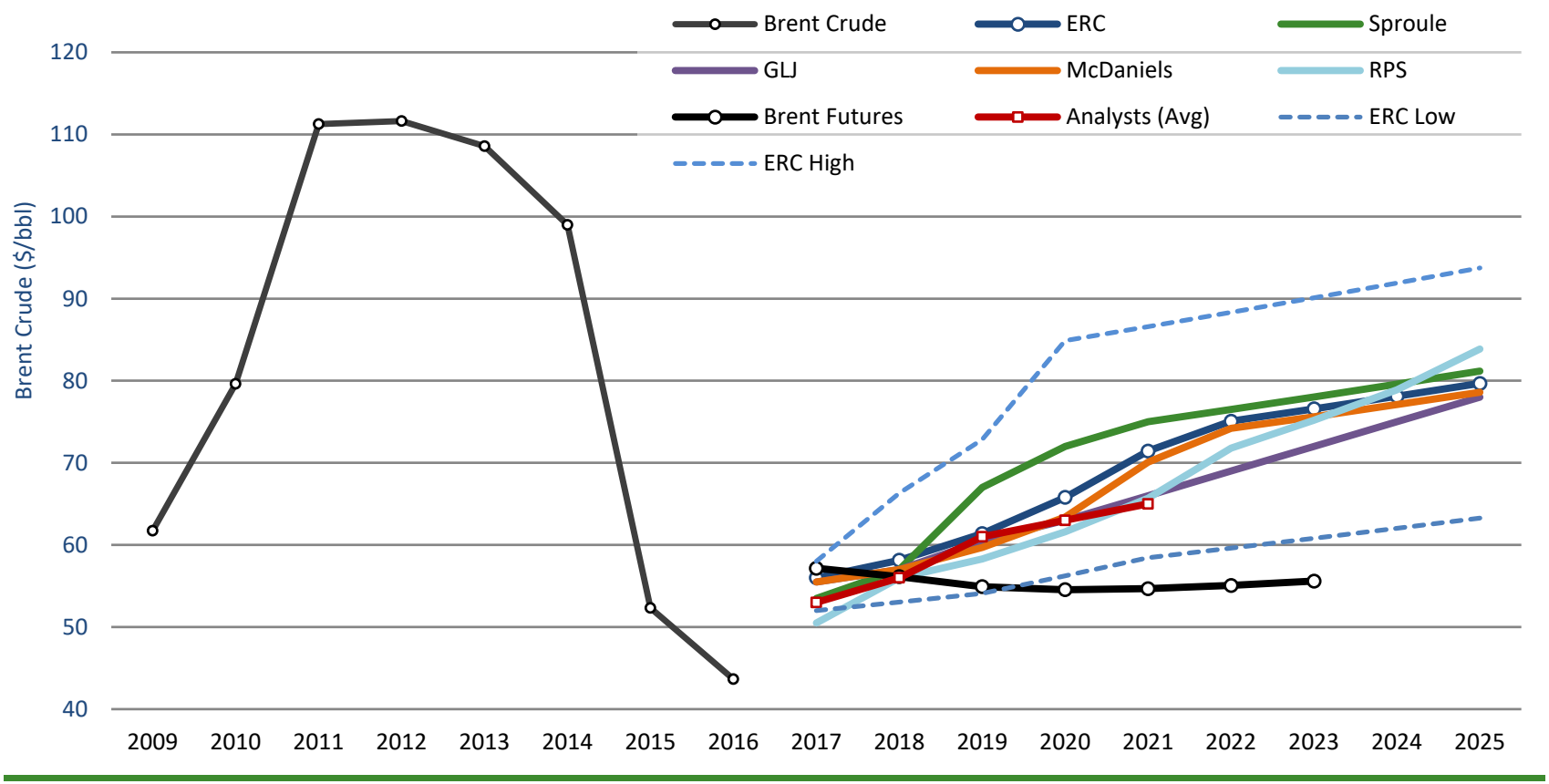

**Histogram of Annual Brent Crude Oil Price Forecasts by Financial Analysts**




*Source: Bloomberg, Reuters, Intercontinental Exchange, Research Reports, ERCE Estimates*

# Brent Crude Oil Price Deck Summary: Petroleum Consultants, Analysts and Futures Curve

## Nominal Brent Crude Forecast by Consultants, Analysts Vs. Brent Historical and Futures Curve



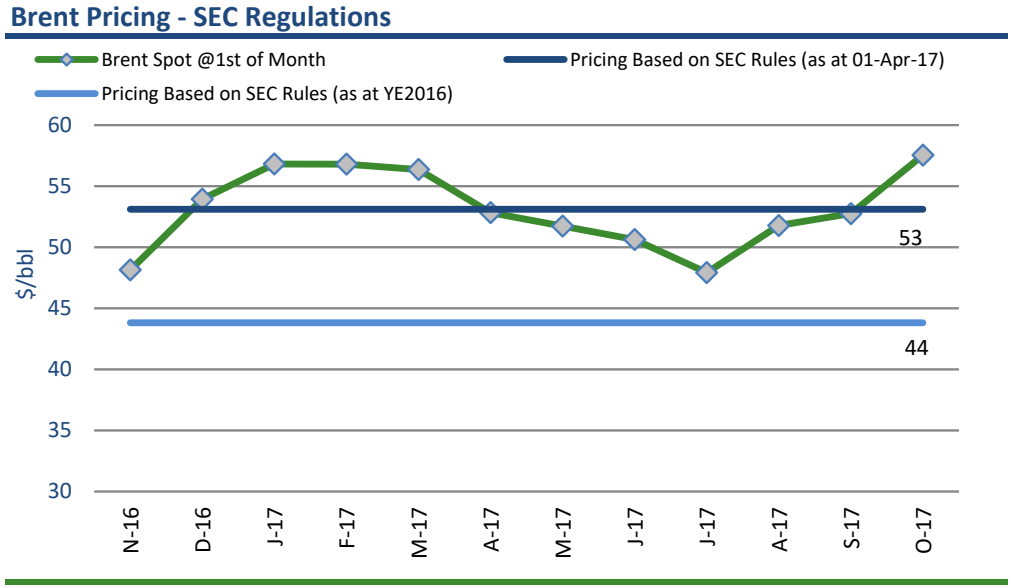

*(Brent Futures 2017 is the arithmetic average of the futures contracts for the remaining year's balance)*

| | 4Q2017 | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|---|
| Petroleum Consultants (Average) | 55 | 57 | 62 | 66 | 71 |
| Financial Analysts (Average) | 53 | 56 | 61 | 63 | 65 |
| Brent Futures (13-Oct-17) | 57 | 56 | 55 | 55 | 55 |

*Source: Sproule, GLJ, McDaniel, Bloomberg, Reuters, Intercontinental Exchange, ERCE Estimates.*

# Brent Pricing Based on SEC Regulations (YE2015 Vs Y2016)

| Rolling 12M | Brent Spot @1st of Month | Rolling 12M | Brent Spot @1st of Month (2016) |
|---|---|---|---|
| Date | ($/stb) | Date | ($/stb) |
| 01-Oct-17 | 58 | 01-Oct-16 | 49 |
| 01-Sep-17 | 53 | 01-Sep-16 | 45 |
| 01-Aug-17 | 52 | 01-Aug-16 | 42 |
| 01-Jul-17 | 48 | 01-Jul-16 | 50 |
| 01-Jun-17 | 51 | 01-Jun-16 | 50 |
| 01-May-17 | 52 | 01-May-16 | 48 |
| 01-Apr-17 | 53 | 01-Apr-16 | 39 |
| 01-Mar-17 | 56 | 01-Mar-16 | 37 |
| 01-Feb-17 | 57 | 01-Feb-16 | 34 |
| 01-Jan-17 | 57 | 01-Jan-16 | 37 |
| 01-Dec-16 | 54 | 01-Dec-15 | 44 |
| 01-Nov-16 | 48 | 01-Nov-15 | 50 |
| **12M Arith. Avg** | **53** | **12M Arith. Avg** | **44** |

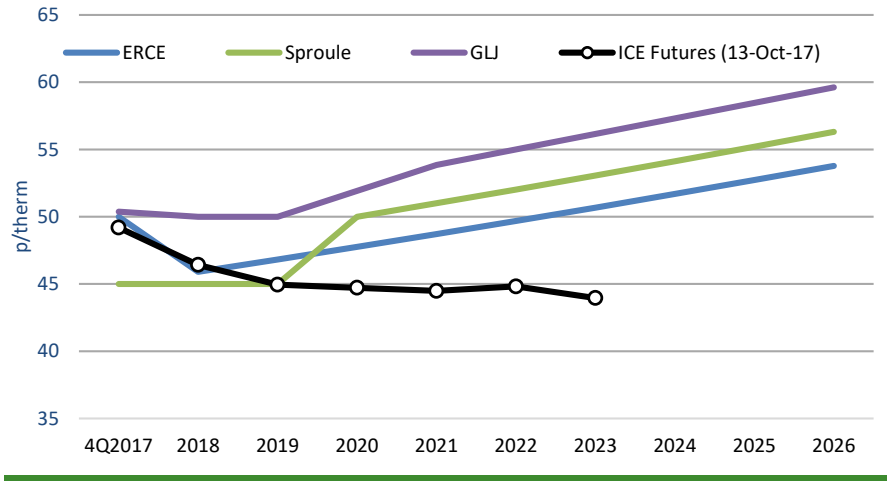



- **Shown for reference purposes only, the data above indicates the current Brent price as defined by SEC regulations.**
- **This is calculated by taking the 12-month unweighted arithmetic average of 1st-day-of-the-month Brent prices.**
- ***Definition 22.V (31 December 2009): "Existing economic conditions include prices and costs at which economic producibility from a reservoir is to be determined. The price shall be the average price during the 12-month period prior to the ending date of the period covered by the report, determined as an unweighted arithmetic average of the first-day-of-the-month price for each month within such period, unless prices are defined by contractual arrangements, excluding escalations based upon future conditions."***

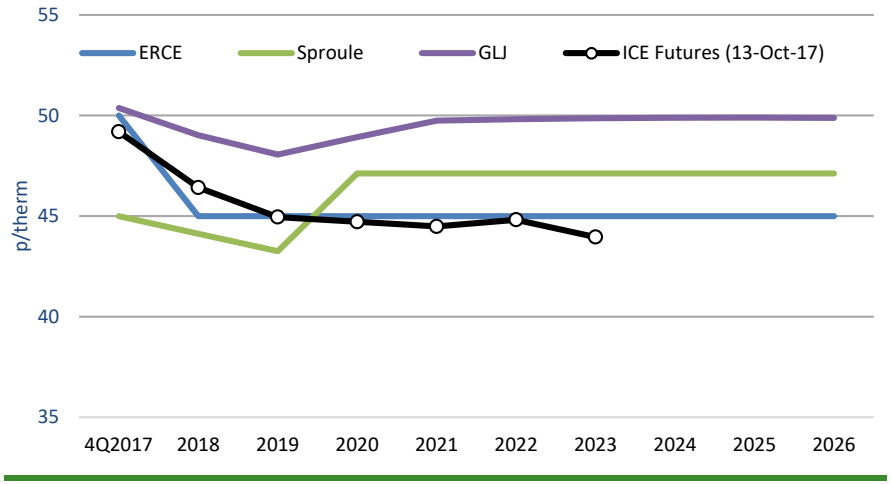
*Source: Intercontinental Exchange, SEC, ERCE Estimates*

# UK NBP Natural Gas Price Assumptions by Petroleum Consultants

### Nominal (Money of the Day) UK NBP Natural Gas Price Assumptions




### Real 2017 (Constant US$) UK NBP Natural Gas Price Assumptionss




| UK NBP Gas Price (Nominal) (p/therm) | 4Q2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|
| ERCE | 50 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 |
| Sproule | 45 | 45 | 45 | 50 | 51 | 52 | 53 | 54 | 55 | 56 |
| GLJ | 50 | 50 | 50 | 52 | 54 | 55 | 56 | 57 | 58 | 60 |
| ICE Futures (13-Oct-17) | 49 | 46 | 45 | 45 | 44 | 45 | 44 | | | |

| UK NBP Gas Price (Real) (p/therm) | 4Q2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|
| ERCE | 50 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 | 45 |
| Sproule | 45 | 44 | 43 | 47 | 47 | 47 | 47 | 47 | 47 | 47 |
| GLJ | 50 | 49 | 48 | 49 | 50 | 50 | 50 | 50 | 50 | 50 |

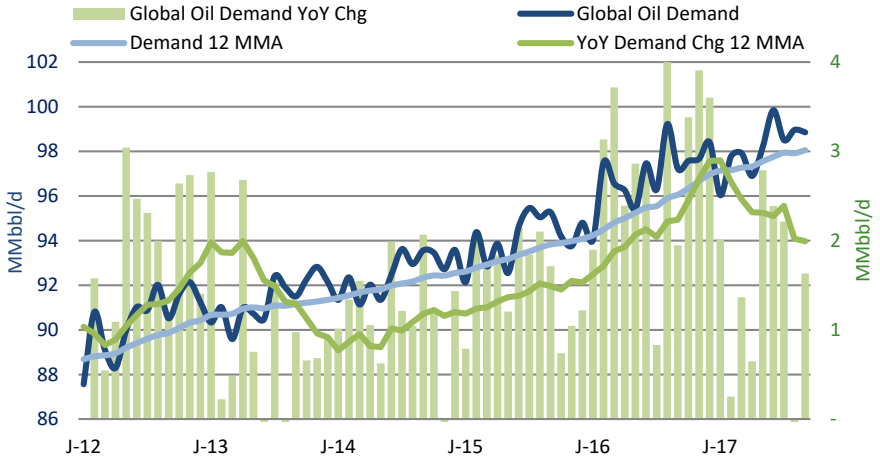
*Source: Sproule, GLJ, McDaniel, ERCE Estimates. Note: *publication date. Note: *Estimates for 2017 are for the remaining year's balance.*

# A Review of Oil Market Fundamentals and Trends

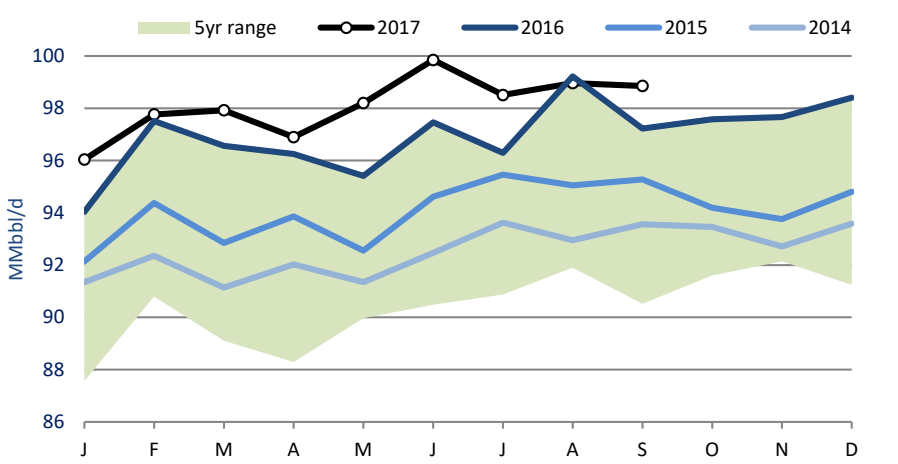
# Global Oil Demand Growth

**The IEA, EIA and OPEC all revised their expectations that global oil demand will be higher for the remainder of 2017 estimating YoY demand growth of between 1.5 and 1.6 MMbbl/d. Figures from the energy agencies show that OECD oil demand, which declined between 2005 and 2014, has grown rapidly in the last three years after oil prices collapsed.**

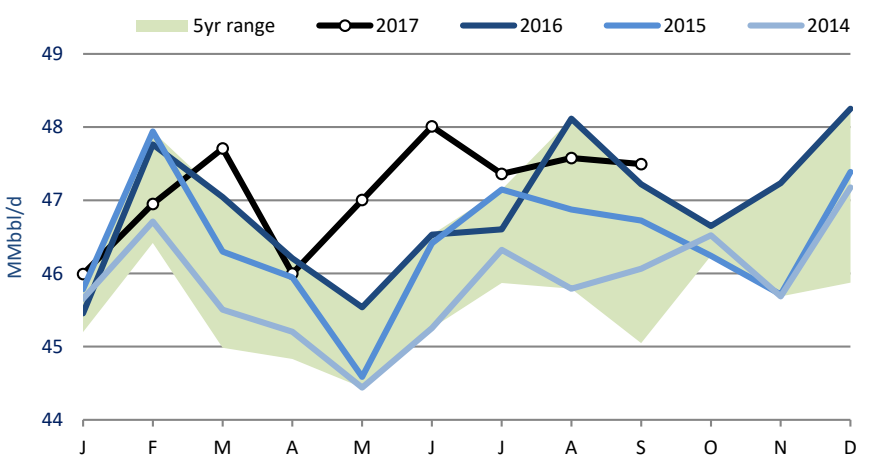
## Global Oil Demand and YoY Change



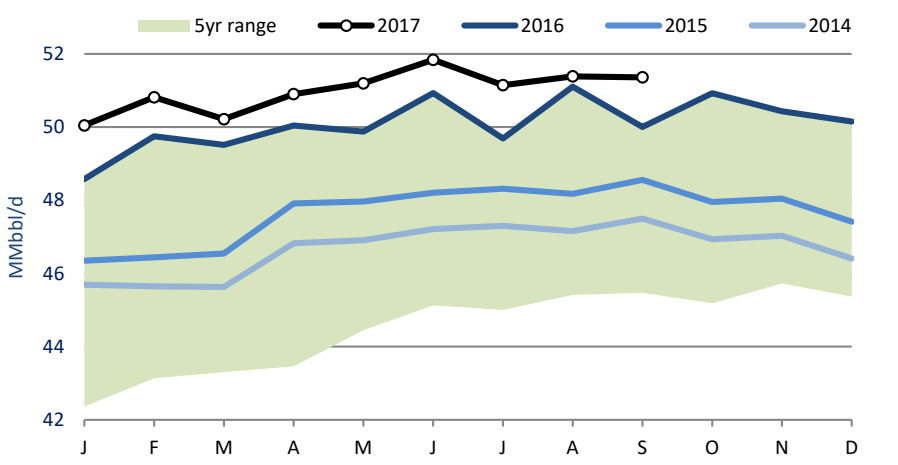

## Seasonal Global Oil Demand and 5-Yr Range




## Seasonal OECD Oil Demand and 5 Yr Range




## Seasonal Non-OECD Oil Demand and 5 Yr Range

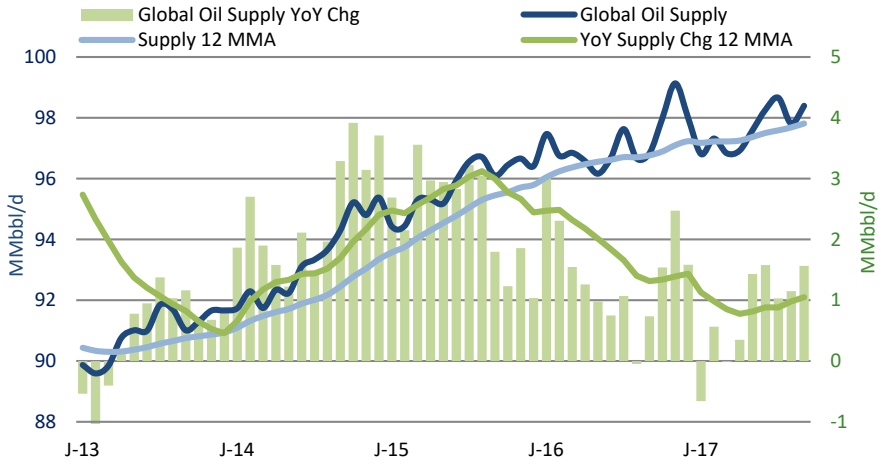



*Source: U.S. Energy Information Administration, International Energy Agency, ERCE Estimates*

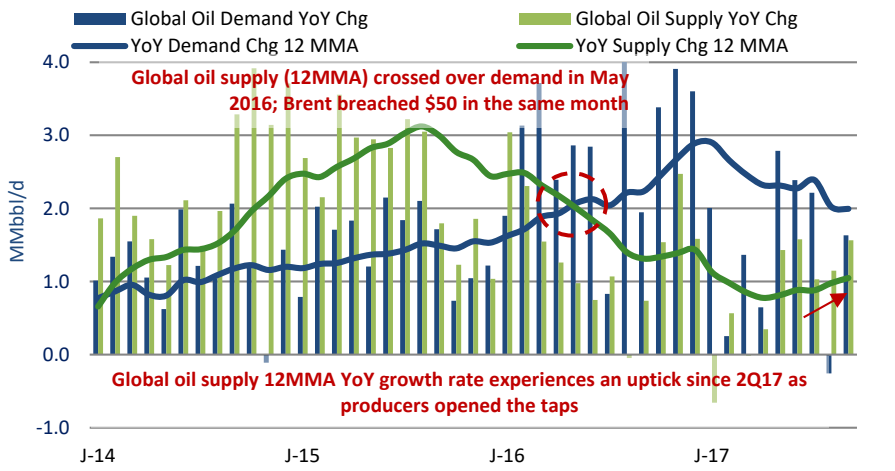
# Global Oil Supply and Non-OPEC Supply

**The IEA continues to warn of a spike in the oil price in the years to come due to lack of investment in developing new oil production, estimating that the industry will require an additional 21 MMbbl/d of new supply by 2025 just to keep production flat but with only 5 MMbbl/d of new supply in the pipeline implying a gap of 16 MMbbl/d to be filled.**

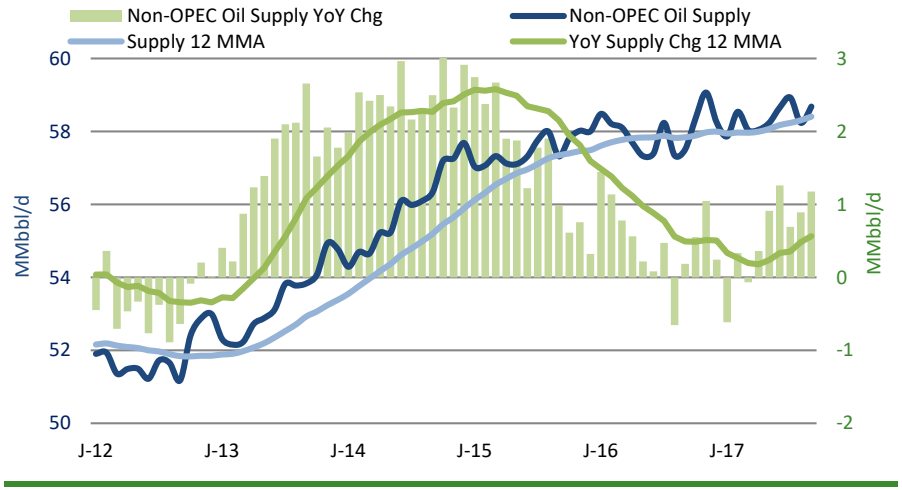
## Global Oil Supply and YoY Change



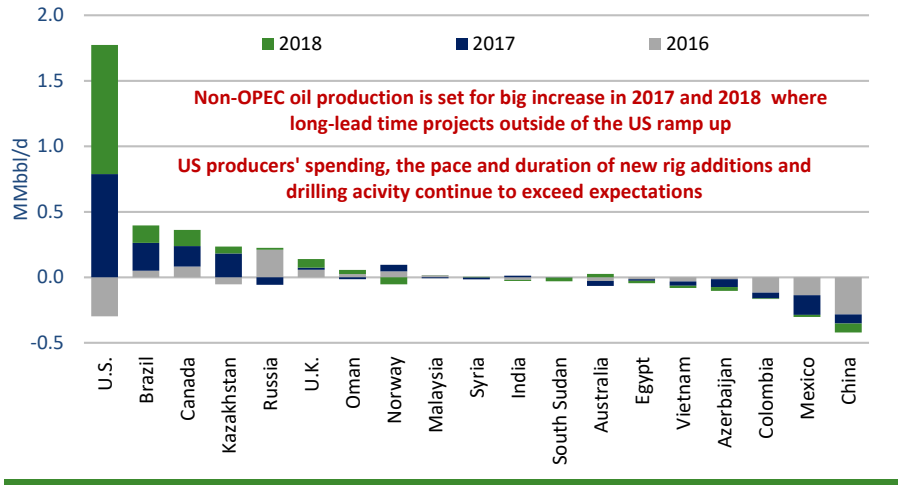

## Global Oil Demand YoY Change Vs. Global Oil Supply YoY Change




## Non-OPEC Crude Oil and Liquid Fuels Supply




## Non-OPEC Oil Production Growth 2016, 2017 and 2018

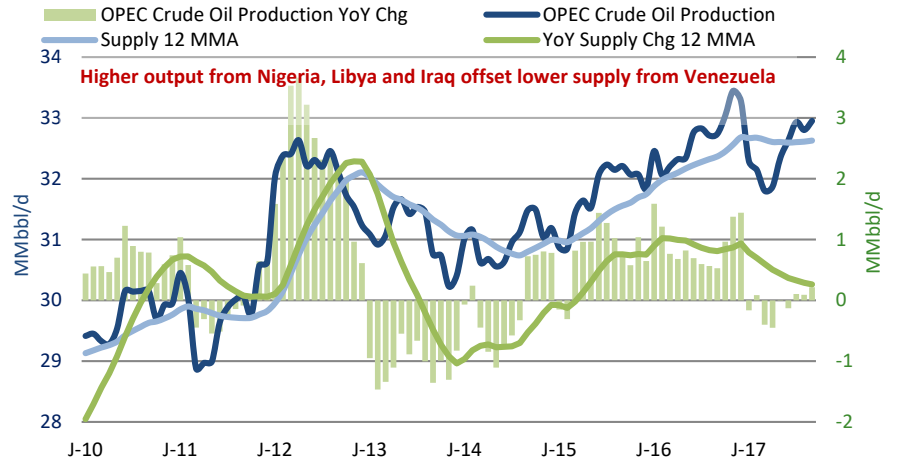



*Source: U.S. Energy Information Administration, International Energy Agency, ERCE Estimates*

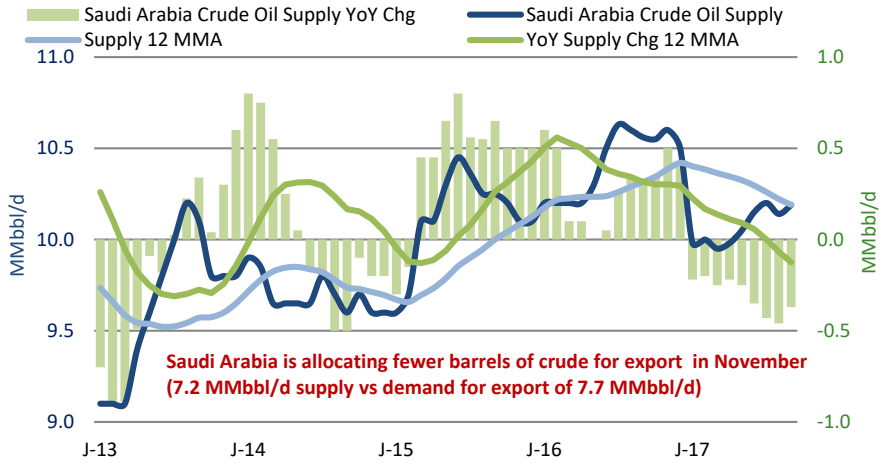
# OPEC Agreement Extended to March 2018

**OPEC agreed to reduce oil output by 1.2 MMbbl/d from January 2017 and secured a reduction of ~0.56 MMbbl/d from non-OPEC producers for an initial 6 month period, marking the first output cut since 2008 and the first deal to include non-OPEC producers since 2001. This agreement was then extended to March 2018. OPEC will decide on whether to further extend or not at its next meeting, which takes place on November 30 in Vienna.**

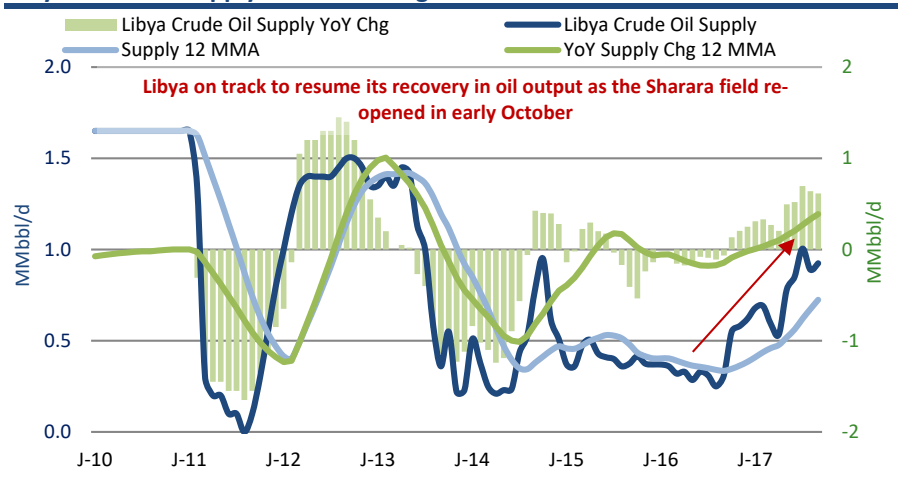
## OPEC Crude Oil Production and YoY Change



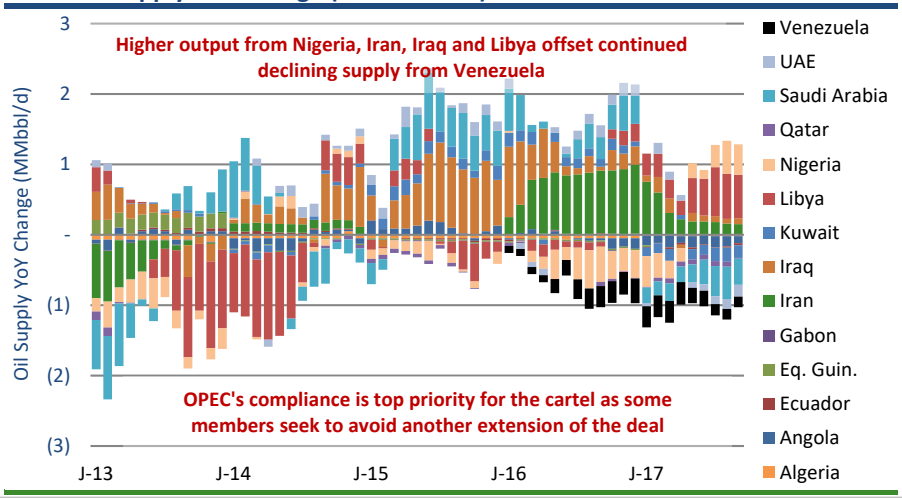

## Saudi Arabia Crude Oil Supply and YoY Change




## Libya Crude Oil Supply and YoY Change



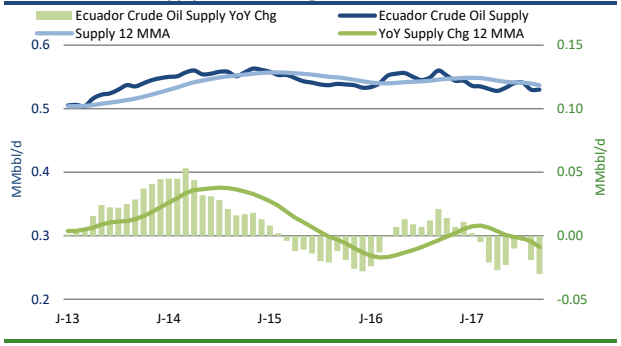

## OPEC Oil Supply YoY Change (All Members)



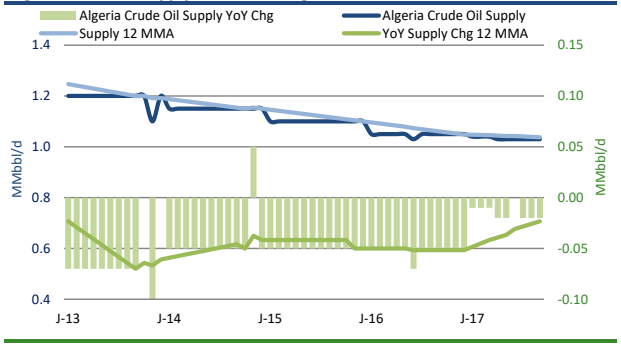

*Source: U.S. Energy Information Administration, IEA, Reuters, ERCE Estimates.*

# OPEC Production Trends

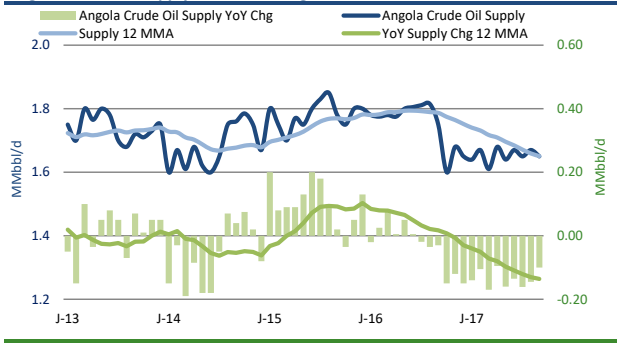
## Ecuador Crude Oil Supply and YoY Change



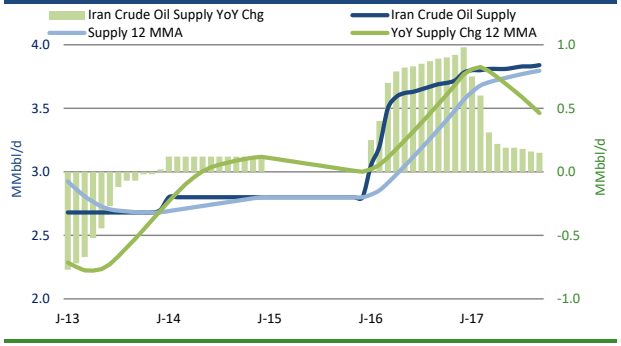

## Algeria Crude Oil Supply and YoY Change



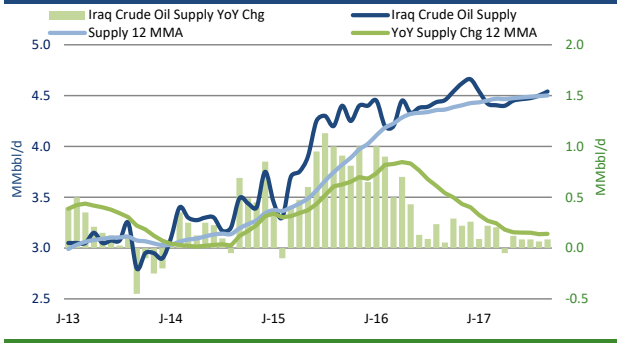

## Angola Crude Oil Supply and YoY Change



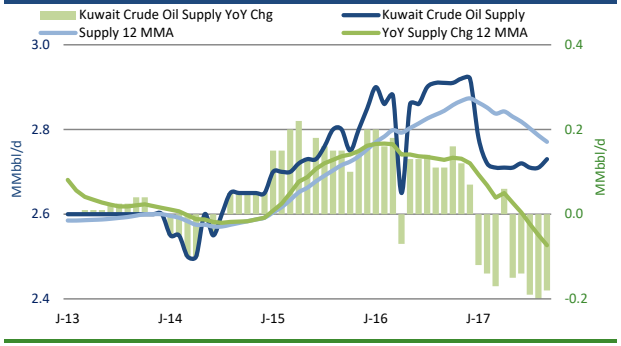

## Iran Crude Oil Supply and YoY Change



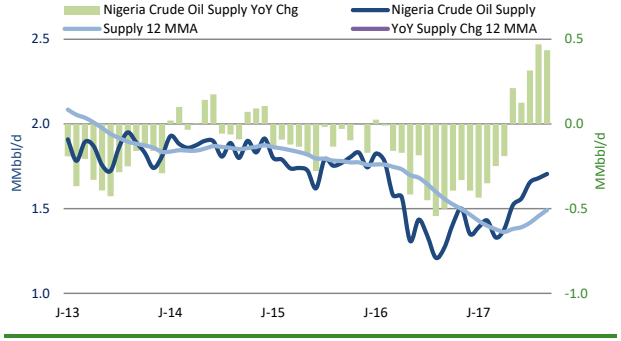

## Iraq Crude Oil Supply and YoY Change



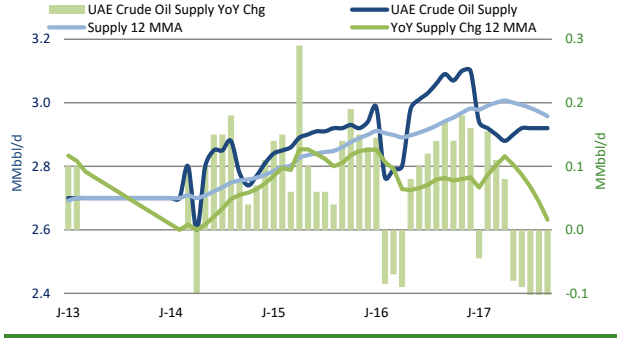

## Kuwait Crude Oil Supply and YoY Change



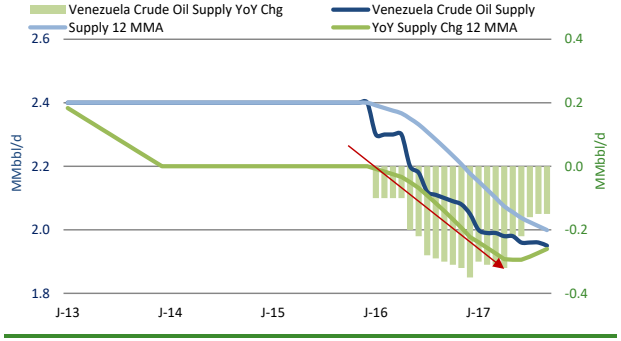

## Nigeria Crude Oil Supply and YoY Change




## UAE Crude Oil Supply and YoY Change




## Venezuela Crude Oil Supply and YoY Change

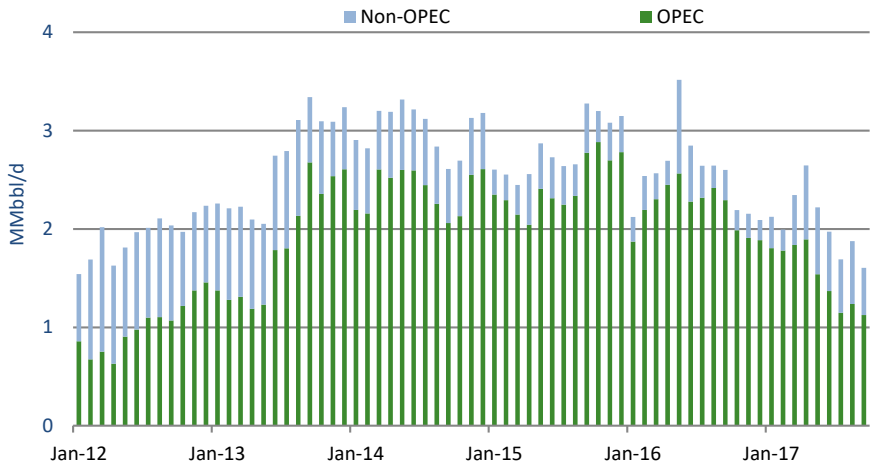



*Source: U.S. Energy Information Administration, IEA, Reuters, ERCE Estimates*

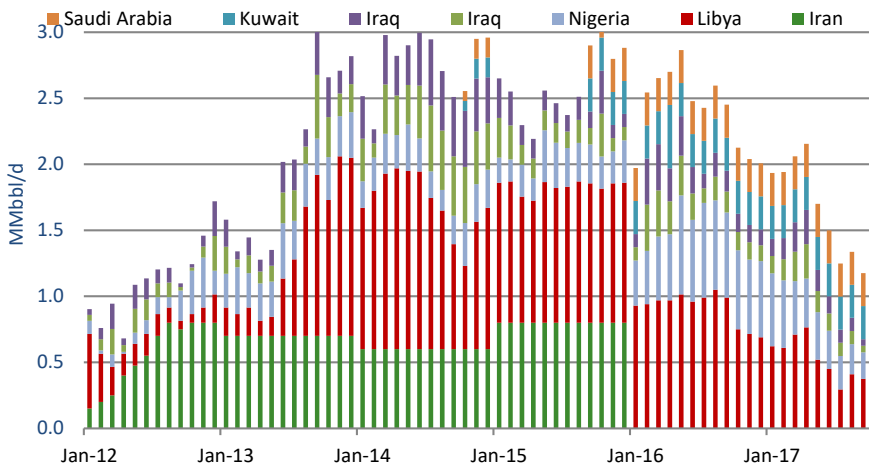
# Unplanned Outages and OPEC Production Spare Capacity

**The level of unplanned crude oil production outages, how quickly it occurs, and the uncertainty of restoring the output have considerable influence on oil prices. Unplanned supply disruptions could still affect crude oil prices and OPEC surplus crude oil production capacity is at low levels (as a % of demand). However, the threshold that the market can bear has risen in light of robust global production and strong increases in inventory levels.**

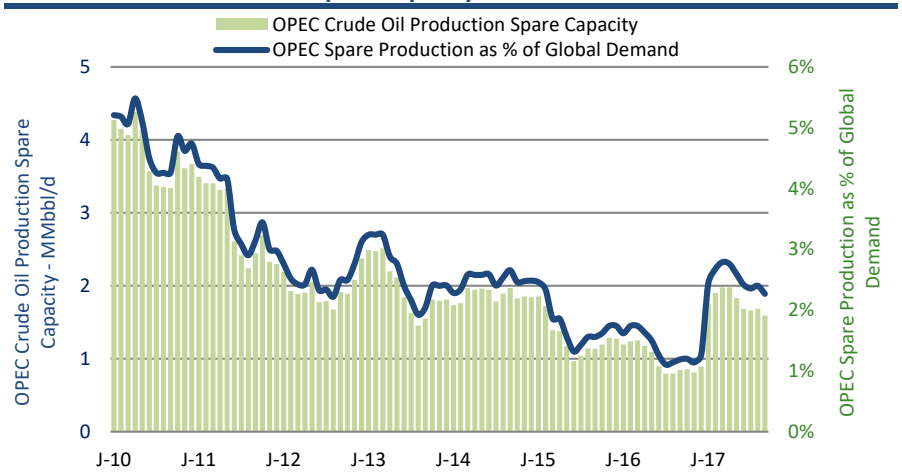
## Unplanned Crude Oil Production Outages




## Unplanned OPEC Crude Oil Production Outages




## OPEC Crude Oil Production Spare Capacity



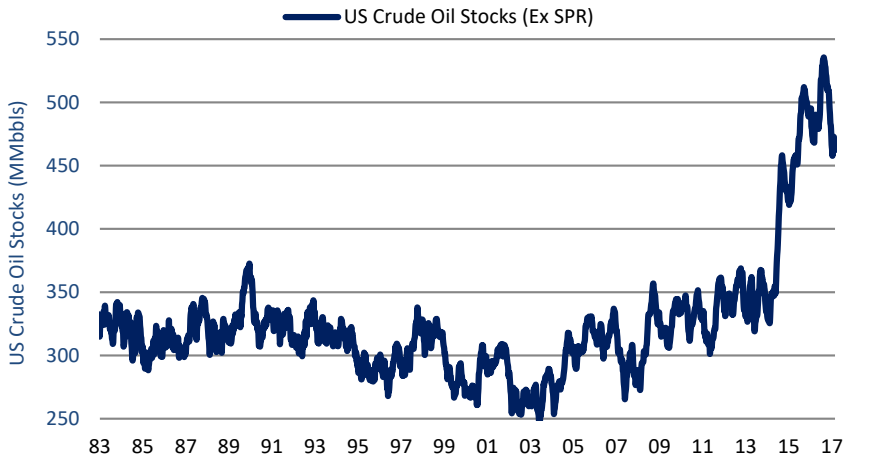

- **OPEC spare capacity is the volume of production that can be brought on within 30 days and sustained for at least 90 days.**
- **OPEC spare capacity provides an indicator of the world oil market's ability to respond to supply shocks.**
- **From 2003 through 2008, OPEC's total spare capacity remained near or below 2 MMbbl/d, which provided very little cushion for fluctuations in supply in a context of rapidly rising demand.**

*Source: U.S. Energy Information Administration, ERCE Estimates*

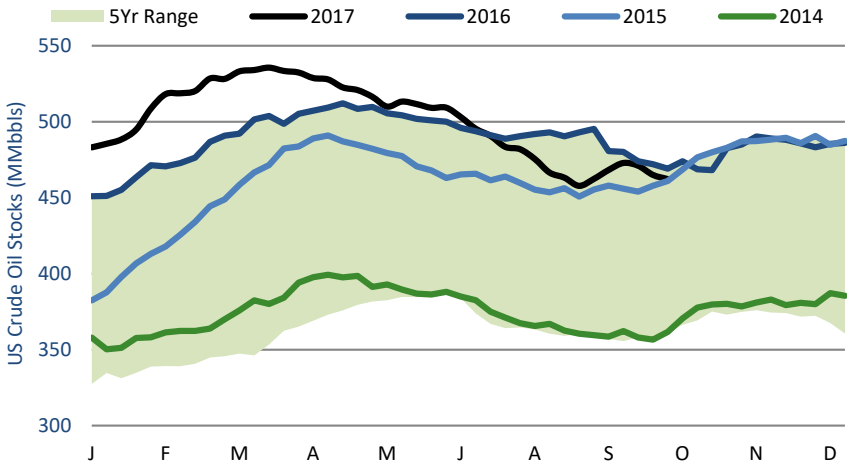
# OECD and U.S. Commercial Oil Inventories

**OECD oil stocks fell slightly in prelim June numbers on lower imports of crude and products but remain significantly above five-year average. OECD oil stocks resumed its slow pace of reduction in 2Q17, highlighting that market re-balancing is gradual rather than rapid.**

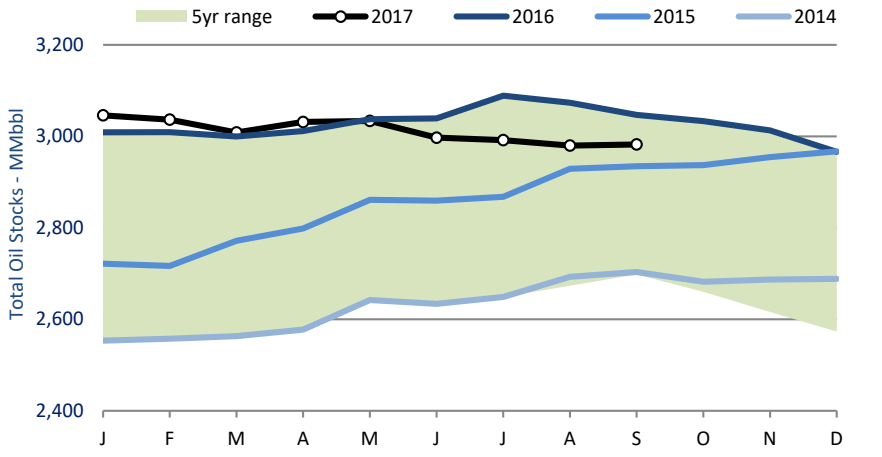
## US Crude Oil Commercial Inventories (1983+) Excluding SPR



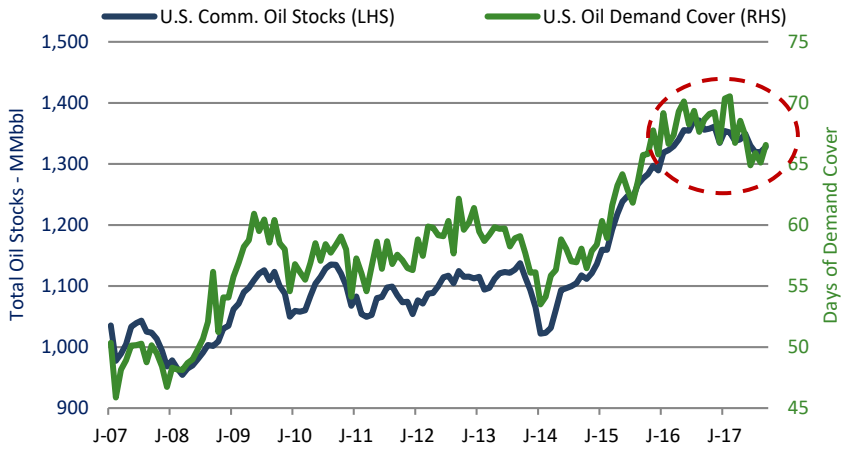

## US Crude Oil Commercial Inventories




## Total OECD Commercial Oil Stocks

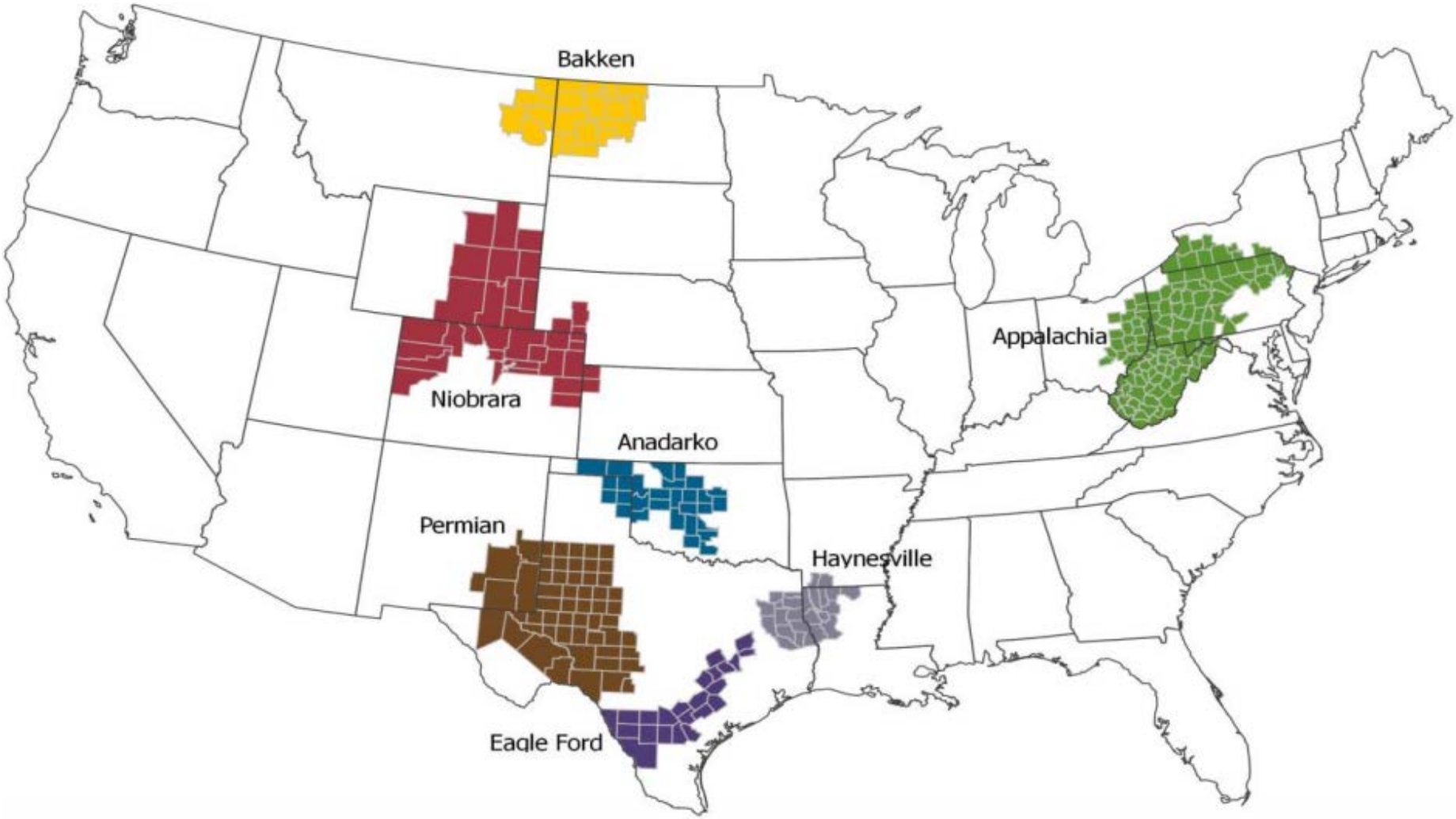



## Total U.S. Commercial Oil Stocks (Crude + Product) and Demand Cover




*Source: U.S. Energy Information Administration, IEA, Reuters, ERCE Estimates. Note: SPR = Strategic Petroleum Reserves.*

# United States Key Tight Oil and Shale Gas Regions

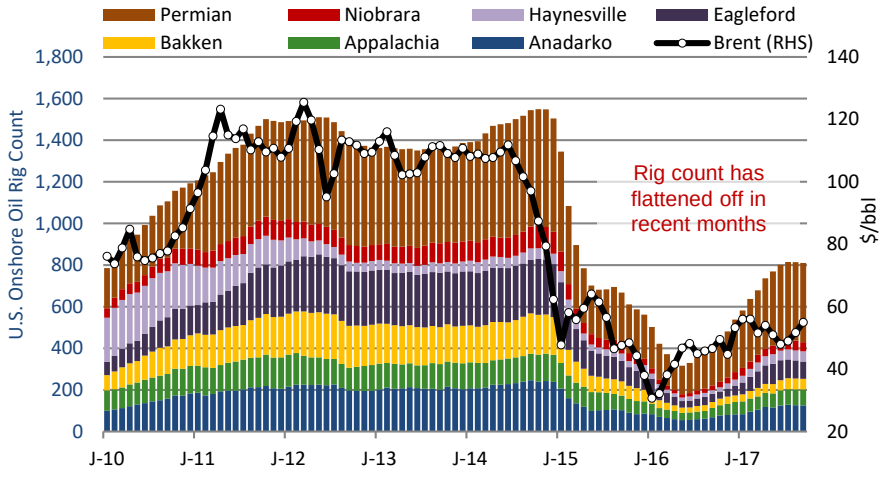



*Source: U.S. Energy Information Administration*

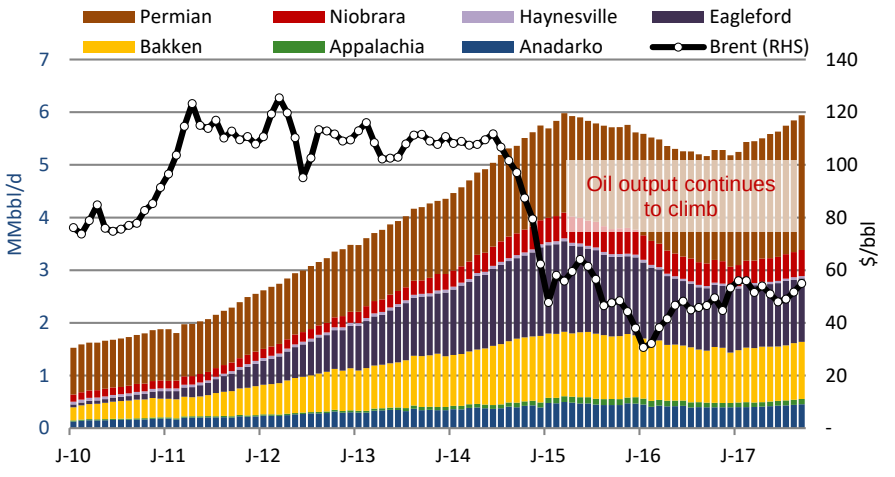
# US Shale Production Climbs; Rig Count Shows Signs of Fatigue

**The US rig count is finally showing signs of fatigue as shale companies, confronting technological, operational and financial obstacles, start to ease up on drilling. Meanwhile, oil output from the onshore shale regions remains robust and may surpass the previous record set in 2015. The backlog of drilled uncompleted wells continue to surge.**

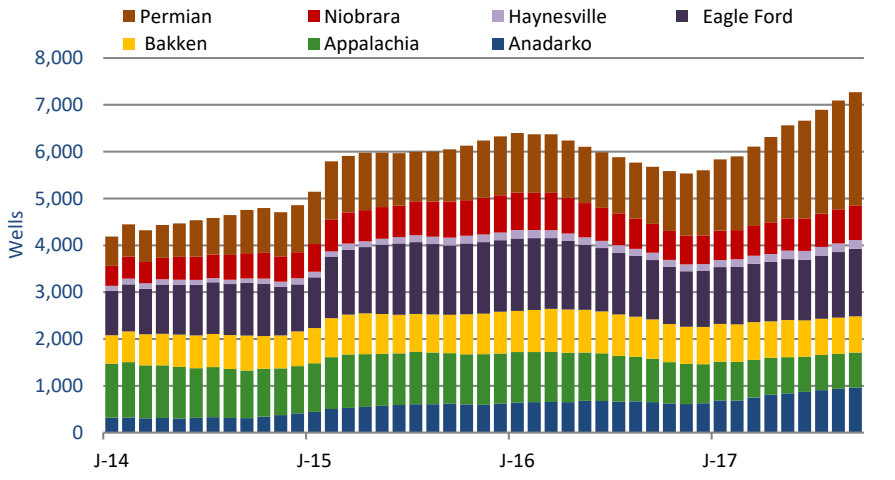
## U.S. Onshore Active Oil Rigs



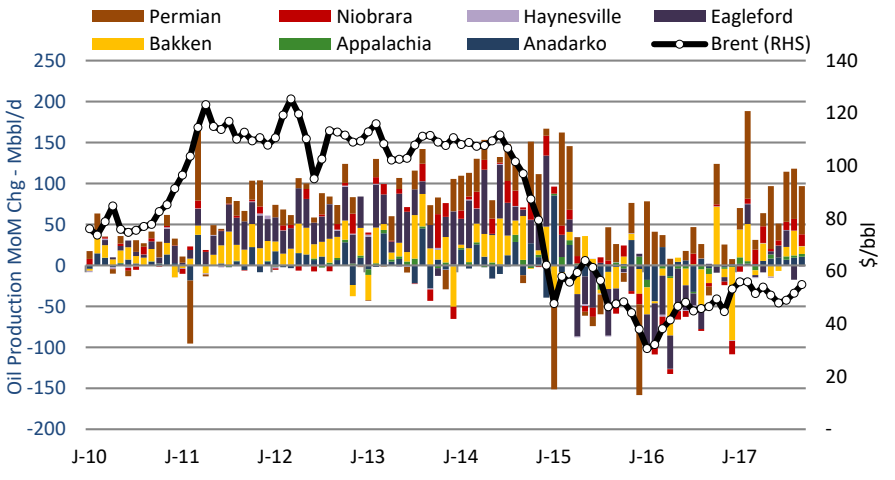

## U.S. Onshore Oil Production by Region




## US Onshore Shale Regions: Drilled Uncompleted Wells Inventory



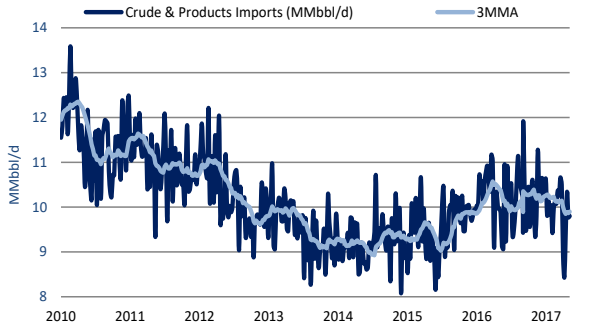

## US Shale Production MoM Change by Shale Region



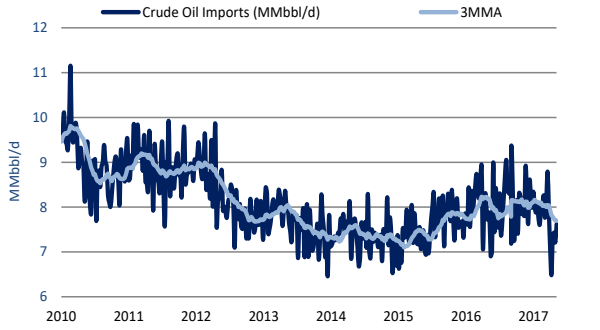

*Source: U.S. Energy Information Administration, ERCE Estimates. Note: Oil production represents both crude and condensate production from all formations (not limited to tight formations).*

# U.S. Crude Oil Imports and Exports

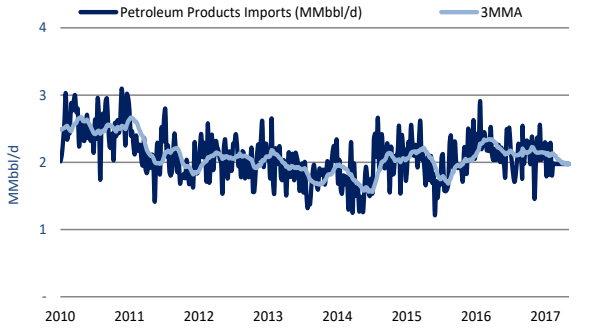
### Weekly US Imports: Crude Oil & Petroleum Products



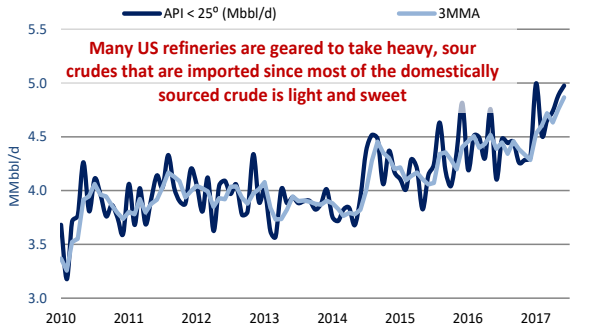

### Weekly US Imports: Crude Oil



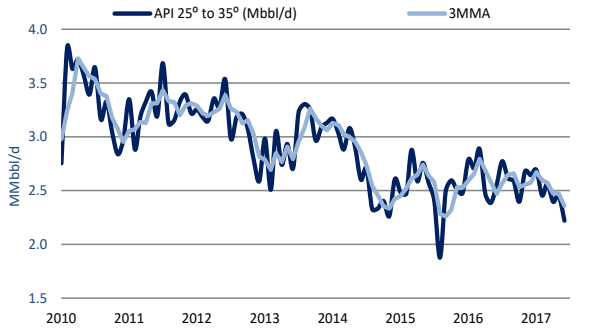

### Weekly US Imports: Petroleum Products



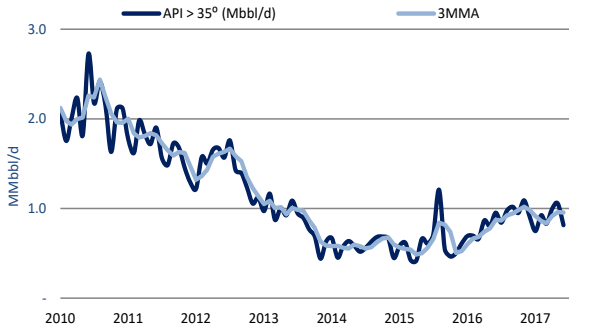

### US Imports: Crude Oil API < 25°



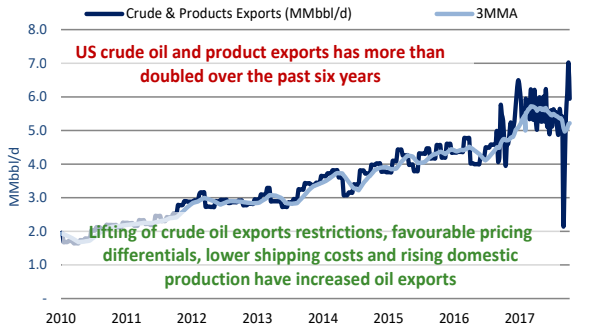

### US Imports: Crude Oil API 25° to 35°



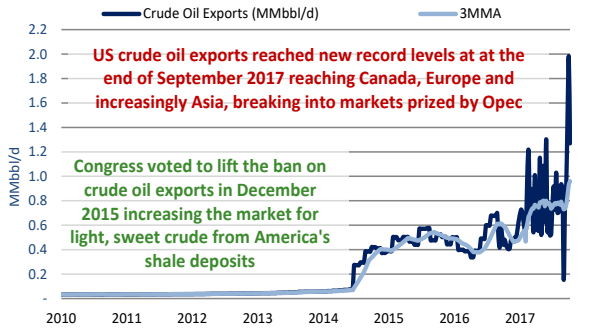

### US Imports: Crude Oil API > 35°



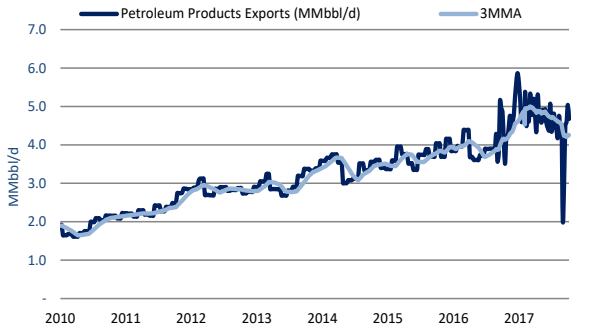

### US Exports: Crude Oil and Petroleum Products




### US Exports: Crude Oil



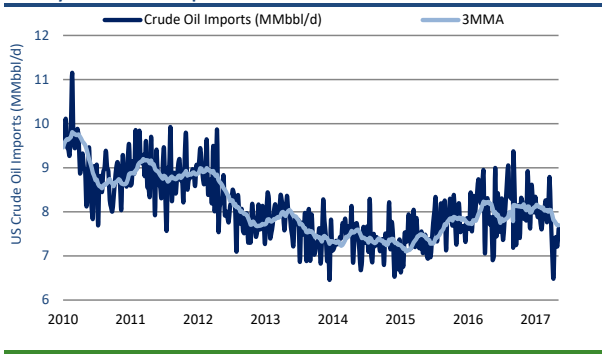

### US Exports: Petroleum Products



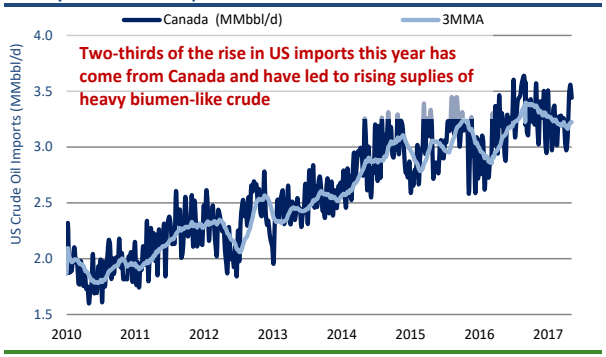

*Source: U.S. Energy Information Administration, WSJ, Reuters, Bloomberg, ERCE Estimates*

# U.S. Crude Oil Imports by Country of Origin

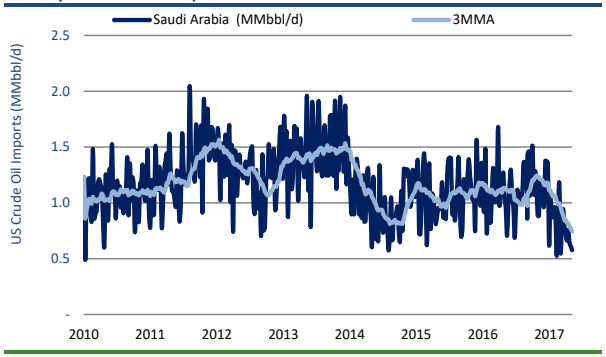
### Weekly US Crude Oil Imports: Total



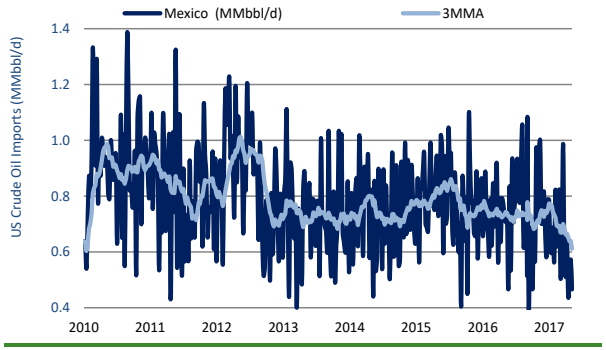

### Weekly US Crude Oil Imports: Canada



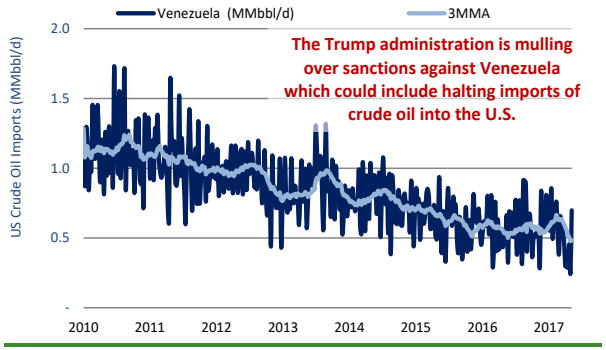

### Weekly US Crude Oil Imports: Saudi Arabia



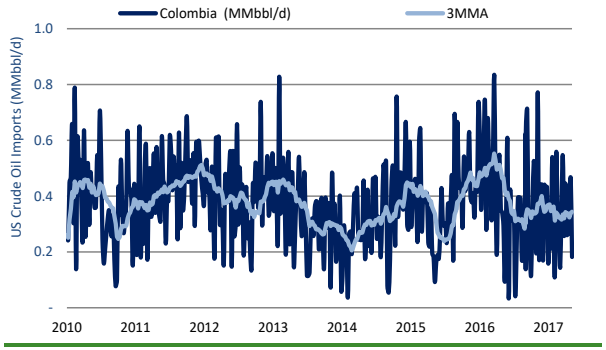

### Weekly US Crude Oil Imports: Mexico



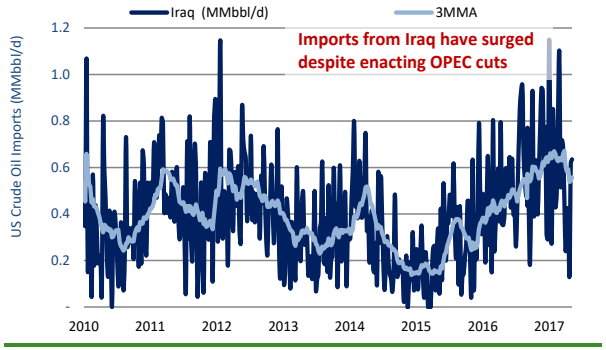

### Weekly US Crude Oil Imports: Venezuela



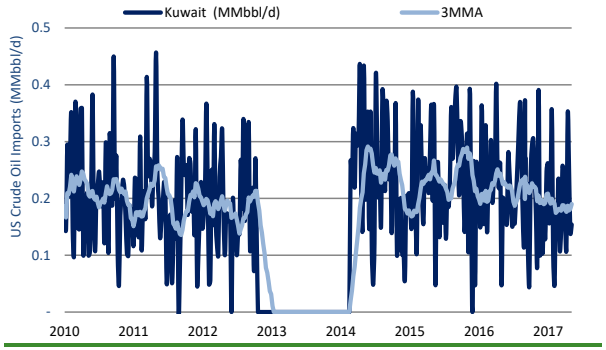

### Weekly US Crude Oil Imports: Colombia



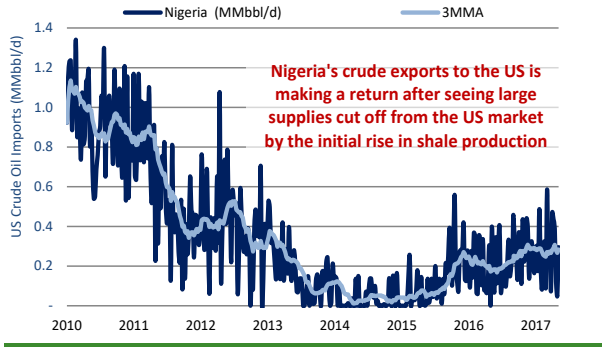

### Weekly US Crude Oil Imports: Iraq




### Weekly US Crude Oil Imports: Kuwait



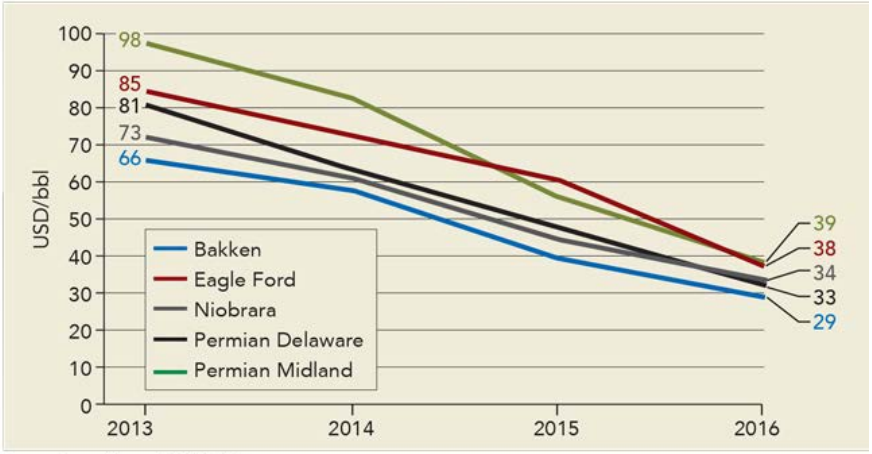

### Weekly US Crude Oil Imports: Nigeria




*Source: U.S. Energy Information Administration, Reuters, FT, WSJ, Bloomberg*

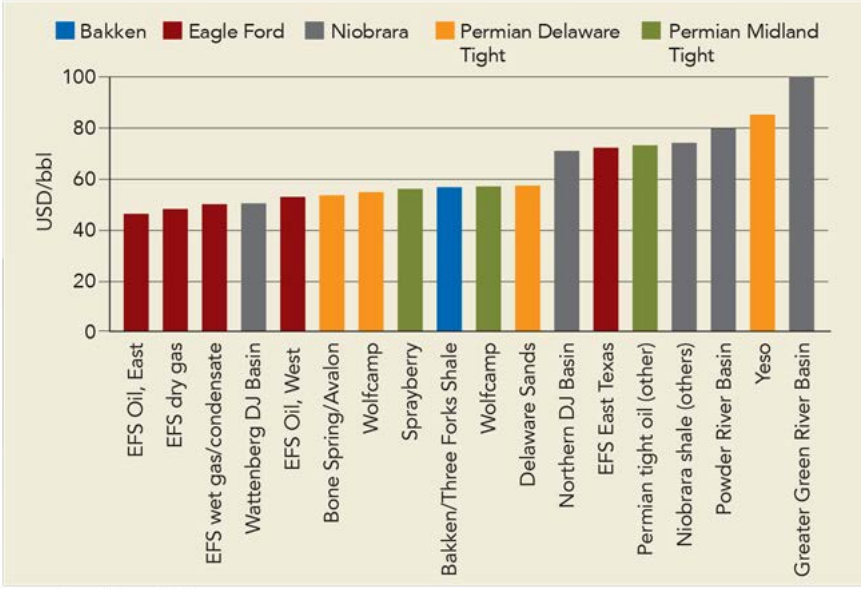
# Average Breakeven Prices for North American Shale

F1: DEVELOPMENT IN WELLHEAD BREAKEVEN PRICES FOR KEY SHALE PLAYS




Source: Rystad Energy NASWellCube

F2: AVERAGE WTI BEP FOR NEW SHALE WELLS PER PLAY




Source: Rystad Energy UCube

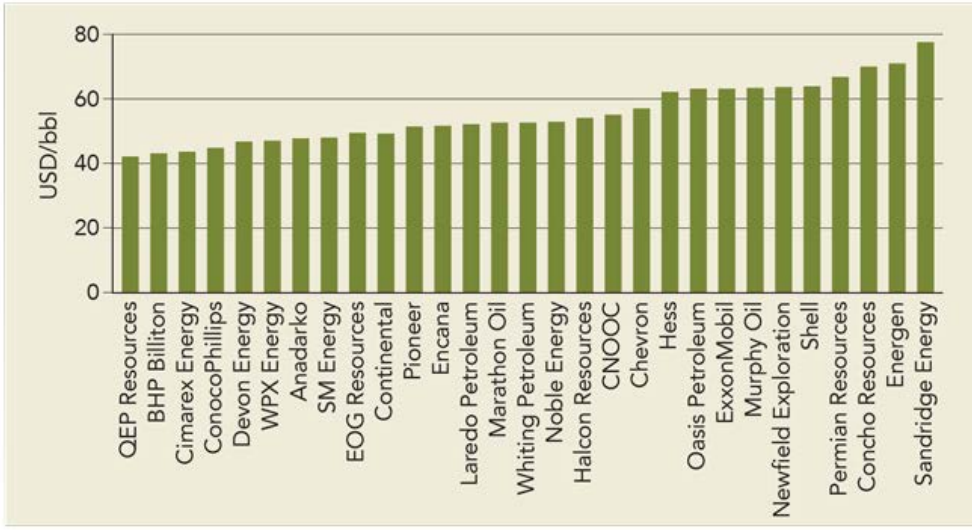
**Average wellhead breakeven price for key shale plays has decreased from $80/bbl (2013) to $35/bbl (2016), according to research by Rystad Energy.**

**Structural changes: improved well performance (increase EUR) and efficiency gains (lower drilling and completion costs) attributed to the drop.**

**Falling oil price has been the main driver in reducing breakeven prices forcing companies to high grade their portfolio (concentrate on sweet spots) and pushing through lower unit and production costs.**

**Is this change sustainable? US producers enter 2017 with improved economics and cash flow. This could result in further increases in investment.**

F3: AVERAGE WTI BEP FOR NEW SHALE WELLS PER COMPANY



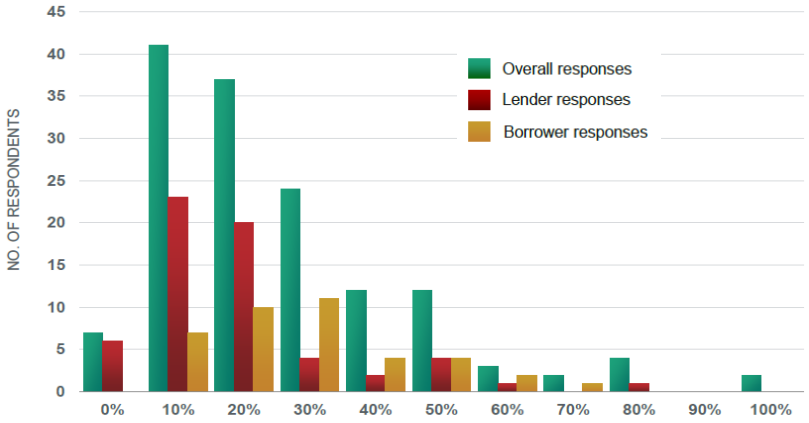

Source: Rystad Energy UCube

*Source: OGFJ, Rystad, ERCE Estimates. Note: F1 is for wellhead breakeven prices and considered the "raw" or "initial" breakeven; F2 includes effect of facility costs and price discounts and is expressed in WTI price.*

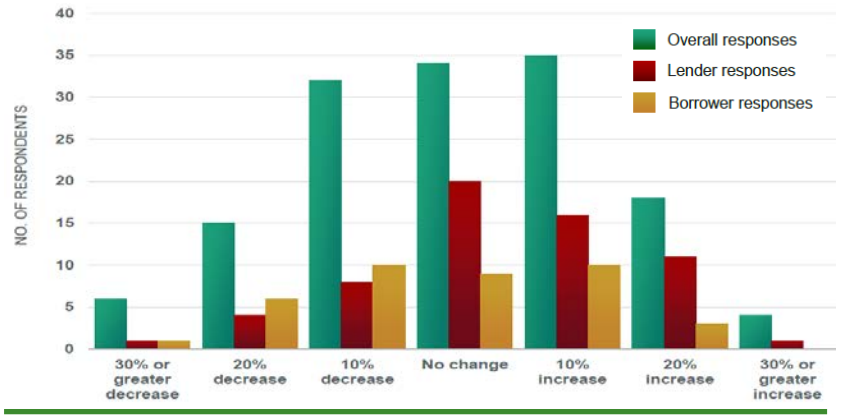
# Autumn Borrowing Base Survey for North American E&Ps (Haynes & Boones Survey, October 2017)

**In the Autumn survey, respondents overall expect 26% of the borrowers to see a decrease in their borrowing base redeterminations. The lenders' response was c.19% and borrowers response was c.29%.**

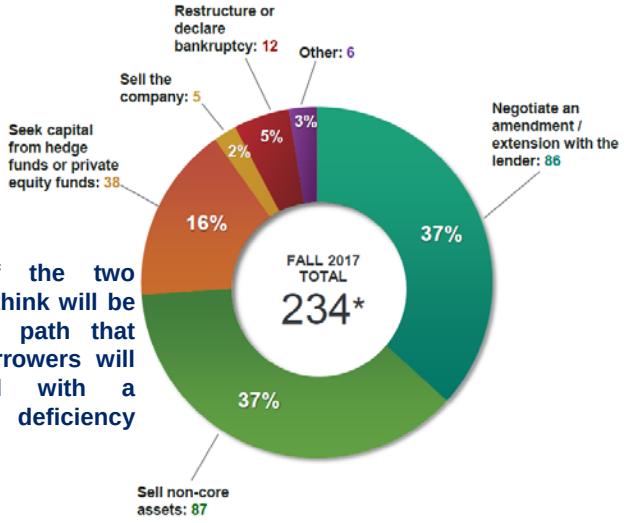
**What % of E&P borrowers do you anticipate will see a DECREASE in their borrowing base redetrminations in Autumn 2017?**



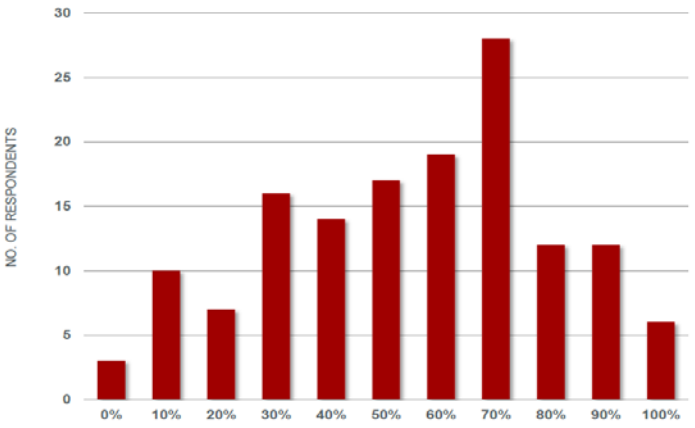

**What % do you expect borrowing bases to change in Autumn 2017 as compared to Spring 2017?**




**Which one of the two options do you think will be the most likely path that lenders and borrowers will take if faced with a borrowing base deficiency in Autumn 2017?**



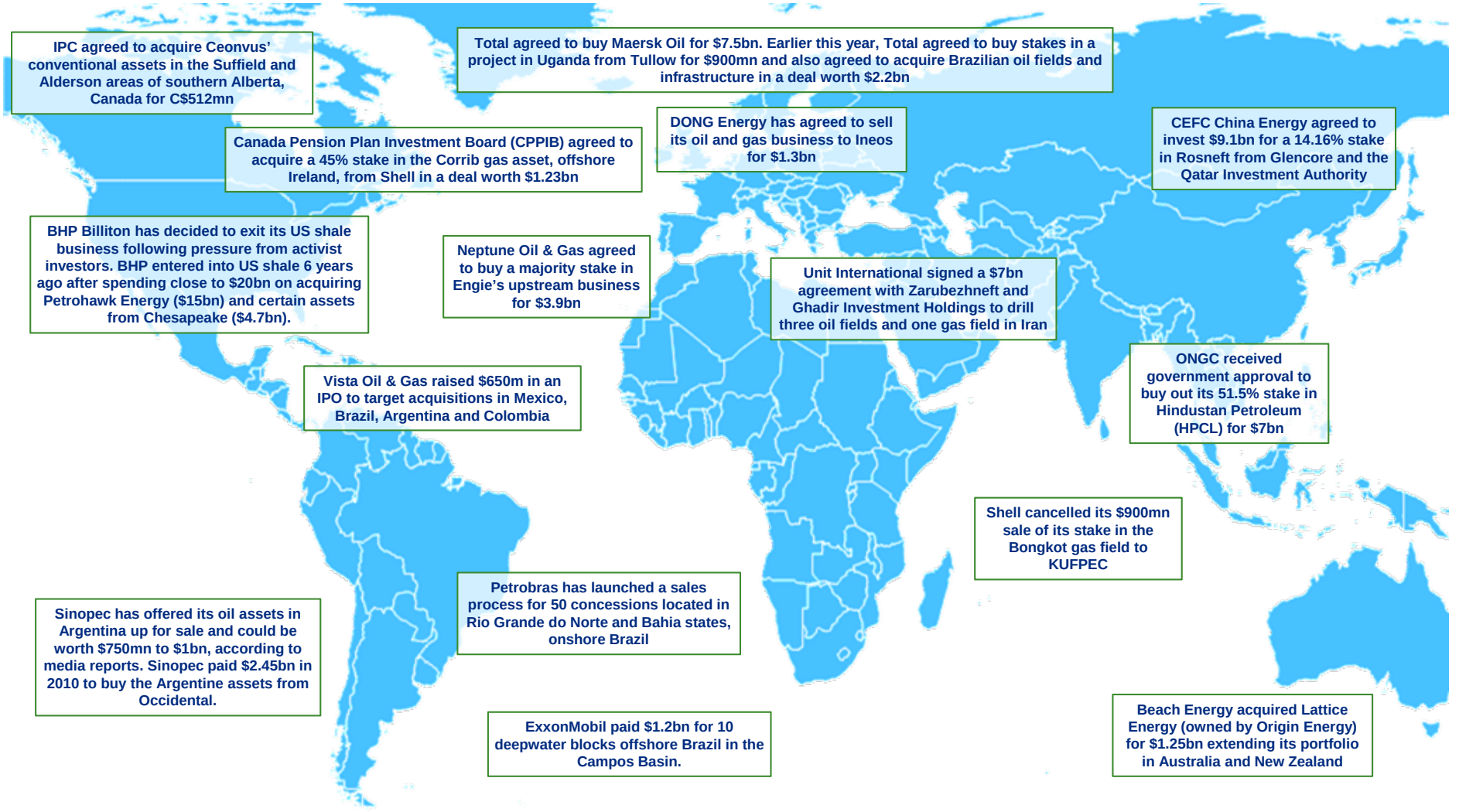

**What % of new reserve-based credit facilities entered in 2017 (by number, not dollar amount) in your estimation have been with E&P borrowers sponsored by private equity?**




*Source: Haynes and Boone Borrowing Base Redeterminations Survey Fall 2017, ERCE estimates*

# Momentum in Upstream O&G M&A Continues through 2017

**Energy deals have picked up pace more broadly through the second half of 2017 as the industry puts the worst of the slump behind it and as bid-ask spread continues to narrow. Three deals in Q3 account for 90% of the deals for that quarter (China's CEFC, Beach Energy and Maersk).**

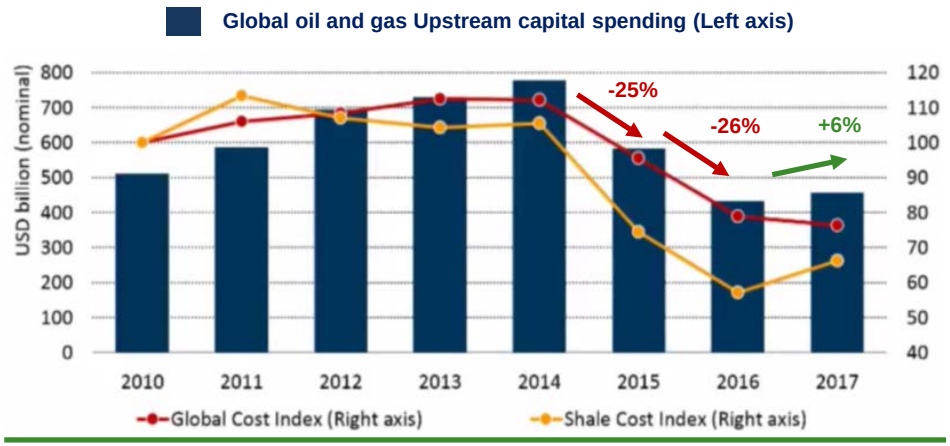



*Source: Analyst Reports, Reuters, Bloomberg, Evaluate Energy, Upstream*

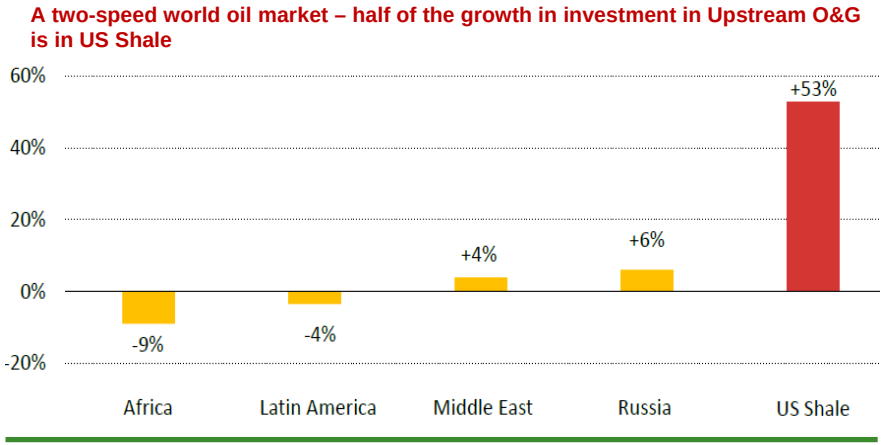
# World Energy Investment 2017: Shorter timelines and smaller sizes

**Two year decline in O&G Upstream investment was unprecedented but 2017 investment has increased modestly. A shift in company strategies from investor pressure and technological developments has lead to shorter project cycles and smaller project sizes across all the oil and gas industry.**

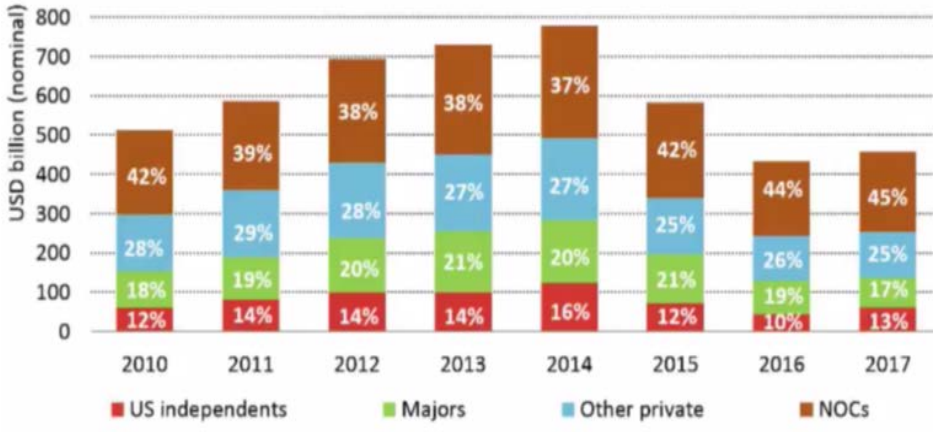
## Global Upstream investment appears to be stabilising



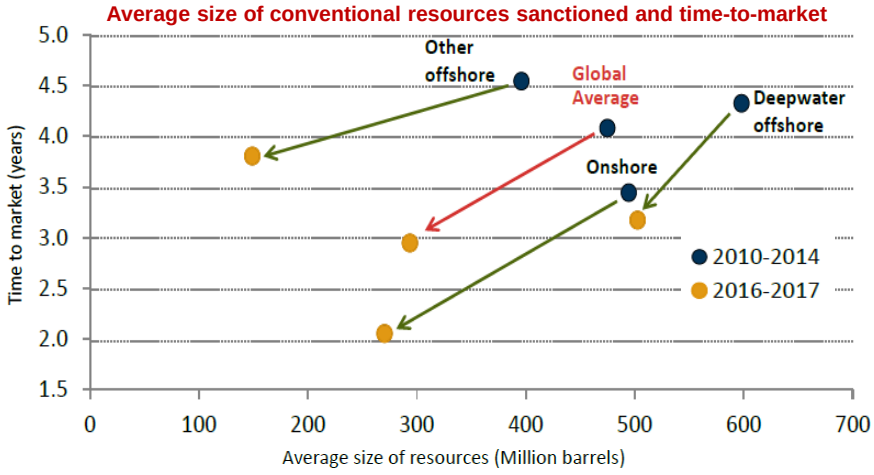

## Change in Upstream investment 2017 Vs 2016




## Global O&G Upstream capital spending 2010 to 2017




## Oil and gas projects moving to shorter timelines and smaller sizes

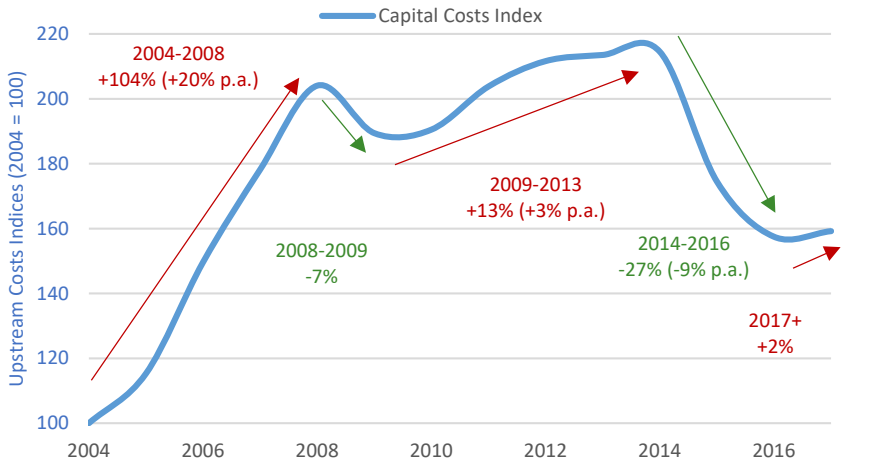



*Source: International Energy Agency World Energy Investment Report 2017, ERCE Estimates.*

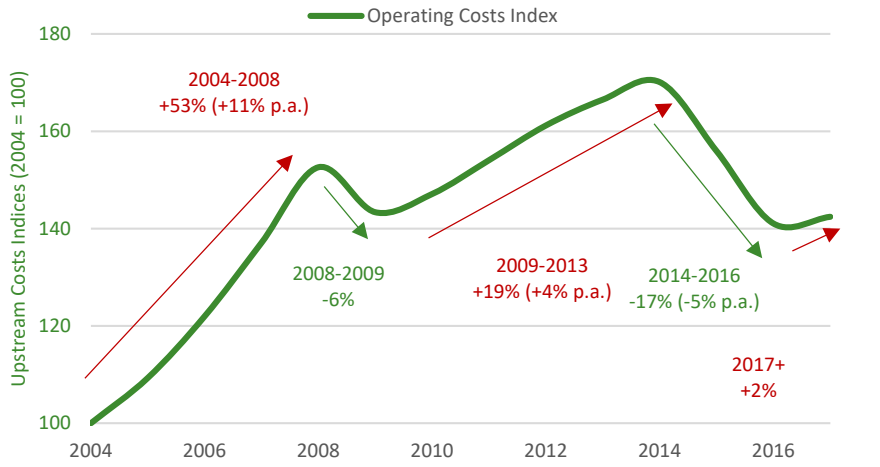
# IHS Upstream Capital and Operating Costs Indices

**The IHS Upstream Capital Cost Index tracks the costs of equipment, facilities, materials and personnel (both skilled and unskilled) used in the construction of a geographically diversified portfolio of onshore, offshore, pipeline and LNG projects. The IHS Upstream Operating Cost Index measures cost changes in the oil and gas field operations arena.**

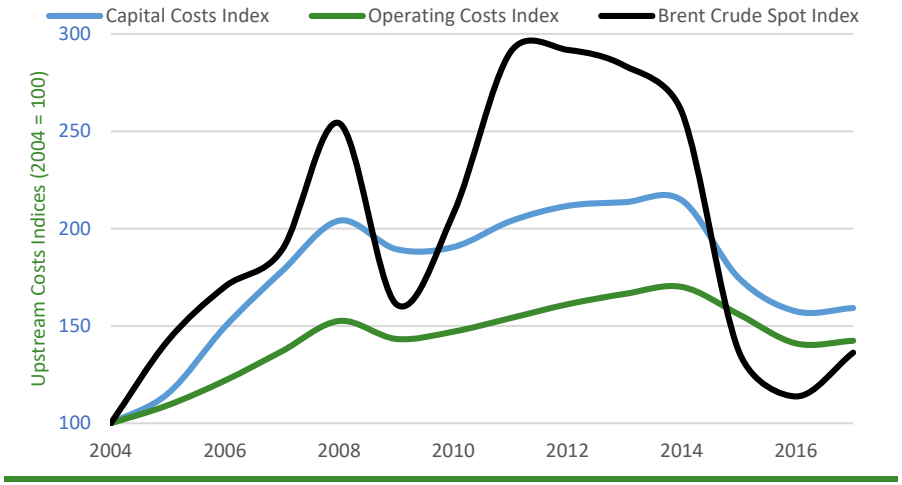
## Upstream Capital Costs Index (Annual Average) (2004 = 100)




## Upstream Operating Costs Index (Annual Average) (2004 = 100)




## Upstream Capital/Operating Costs Indices Vs Brent Crude Spot (Annual)

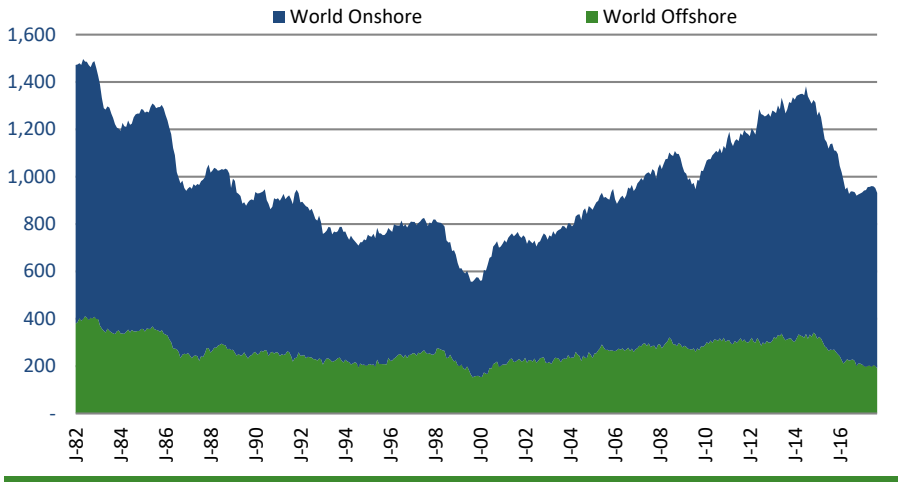



| % Chg for the period | 2002-2008 | 2008-2009 | 2009-2014 | 2014-2016 | 2017+ |
|---|---|---|---|---|---|
| Capital Costs | 120% | -7% | 13% | -27% | 2.3% |
| Operating Costs | 80% | -6% | 19% | -17% | 1.8% |
| Brent Crude Spot | 241% | -37% | 61% | -56% | 20% |
| **Avg Annual % Chg for the period** | **2002-2008** | **2008-2009** | **2009-2014** | **2014-2016** | **2017+** |
| Capital Costs | 20% | -7% | 3% | -9% | 2.3% |
| Operating Costs | 11% | -6% | 4% | -5% | 1.8% |
| Brent Crude Spot | 27% | -37% | 17% | -24% | 20% |

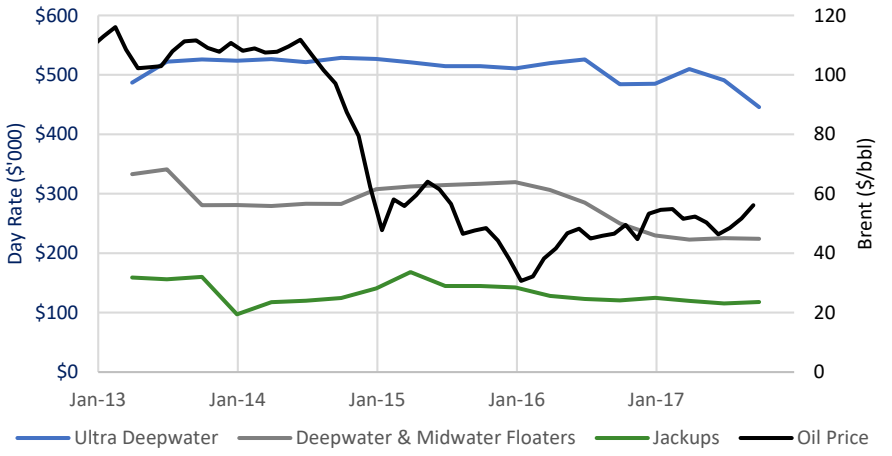
*Source: IHS, Intercontinental Exchange, ERCE Estimates.* Cost indices are similar to the Consumer Price Index (CPI) in that it provides a clear, transparent benchmark tool for tracking and forecasting a complex and dynamic environment.

# Global Rig Count (Ex North America) and Average Day Rates

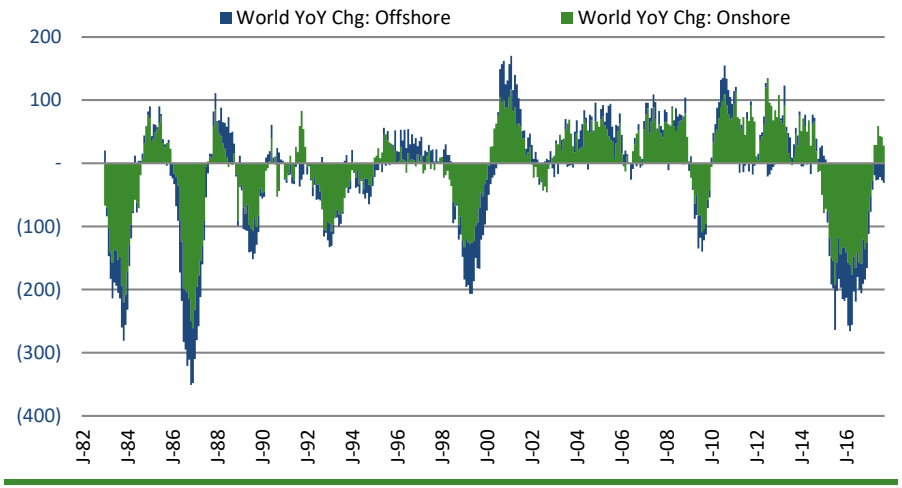
### Global Rig Count: Onshore Vs. Offshore Ex North America (1982 - 2017 YTD)




### Average Drilling Rig Day Rate Vs Brent Crude Oil Price: (2013 - Q3 2017)




### Global Rig Count YoY Chg: Onshore Vs. Offshore (1982 - 2017 YTD)




**Global rig count and utilisation stabilisation lagged by reduced day rates due to gradual roll off high rate historic contracts**

**New, short term contracts lock in drastically lower rates as rig providers are unwilling to hedge against oil price rises**

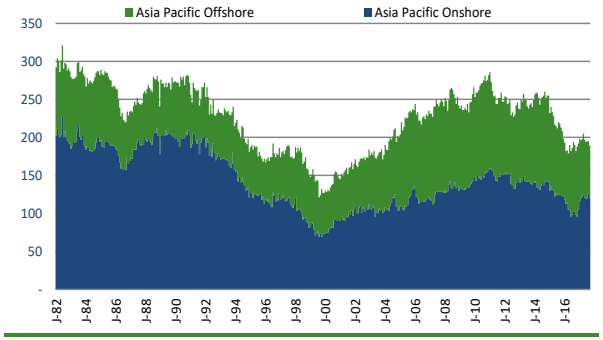
**Longer term contracts more commonly being linked to market index, with minimum rate agreed at time of contract.**

**Utilisation may increase but efficiencies and streamlining achieves over past two years likely to be retained and low cost environment may continue – some long term contracts still in place**

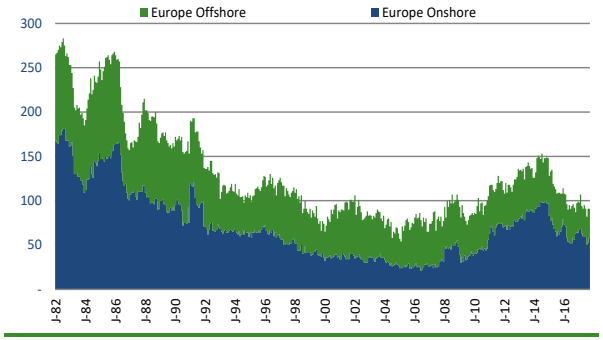
*Source: Baker Hughes, Transocean, Noble Drilling, ENSCO, Paragon Offshore, SeaDrill, Diamond Offshore, ERCE Estimates.*

# Global Rig Count Trends (Excludes North America)

### Asia Pacific Rig Count: Onshore Vs. Offshore (1982 - 2017 YTD)




### Europe Rig Count: Onshore Vs. Offshore (1982 - 2017 YTD)

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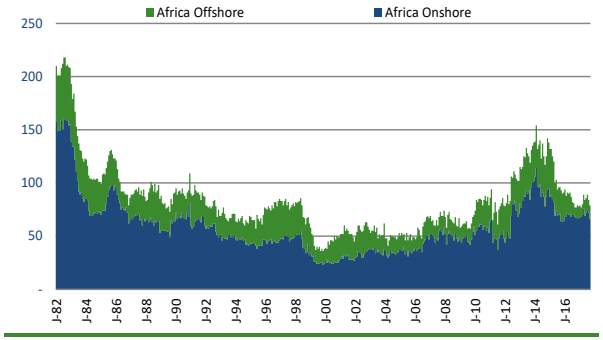
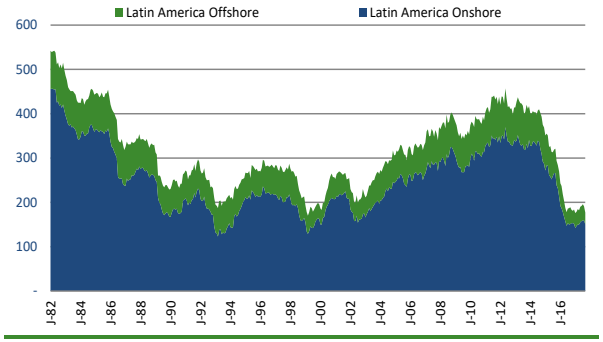
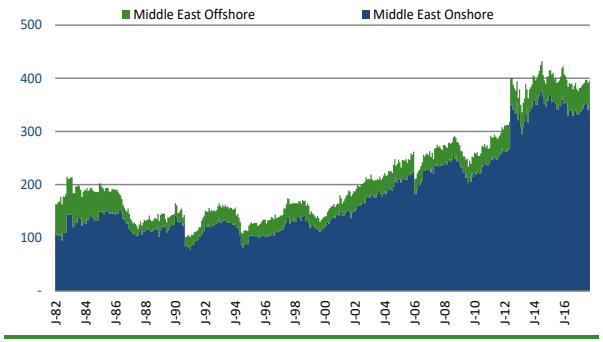


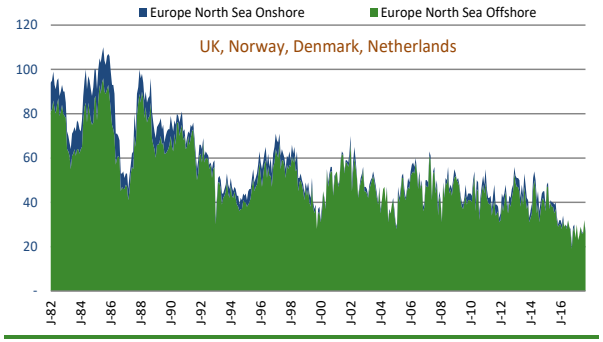

### Latin America Rig Count: Onshore Vs. Offshore (1982 - 2017 YTD)



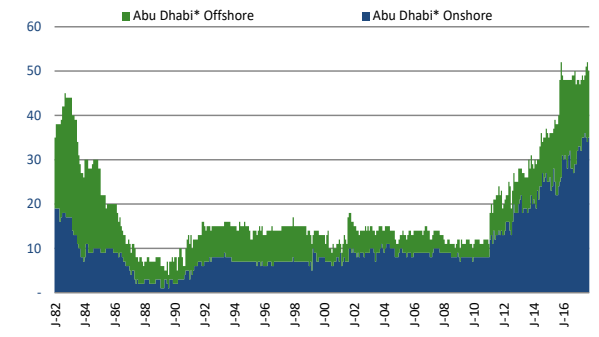

### Middle East Rig Count: Onshore Vs. Offshore (1982 - 2017 YTD)



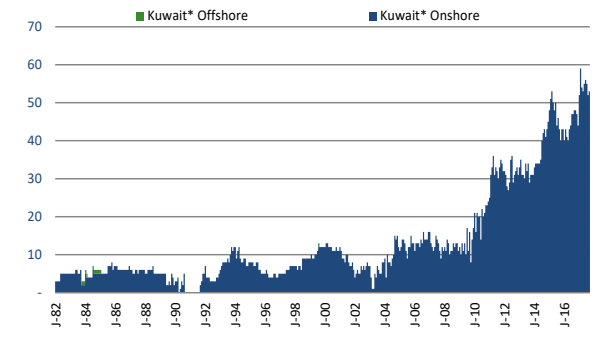

### Europe North Sea Rig Count: Onshore Vs. Offshore (1982 - 2017 YTD)



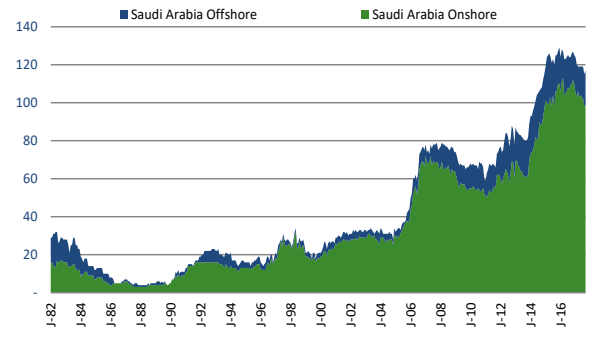

### Abu Dhabi Rig Count: Onshore Vs. Offshore (1982 - 2017 YTD)




### Kuwait Rig Count: Onshore Vs. Offshore (1982 - 2017 YTD)




### Saudi Arabia Rig Count: Onshore Vs. Offshore (Monthly 1982 - 2017 YTD)

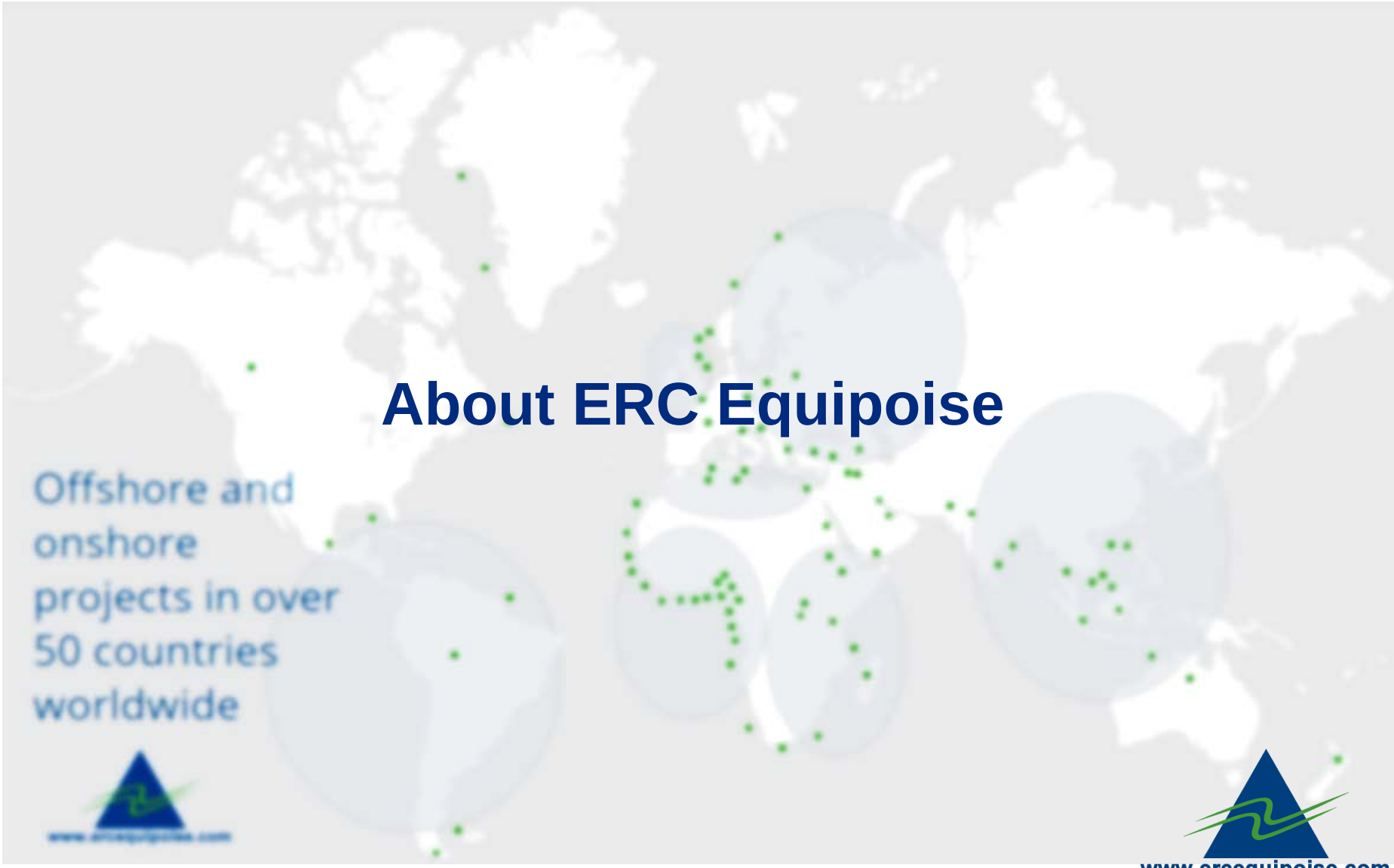



*Source: Baker Hughes, ERCE Estimates.*

# ERCE Oil Price Review: Glossary

| | |
|---|---|
| **$** | All dollar amounts are in U.S. dollars unless otherwise indicated. |
| **bbl** | barrels |
| **bbl/d** | barrels per day |
| **Brent** | A blended crude stream produced in the North Sea region which serves as a reference or "marker" for pricing a number of other crude streams. |
| **btu** | British thermal unit |
| **chg** | Change. |
| **EIA** | U.S. Energy Information Agency |
| **ERCE** | ERC Equipoise Ltd. |
| **FSU** | Former Soviet Union and includes Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan. |
| **IEA** | International Energy Agency |
| **M** | Month (e.g. 1M Ago = one month ago). |
| **MMbbl** | million stock tank barrels. |
| **MMbbl/d** | Million stock tank barrels per day. |
| **MMA** | Month Moving average (12MMA = twelve month moving average). |
| **MMbtu** | Million british thermal units |
| **MoM** | Month-on-month (e.g. MoM Chg = month-on-month change). |
| **Nominal** | Economic value expressed in historical nominal monetary terms, also known as “money-of-the-day”. |
| **Therm** | a unit of heat equal to 100,000 British thermal units and approximately the energy equivalent of burning 100 cubic feet of natural gas. |
| **OECD** | The Organisation for Economic Co-operation and Development - an international economic organisation of 34 countries and include many of the world’s most advanced countries but also emerging countries like Mexico, Chile and Turkey. |
| **OPEC** | Organisation of the Petroleum Exporting Countries. Its mandate is to "coordinate and unify the petroleum policies" of its members and to "ensure the stabilization of oil markets in order to secure an efficient, economic and regular supply of petroleum to consumers, a steady income to producers, and a fair return on capital for those investing in the petroleum industry. It’s current members are Algeria, Angola, Ecuador, Iran, Iraq, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, the UAE, and Venezuela. |
| **p** | pence (GBp) |
| **Real** | Economic value that has been adjusted from a nominal value to remove the effects of general price level changes over time and is thus measured in terms of the general price level in some reference year (the base year e.g. 2013). |
| **Spot Price** | The price for a one-time open market transaction for immediate delivery of a specific quantity of product at a specific location where the commodity is purchased "on the spot" at current market rates. |
| **stb** | stock tank barrels. |
| **USD Index** | Trade Weighted U.S. Dollar Index – a weighted average of the foreign exchange value of the U.S. dollar against the currencies of a broad group of major U.S. trading partners which includes the Euro Area, Canada, Japan, Mexico, China, United Kingdom, Taiwan, Korea, Singapore, Hong Kong, Malaysia, Brazil, Switzerland, Thailand, Philippines, Australia, Indonesia, India, Israel, Saudi Arabia, Russia, Sweden, Argentina, Venezuela, Chile and Colombia. |
| **WTI** | West Texas Intermediate – a crude stream produced in Texas and southern Oklahoma which serves as a reference or "marker" for pricing a number of other crude streams and which is traded in the U.S. domestic spot market at Cushing, Oklahoma. |
| **YoY** | Year-on-year (e.g. YoY Chg = year-on-year percentage change). |
| **YTD** | Year-to-date. |

# About ERC Equipoise

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Dominion petroleum ltd.
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ADDAX PETROLEUM
SUMMIT PETROLEUM

# ERC Equipoise Services

## Sub-surface Support and Evaluation

- Provide technical support for subsurface analysis from exploration to rehabilitation
- Can provide technical and commercial expertise, when a company does not have the needed in-house staff
- May involve attending TCM meetings, reviewing FDP documents, and generating or providing critiques of seismic interpretations, geological studies and simulation work

## Independent Reserves & Resources Evaluations including Commercial Calculations

- Experts in international reporting standards including SPE/PRMS, SEC, NI 51-101, UNFC
- Reports are tailored to their function which can include:
  - Disclosures to the Public, Shareholders or to Stock Exchange Commissions
  - Financial activities such as equity raises, flotations, and debt applications
  - A&D processes
  - Valuations / Defence Documents

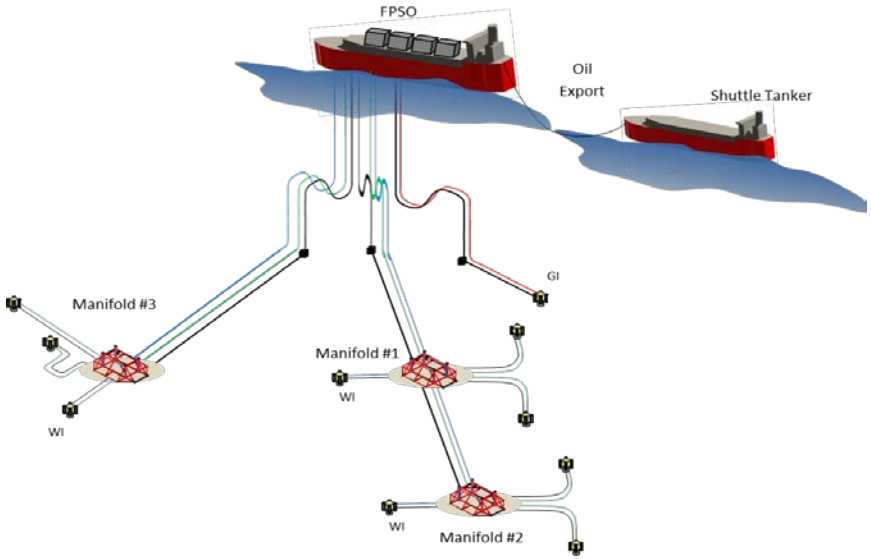
## Expert Witness including Equity Determination and Redetermination

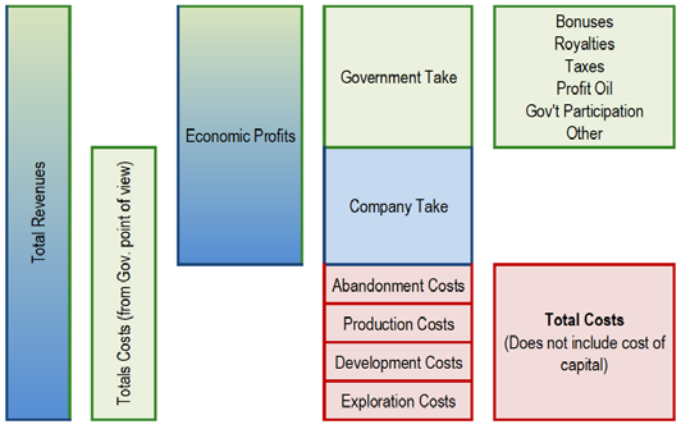
- Our Directors have been involved in expert work since the 1980s and are actively involved today
- Recognized experts in the fields of Fair Market Value determination, equity redetermination, FPSO contract disputes, Gas and Oil contract disputes and taxation matters
- Examples of fields we have worked on include: Audrey, Scott, Nelson, Snore, East Brae, Markham, Schiehallion, Galleon, Goldeneye, Jubilee and Ormen Lange
- Clients have included BP, Shell, Conoco, Centrica and Santos

## Maximising value through the E&P cycle

**ERCE's Integrated Commercial Evaluation group is a team of experienced professionals who deliver:**

- Conceptual field planning, economic screening and capital cost estimation
- Economic evaluation of petroleum Reserves and Resources
- Due diligence and asset evaluation and valuation including sensitivity modelling of market conditions and scenario planning
- Economic modelling and fiscal expertise
- Commercial evaluation



# Inhouse database including recent outturn figures in changing cost base

- Provision of specialist knowledge to assist clients in the understanding of costs, schedule and risks for all production facilities and associated infrastructure
- *Across all stages of asset lifecycle; from feasibility through to execution and abandonment*

- Inhouse database includes out turn costs from variety of sources, projects and studies for all capital and operational expenditure

- Recent and ongoing experience of current low oil price environment
- Global affect on costs, including contract vessel rates and equipment supply and services
- Inhouse database including recent outturn figures in changing cost base

# Broad, global experience with offshore and onshore developments

- Previous studies and experience includes a range of projects and discoveries
- Onshore and Offshore (shallow and deepwater)
- Remote locations, harsh environments with varied hydrocarbon characteristics including heavy oil and sour gas
- Global locations: UKCS, Norway, Mediterranean, Africa, Russia, FSU, Middle East, and Far East
- Over 225 projects for 75 clients providing economic screening for audits, financing, partner and authority approvals, disputes and M&A in 2016

**Providing an integrated technical and commercial approach to project and portfolio evaluation**

## The Economics group is headed by Principal Economist Jerry Ho

- ERCE's lead on economic audits of all of ERCE's clients.
- Extensive experience in modelling various oil and gas fiscal regimes through advising institutional and corporate/industry clients in his oil and gas focused equity research roles at various reputable commodities-specialist financial institutions. He has also provided material for expert submissions during court and arbitration cases.

## James Culley is ERCE's Senior Field Development Engineer

- Recently joined ERCE to provide in-house concept screening, field development planning and cost estimating.
- Experience of studies include cost analysis of alternative gas technologies (LNG, CNG, GTL), aggressively scheduled early production facilities, FPSO, subsea, platform, MOPU and onshore production options.

# ERC Equipoise Contact Details

## Our partners

Reservoir Evaluation is a complex task, requiring specialists experienced in a variety of topics including Reservoir Engineering, Geophysics, Geology, Petrophysics, Facilities Design and Costing together with Economics.

Over the years, ERC Equipoise has developed strong relationships with a number of expert companies and independent consultants in the petroleum industry. These companies and individuals are seconded onto our teams during project execution, working seamlessly to ensure that our clients have access to the specialist knowledge required to properly evaluate their assets.

GLJ Petroleum Consultants

We combine our regional subsurface knowledge of Europe, Africa and the Near and Far East with GLJ's experience in the North and South American Unconventional fields.

GeoScience

We work closely with this established earth science consultancy characterising the fractured reservoir and incorporating their analysis into ERCE models.

ThyssenKrupp

Providing conceptual and, where required, front end engineering project input to ERCE projects in the areas of field development planning and facilities and field cost assessment.

**Associate Consultants**

ERCE has long standing relationships with numerous independent consultants, many of whom are prominent in their field of expertise, in the areas of Reservoir Engineering, Petrophysics, Geoscience, Economics and Facilities Engineering.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