

# Global Upstream Trends and the Impact of Sustainable Energy

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29 September 2017

“If you're going through hell,  
keep going”

Winston Churchill



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The Zume portfolio management software is driven by the client's existing proprietary databases, spreadsheets and applications thus avoiding major disruptive reorganisation of working practices and corporate models. IMAP consultants work closely with the client to help embrace the transformational power of the ZUME portfolio management tool and guide the organisation in the resulting progressive transformation of its business practices from the board room to the field.

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[www.imap.com.au/imap-global](http://www.imap.com.au/imap-global) (Website available from 1 November 2017)

## The six great myths of the oil business

- We will never see \$100/bbl again
- Peak oil demand will be reached in 2020s
- Peak oil demand = the decline of the oil industry
- US LTOs (oil shale) have changed the business for ever
- Offshore oil is not competitive
- Renewable energy and electric vehicles will kill the oil business

**“The problem of oil is there is always too much or too little.”**

**Myron Watkins 1937**

**Professor of economics, New York University**

# The Economist

MARCH 6TH - 12TH 1999

TRADE  
WAR?

pages 20 and 65

MICROSOFT  
ON TRIAL

pages 21 and 57

# The Economist

OCTOBER 20TH-26TH 2003

www.economist.com

Don't blame China

PAGE 65

The Democrats' economic ideas

PAGE 25

Iran's last chance

PAGE 12

A SURVEY OF CORPORATE LEADERSHIP

AFTER PAGE 90

# Drowning in oil

FRED

Crude Oil Prices: Brent - Europe



# The end of the Oil Age

March 1999

October 2003



Business 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

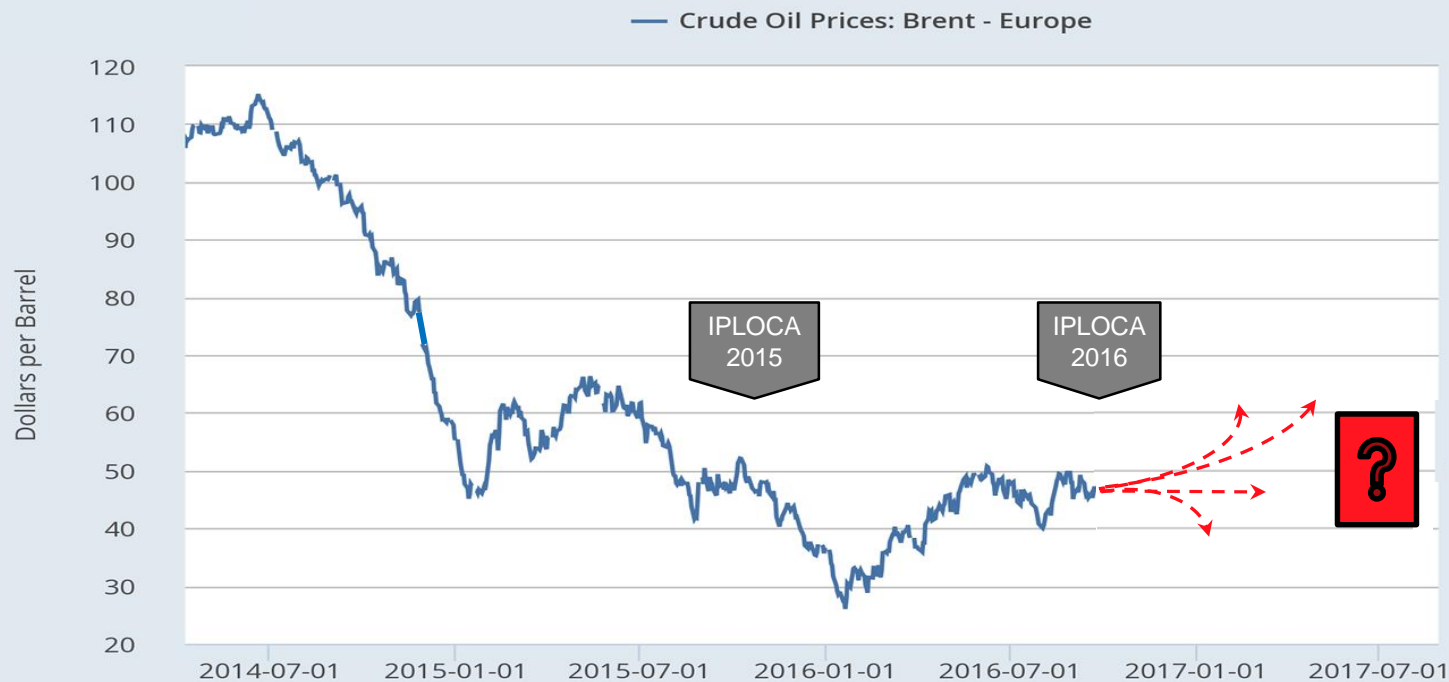
## Global Upstream Trends



"We are emphasising an important message: more investment is needed in oil production capacity to avoid the risk of a sharp increase in oil prices towards the end of our outlook period (2022). The oil market today seems remarkably sanguine about this issue, but this feeling might not persist for too long before the realisation dawns that unwelcome price pressures might lie ahead."

IEA - Oil Market Report 2017

Lower for longer

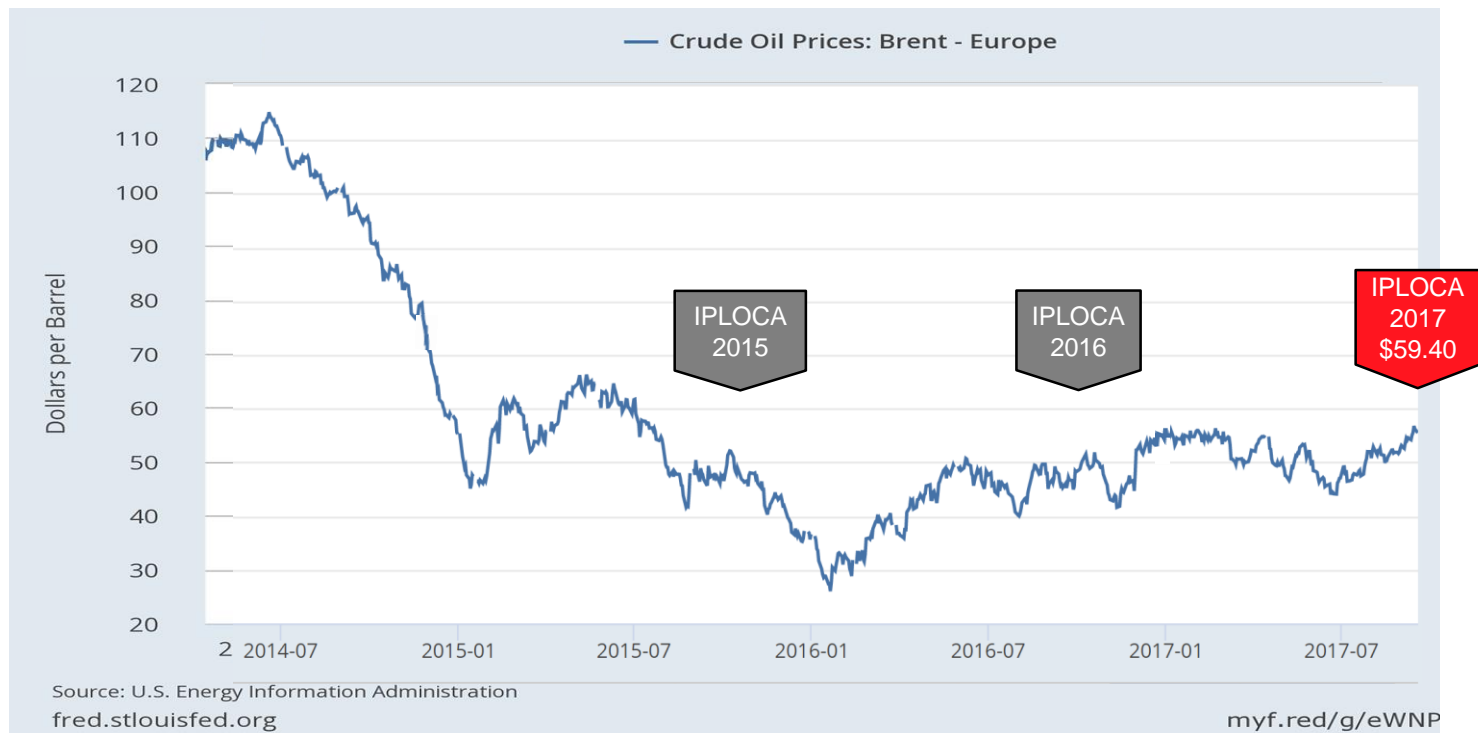


Source: U.S. Energy Information Administration  
fred.stlouisfed.org

myf.red/g/eWNP



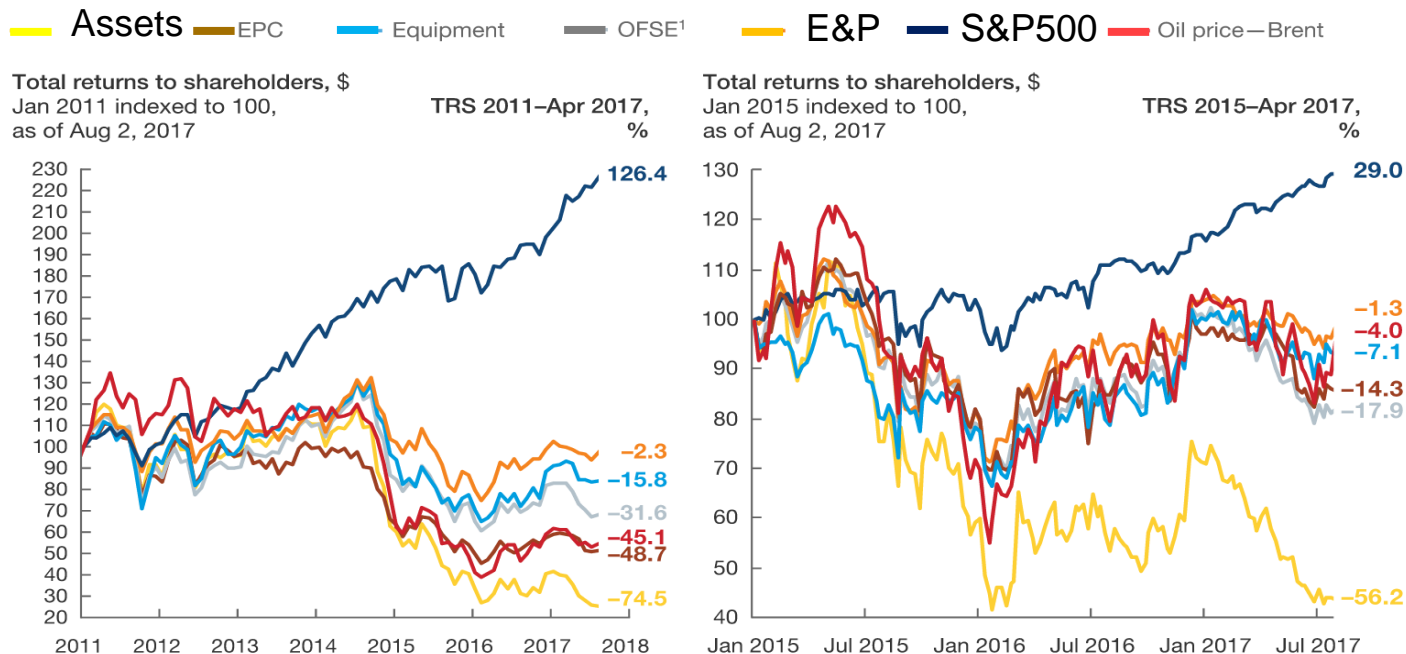
## Lower for how much longer?



## The roller coaster keeps on rolling

- Energy sector was biggest gainer on S&P 500 in 2016 with rally of 24%
- 2017 to mid-August biggest decliner, down 16.6%
- Now back up 11.5%
- Oil field serves drop 40% to mid-August, now up 18%

Returns to shareholders show signs of recovery from the decline seen so far in 2017.



<sup>1</sup>Includes assets, EPC, equipment, and services companies.

<sup>2</sup>Includes majors, NOCs, integrated, and independent.

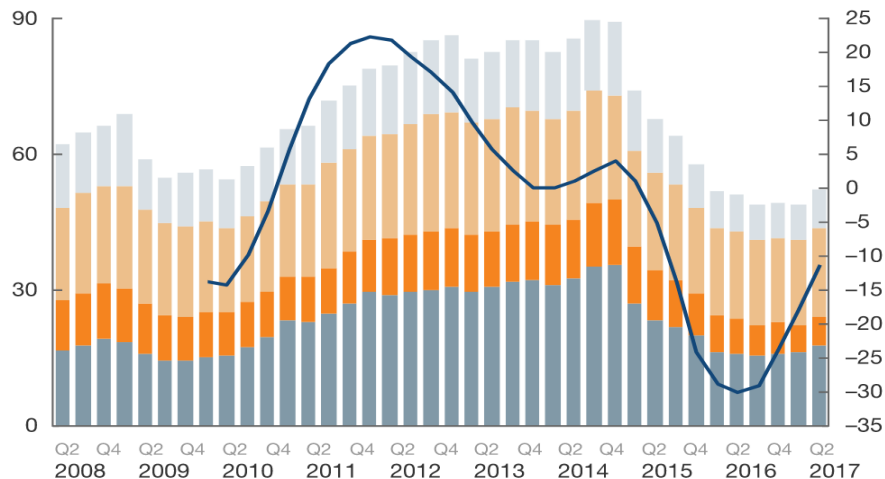
# Oil field service & equipment revenues improving

OFSE revenues show steady increases across all segments.

— 4Qs moving average growth

Quarterly revenue, \$ billion

4Qs moving average growth, %



Revenue growth, %

	Quarter vs previous Q2 2017 vs Q1 2017	Quarter vs last year's Q2 2017 vs Q2 2016
Total	6.4	2.2
Equipment	8.5	6.2
EPC	4.3	1.0
Assets	0.9	-20.0
Services	9.9	12.6

Note: Revenue as announced—adjusted for different accounting/disclosure policy. Sample includes 12 equipment, 11 EPC, 24 assets, and 10 services companies.

McKinsey&Company | Source: S&P Capital IQ; McKinsey analysis

- In 2015, demand grew by 2.0 mb/d (biggest year-on-year growth since 2010 post-financial crisis recovery) followed by robust growth of 1.6 mb/d in 2016.
- 2017 demand rate revised from 1.3 to 1.6 mb/d in September
- Global oil demand is expected to grow by av. 1.2 mb/d each year to 2022
- On average 40 new developments approved annually between 2007 and 2013 by the oil majors, fell to 12 last year
- Electric vehicles important longer term issue for oil demand but by 2022 only limited volumes of global transport fuel demand will be lost to EVs
- LTO (light tight oil) production will continue to grow through 2022, adding 1.4 mb/d over the period
- Oil prices of say USD 80/bbl, LTO output could rise by up to 3 mb/d

## Peak oil demand – when & so what?

2040+	BP, Total, Exxon, Saudi Aramco
2038+	Morgan Stanley
2030+	Shell

### Peak oil demand ≠ End of the oil industry

- Theoretical peak oil demand in 2030 likely to be 10 mbb/d higher than today
- Natural decline of oilfields between 2.5 and 9% per year depending on level of investment (IEA)
- With full investment = 33 mbb/d production to be replaced by 2030

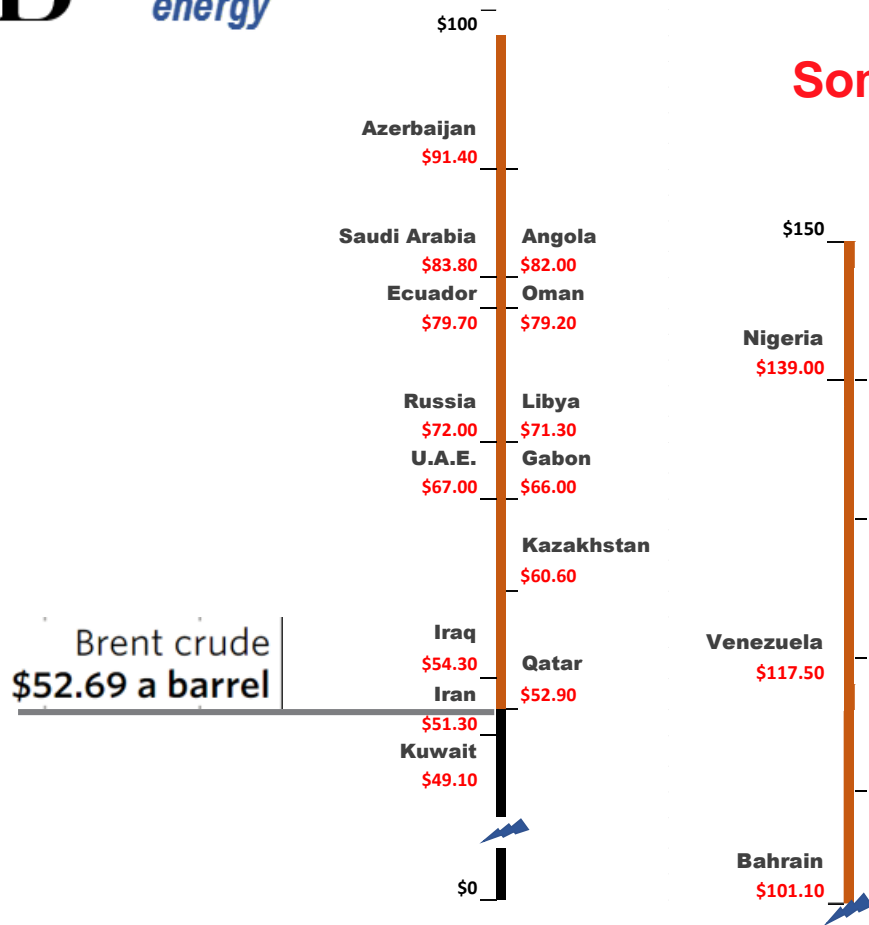
### Increased demand + replacement = min. 43 mbb/d

- Equivalent to 45% of current production and would require some \$2 trillion\* cumulative capital investment over the next 5 years
- At peak, an additional 2.7 mbb/d of new oil needed every year to replace depletion going forward

## China to ease crude imports

- Consumption risen fourfold to 12.4m b/d since 1990
- Imports 8 million b/d - as much crude as the US
- Strategic stockbuilding may soon slow or even end, freeing up 100,000s of barrels of crude into a market ill-prepared to absorb it
- “At a minimum this market needs China to keep buying to stop the wheels from falling off,”  
Michael Tran, director of global energy strategy at RBC Capital Markets

## Something has got to give?



- “For OPEC countries, export revenues slumped to an estimated USD 450 billion in 2016, down from USD 1.2 trillion in 2012, causing major budgetary strains and in some cases making difficult political situations even worse”

IEA - Oil Market Report 2017

After: Wall Street Journal

Sources: International Monetary Fund (break-even price forecasts except for Russia, Nigeria, Angola, Gabon, Venezuela and Ecuador); Fitch (Russia, Nigeria, Angola and Gabon); Highmark Capital (Venezuela and Ecuador)

## US Light Tight Oil (Oil Shale)





## America's shale firms don't give a frack about financial returns

*Exploration and production companies are poised to go on another investment spree*

The  
Economist

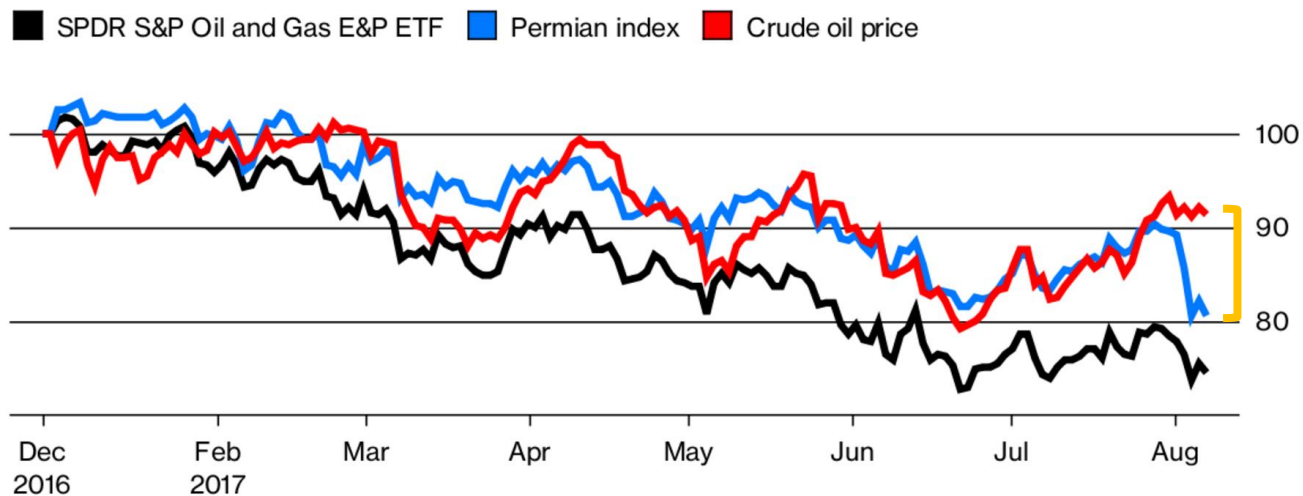


Brett Ryder

**Should investors ...no longer ... buy new shares or lend money to companies that have a terrible history of sustaining profits or returning cash to shareholders, ... the industry will struggle. To make matters worse, most shale wells suffer from enormous depletion rates...[if]..the companies ...are not generating cash and cannot access new cash ... they cannot replace reserves... they die. I believe it's time for investors to walk away from shale ... and reallocate into offshore, where the opportunity to make a ton of money now exists.**

**Seeking Alpha - The Shale Party Is Going To End Badly 6 Sept 2017**

## Roller coaster in US shale oil



Data: Bloomberg; graphic by Bloomberg Gadfly

## A storm is brewing for oil shale

- Harold Hamm, CEO Continental Resources, declared shale producers drilling themselves into a hole and risk flooding market with excess crude whilst "barely breaking even or losing money". Hamm urged producers to be prudent and use some discipline.
- "The volatility of the current operating environment requires financial discipline.." "...pursuing growth without adequate returns is something we will avoid." Al Walker, CEO, Anadarko Petroleum
- Investors' willingness to fund even unprofitable shale drillers was "the biggest problem our industry faces."
- Anadarko is considering a strategic move back into international exploration, "We are going to need conventional oil."
- "One of the features of shale, which we have grown to like a bit less with time, and see as a bit more of a curse, is that the investments that are demanded there are quite pro-cyclical. You have to continue to invest to actually maintain the value of those businesses" Andrew Mackenzie, CEO BHP

- Companies struggling financially → key reason for drop in shale players' stock price
- Shale companies revising their 2017 capital budgets.
- Service price inflation began in Q1 2017
- Interests rates are rising
- Infrastructure limitations, especially in Permian
- OFS companies reached capacity for fracking, pressure pumping & sand supply in Q2 2017
- 160 North American upstream companies declared bankruptcy or commenced strategic reviews since the 2014 price slump

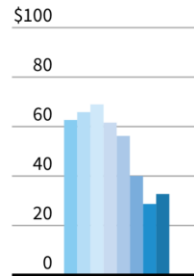
# US shale production break-even price rising

- The break-even price of US shale production is rising for the first time in five years but remains half of what it was in 2010 (Rystad)
- But is this wellhead break-even not cash-flow break-even.

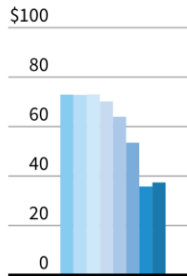
## PRICE PER BARREL

■ 2010 ■ 2011 ■ 2012 ■ 2013  
 ■ 2014 ■ 2015 ■ 2016 ■ 2017\*

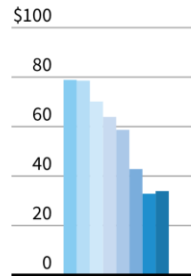
### BAKKEN



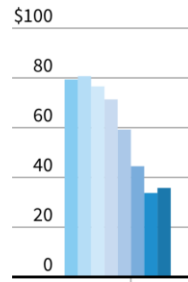
### EAGLE FORD



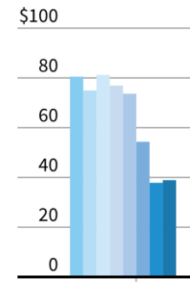
### NIOBRARA



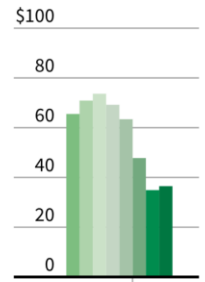
### DELAWARE BASIN



### MIDLAND BASIN



### U.S. SHALE AVERAGE



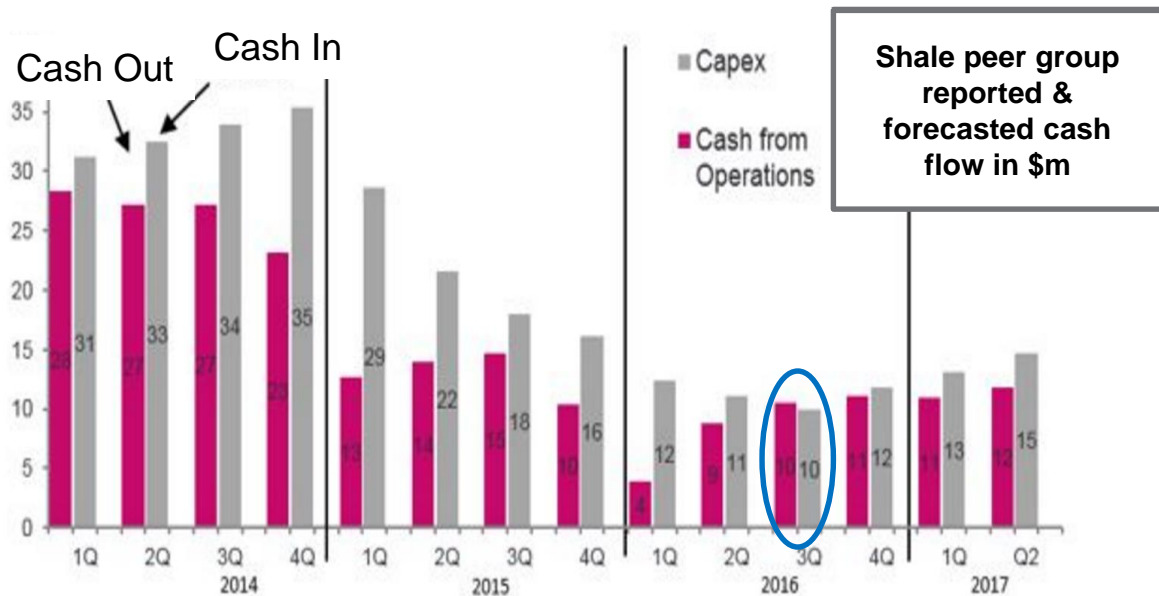
\*Estimated

Source: Rystad Energy

By Travis Hartman | REUTERS GRAPHICS

## “Shale industry has started to adjust to ... reality”\*

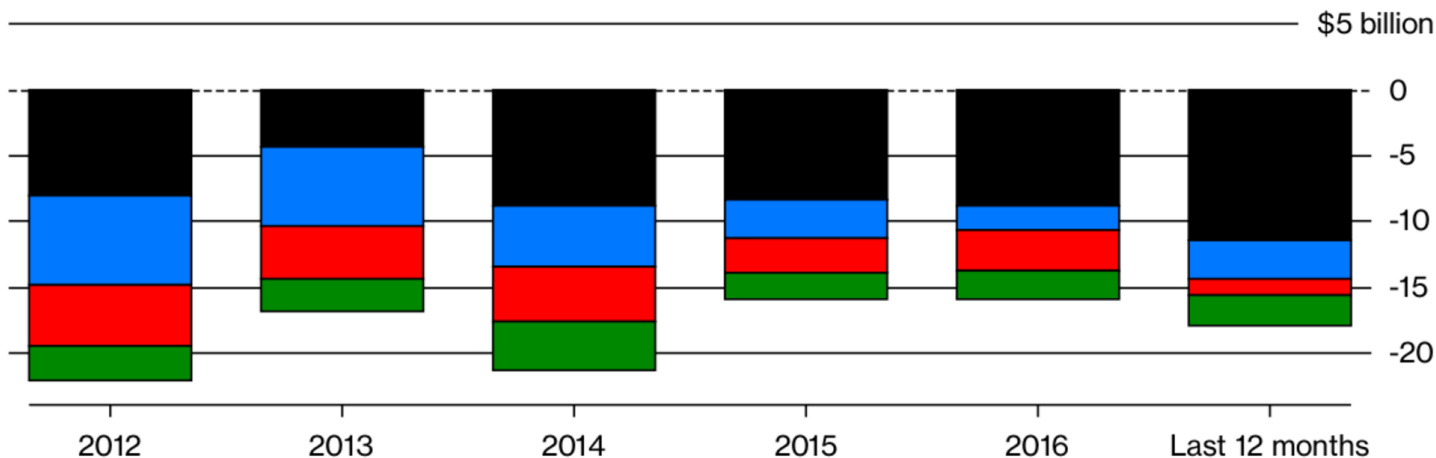
- Gap between E&P companies' earnings and investments grew in Q2 2017 to \$3 bln



## Burn Baby Burn

The shale business hasn't funded itself whether oil is at \$100 or \$50 a barrel

Permian
  Bakken
  Eagle Ford
  Niobrara



Note: Free cash flow for a sample of 33 shale-weighted E&P companies.

Data: Bloomberg; graphic by Bloomberg Gadfly



## Break-even is just not good enough

Nobody runs a commercial business to break even.



## Debt & equity financing in 2016 selected US E&Ps

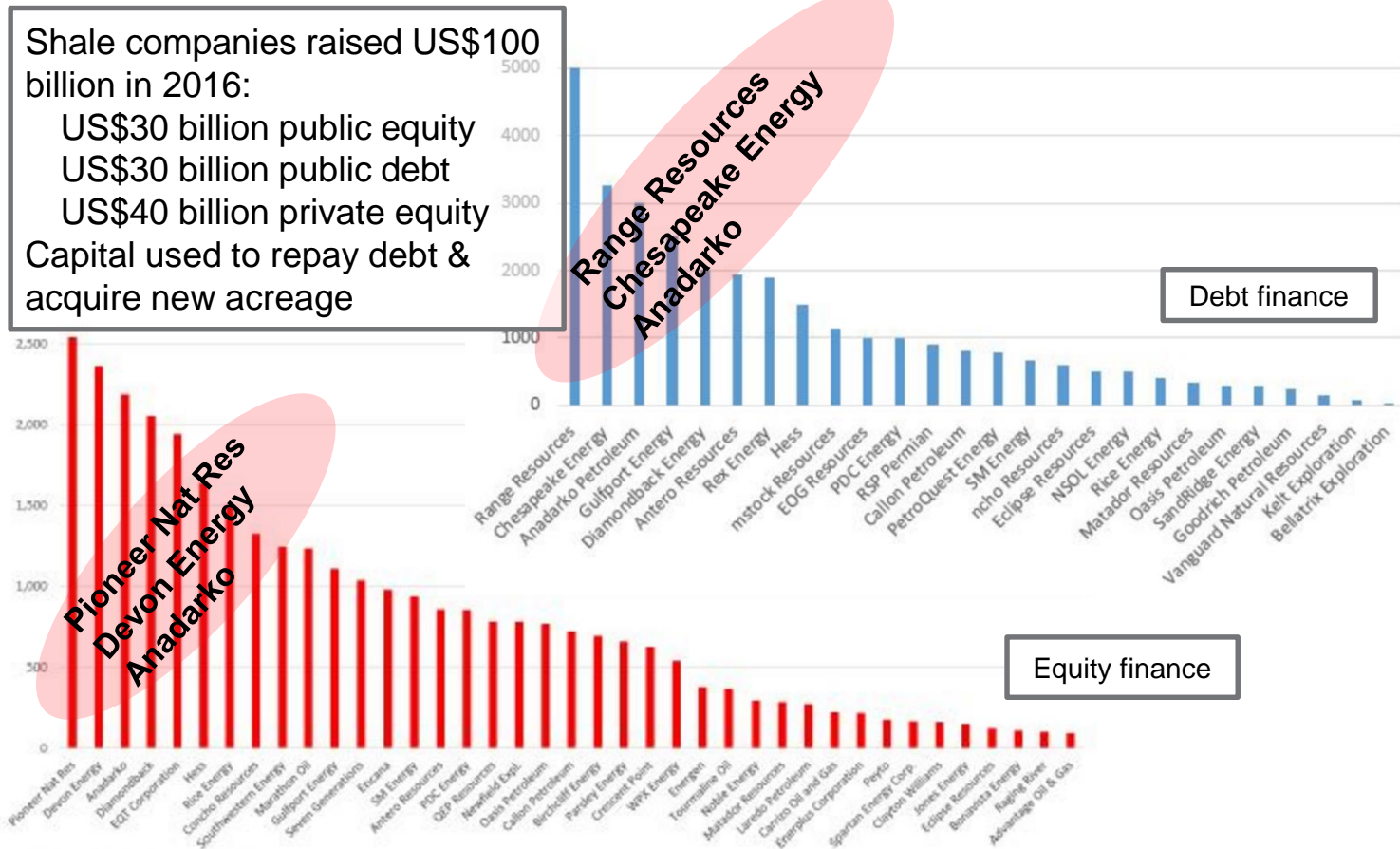
Shale companies raised US\$100 billion in 2016:

US\$30 billion public equity

US\$30 billion public debt

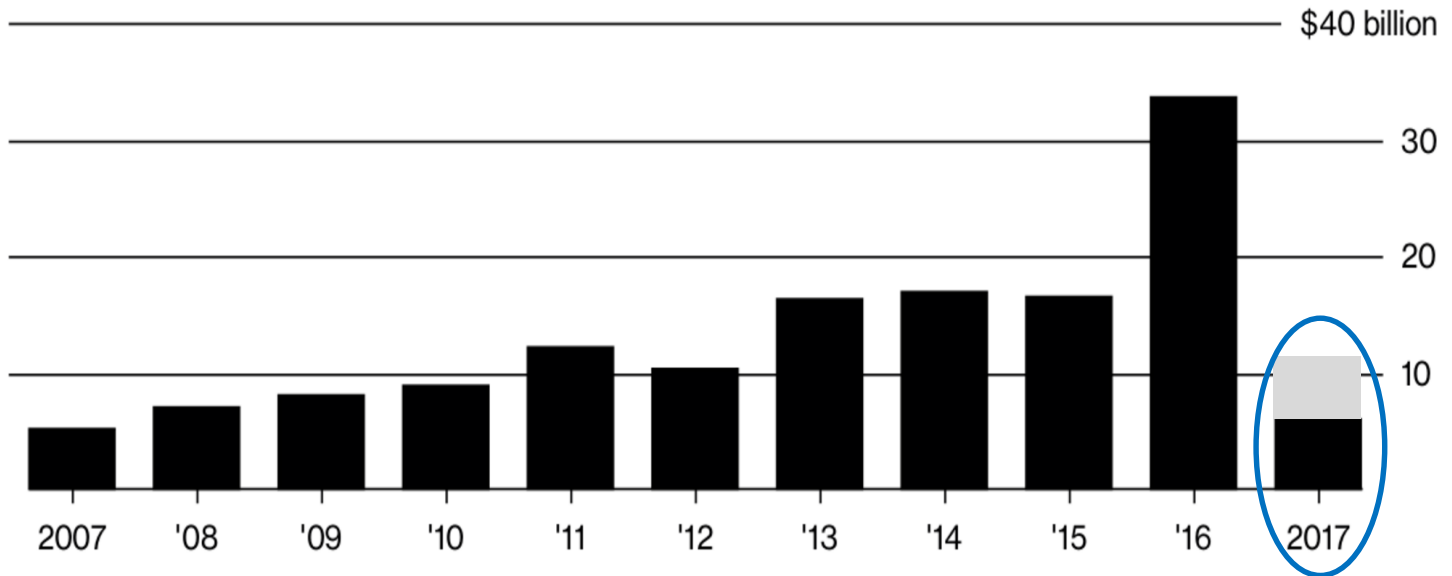
US\$40 billion private equity

Capital used to repay debt & acquire new acreage



Source: Bloomberg, Rystad Energy Analysis

Public equity issuance by US E&P companies picked up in 2013 as the shale boom accelerated and then spiked in 2016 to help cope with low oil prices. A major reversal is occurring in 2017.



Note: Data for 2017 as of 7 August.

Data: Bloomberg; graphic by Bloomberg Gadfly

**\$11.7 billion**

Principal balance at 9/30/2015 <sup>(1)</sup>

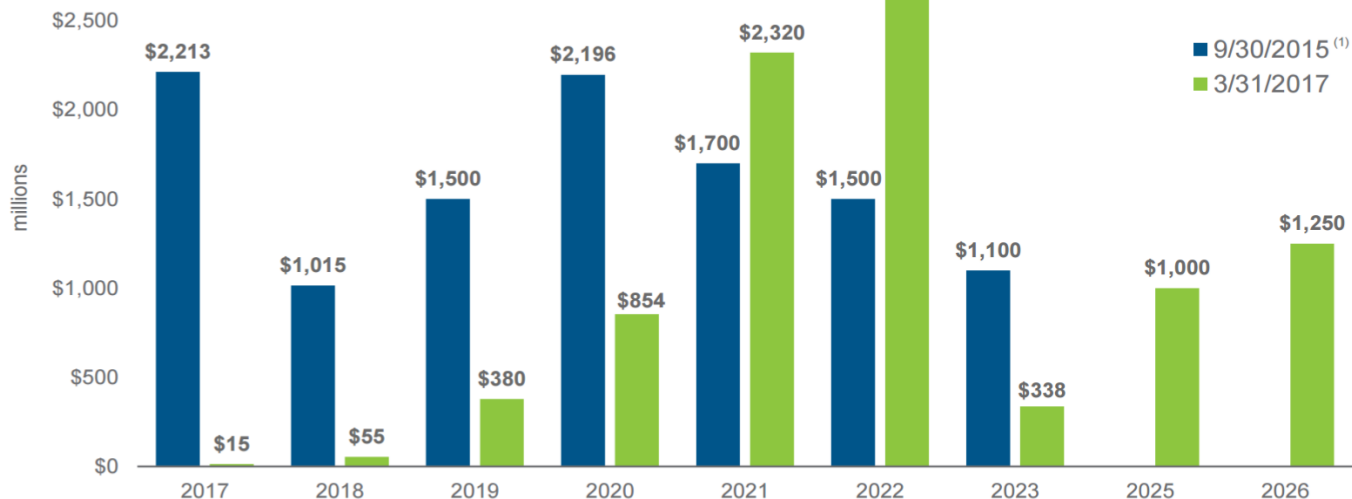
**\$9.1 billion**

Principal balance at 3/31/2017

**>> \$2.6 billion debt reduction over 18 months**

**\$9.7 bln by July 2017**  
**Leverage 4.3x**

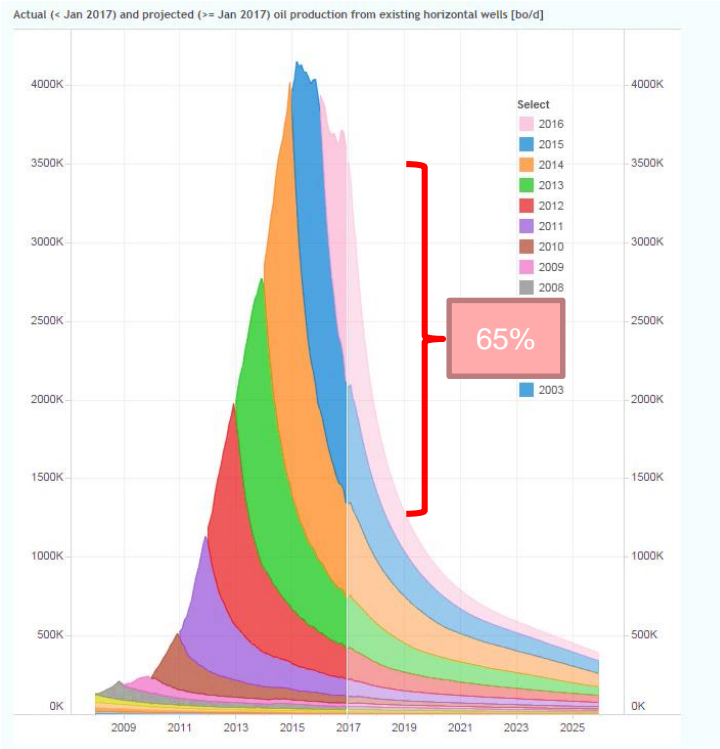
**Annual income 2015 - \$6.7 bln**  
**Annual income 2016 - \$3.1 bln**  
**Borrowed in 2016 ~ \$3.2 bln**



**~1.8 mmbbl of oil hedged in 2018 with swaps at an average price of \$51.43**

## US Oil shale production projection

- Projected oil production from Jan 2017 of 46,408 horizontal wells that started production before 2017.
- Key assumption: future behaviour of wells will be similar to past behaviour
- 65% of output from all horizontal wells onstream before 2017 to be replaced by end 2018
- 6,600 oil wells to be completed per year simply to maintain production
- With increasing rates of depletion and drop in production per well in Bakken and Eagle Ford more and more wells will need to be completed simply to maintain current production rates



After: Enno Peters  
<https://www.shaleprofile.com/>

## M&A in the shale basins

- Survival of the fittest
- US led M&A by August 2017: 250 transactions worth record \$114 bln agreed\*
- Exxon added 22K acres in Permian Basin since May through undisclosed acquisitions and acreage trades adding to their 6 bln boe resource base.

\* Source: Datalogic

\*\* IHS Herold

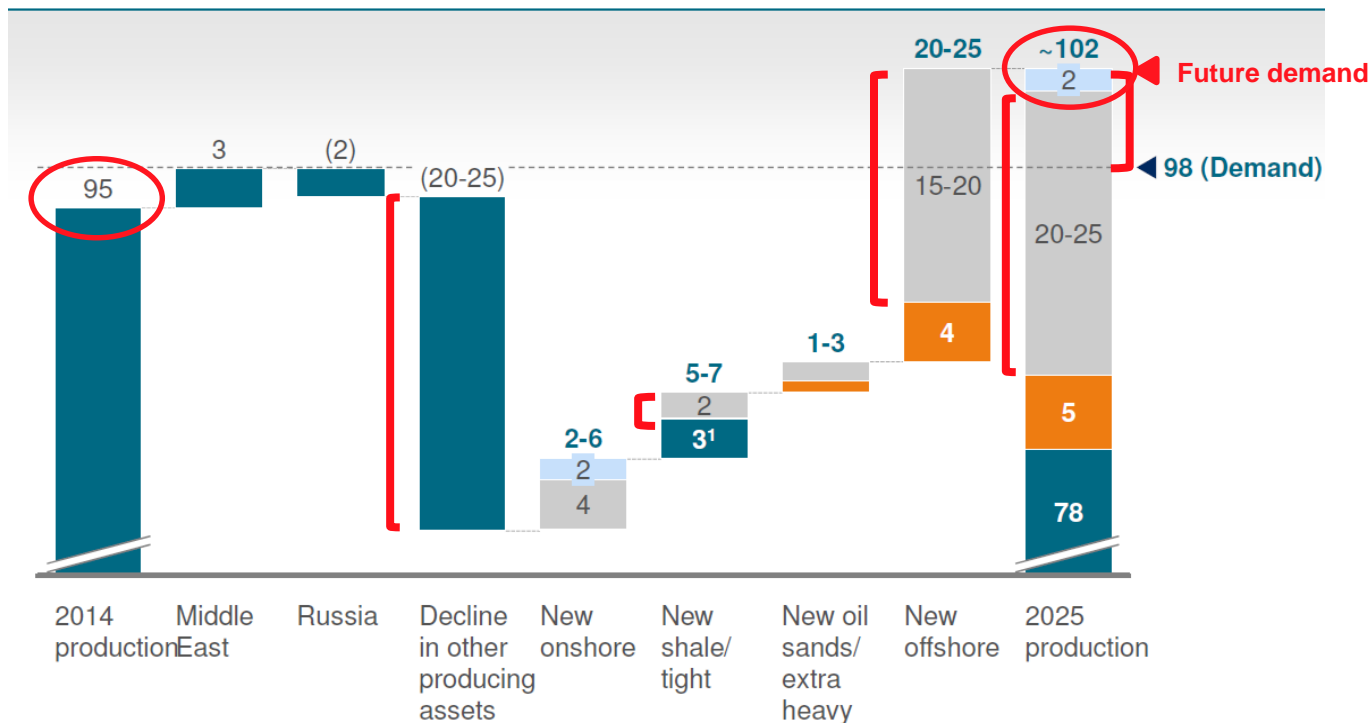
## Upstream Investment



## New hydrocarbon supply to 2025 by resource type

2025 potential supply capacity, mboed

Other liquids Not sanctioned Sanctioned Producing



1 Growth from producing assets

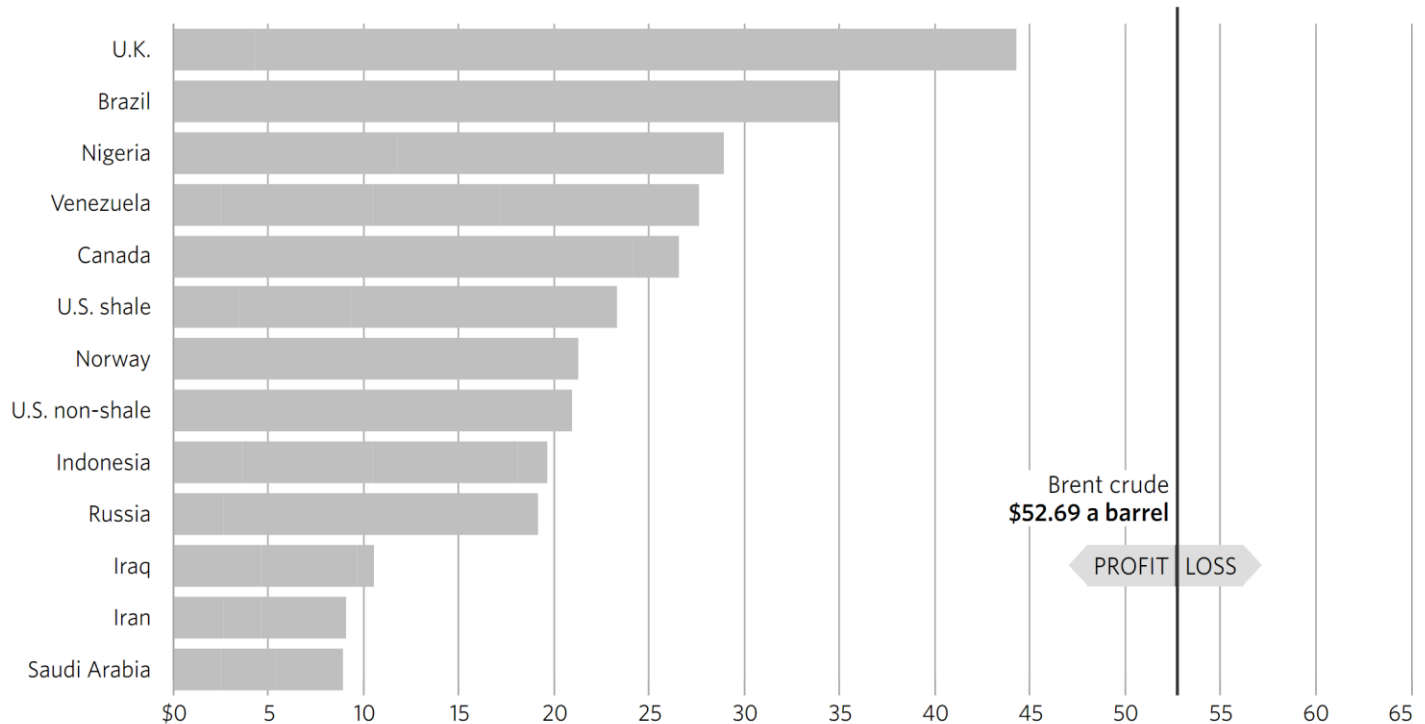
Non-OPEC ex. Russia

Source: McKinsey 2016



# Cost of producing a barrel of oil and gas

Average cash cost to produce a barrel of oil or gas equivalent in 2016, based on data from March 2016.



Note: Brent crude price as of Sept. 1, 2017 at 10:59 p.m. BST.

Source: Rystad Energy UCube

- Exxon this week won 9 deepwater Campos Basin blocks paying \$1.57 bln in bid bonuses, incl. single highest ever bid
- Av. peak production per well in sub-salt is 25,000 b/d and keeps pumping for decades. Record production 36,000b/d\*
- Time to drill a well\*:  
2010 – 310 days  
2016 – 89 days
- Cost to drill\*:  
2016 Q1 \$8/boe
- Petrobras to install 19 FPSOs offshore Brazil over next five years
- 31 FPS units under construction, 1/3 destined for Latin America
- Barents Sea annual investment rising from <\$2 bln to \$5 bln by 2021
- Transocean divested jackup fleet to Borr Drilling then acquired Songa Offshore creating largest floating rig fleet, with major harsh environment capacities
- One could acquire nearly the entire offshore drilling industry for less than the cost of one average fracking company.\*\*

Source: \* Petrobras

\*\*Seeking Alpha - The Shale Party Is Going To End Badly

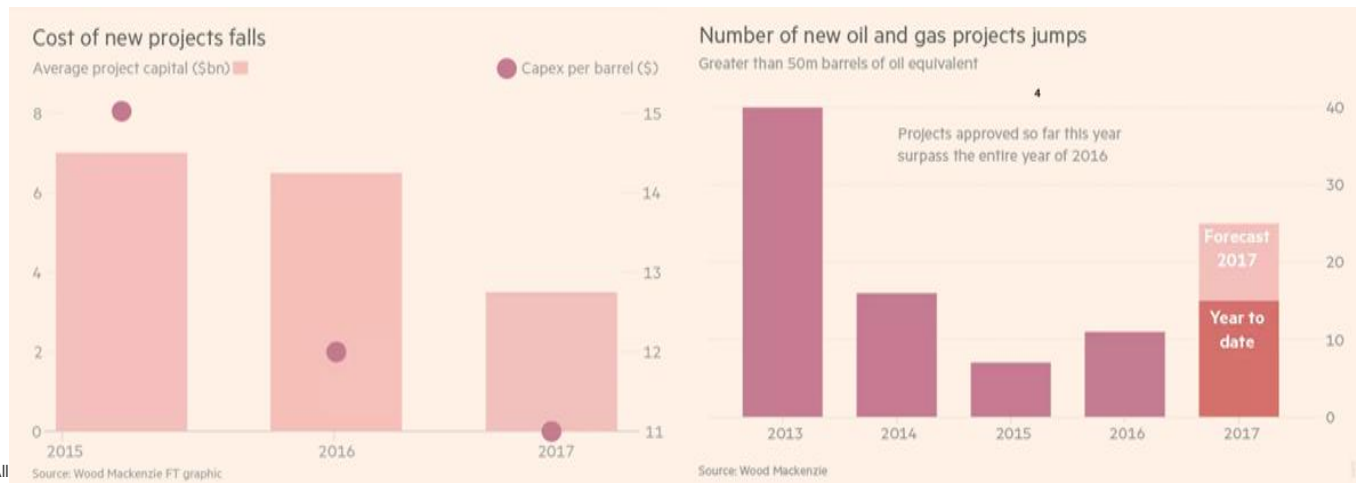
## Global upstream investment

- Global oil and gas upstream investment fell by 25% in 2015 and by another 26% in 2016
- In 2017 there are modest signs of recovery led by US light tight oil.



## Large conventional project FIDs

- 2007 to 2013: Av. 40 new large developments approved annually
- 2016: 12 large conventional projects approved contained ca. 8.8bn boe
- 1H 2017: 15 large projects with ca. 8bn boe (Wood Mackenzie)
- >100 projects ready for development delayed since 2014 (Rystad)
- 75% of 2017 of conventional projects approvals are “brownfield” or near-field expansions tied back to existing platforms and pipelines
- Less risky, capital-intensive, and faster to bring on stream than greenfield developments → quicker payback and better returns on development dollars



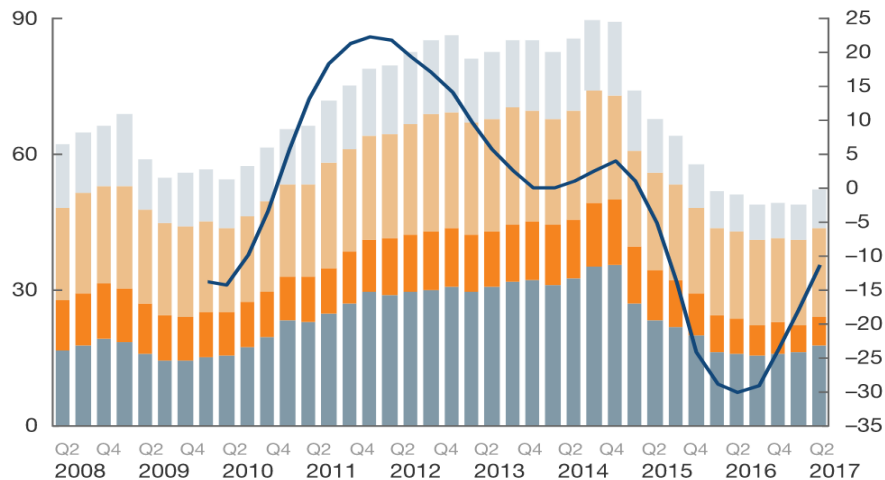
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Quarterly revenue, \$ billion

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Revenue growth, %

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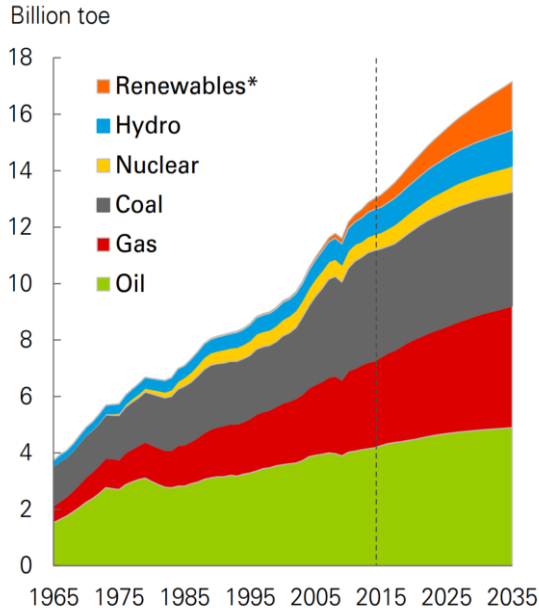
McKinsey&Company | Source: S&P Capital IQ; McKinsey analysis

**What will be the impact of renewable energy on the oil & gas sector in the next 20 years?**



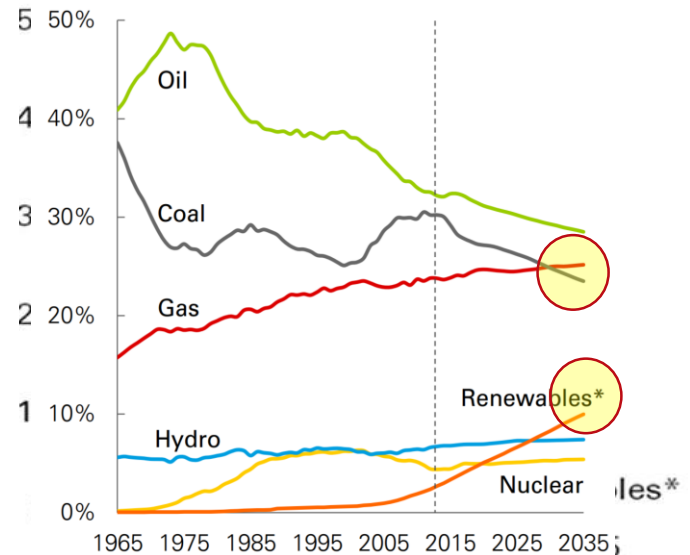
## Demand for oil and gas continues to grow

Primary energy consumption by fuel



\*Renewables includes wind, solar, geothermal, biomass, and biofuels

Shares of primary energy



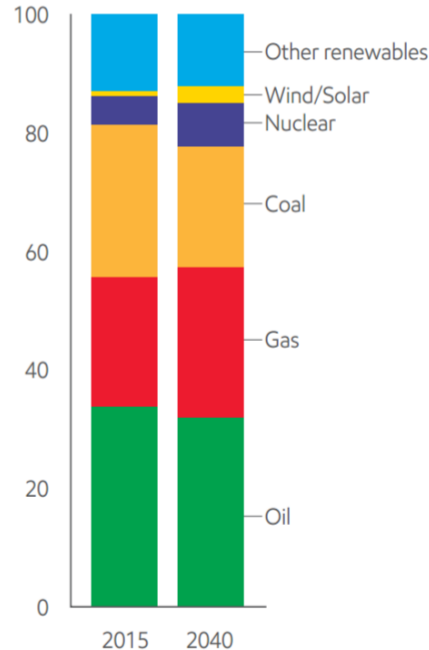
\*Includes biofuels

Source: BP Energy Outlook 2035

## Effect of renewables on oil & gas – “zero”

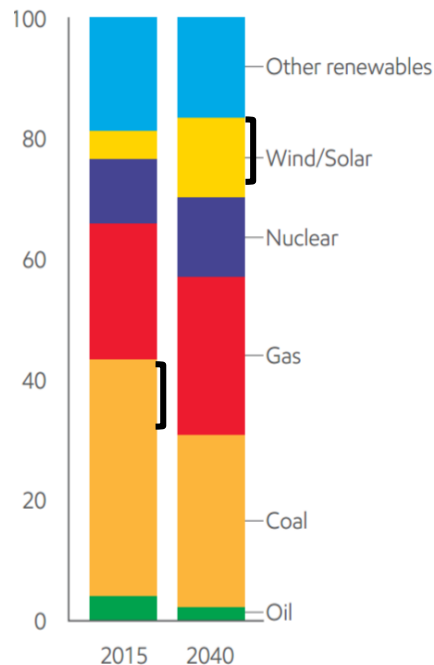
### Global energy mix evolves

Share of primary energy



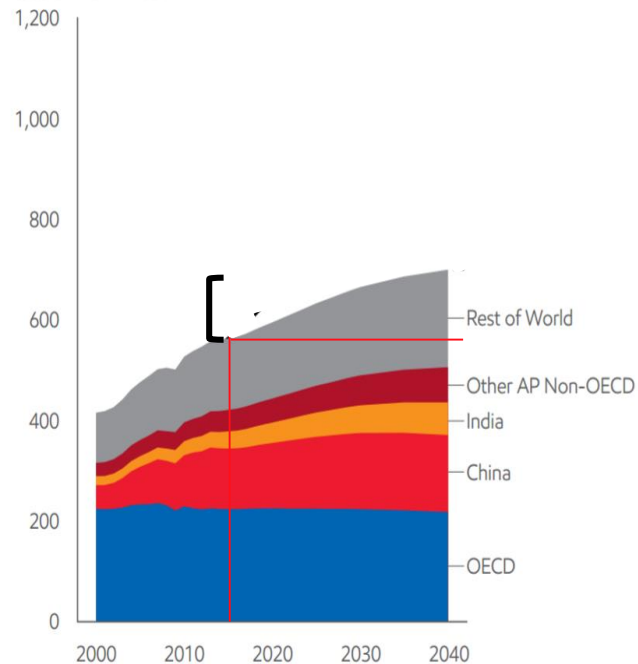
### Electricity supply mix shifts

Percent share TWh (net delivered)



### Global efficiency limits demand growth

Quadrillion BTUs

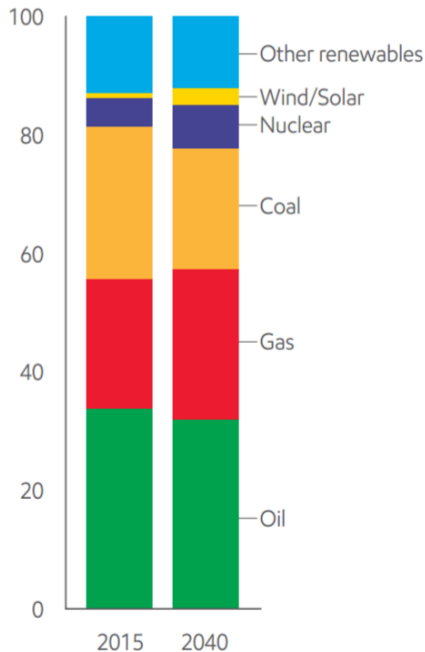




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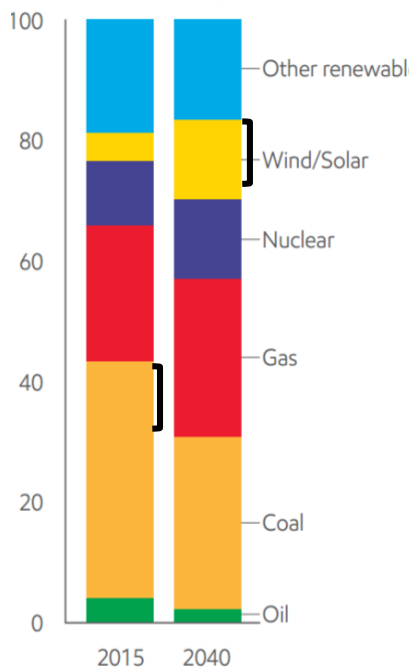
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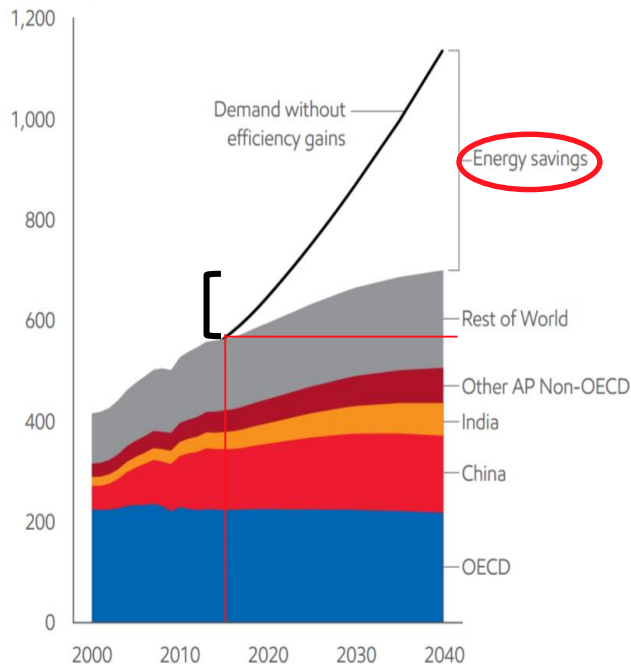
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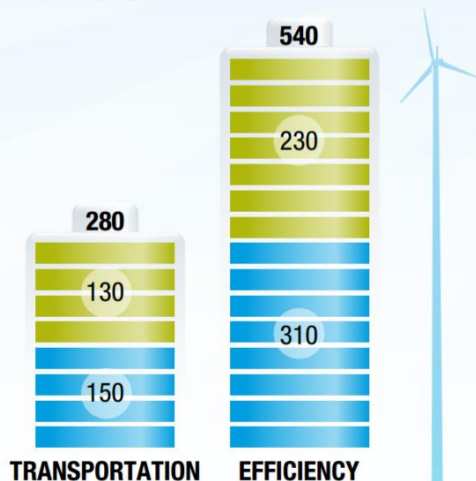
## Sources of energy in next 20 years

- GDP expected to double in next 20 years
- Energy efficiency gains should limit increase in global energy demands to 30%
- Oil, gas and coal will remain dominant energy sources
- Renewables, nuclear and hydroelectric should supply half of the new energy demand
- Renewables (excl. hydro) should quadruple in 20 years becoming 10% of energy supply (3% in 2015)
- Two-thirds of increase in global energy demand going to the power generation
- Renewables are critically important as a source of marginal new electricity supply
- Renewables accounted for 60% of all new energy capacity installation in 2016 (FT: Michael Power, Investec Asset Management)

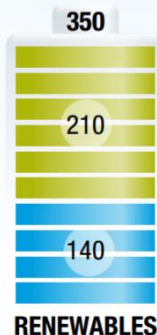
# Technology will create opportunities for increased efficiency & productivity

There is the potential to unlock \$900 billion to \$1.6 trillion of value in the global economy (McKinsey)

## 2035 run rate savings opportunity \$ billion 2015



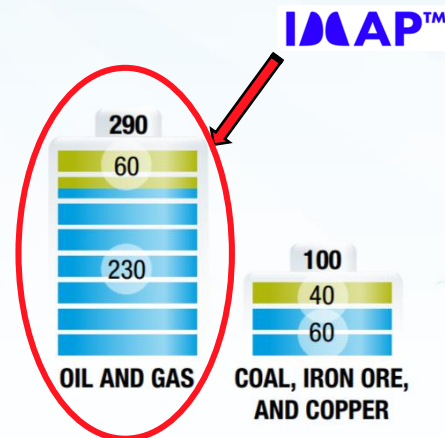
Consumption of energy will become less intense as people use energy more efficiently in homes, businesses, and transportation.



Technological advances will help bring down the cost of renewable energies, such as solar and wind energy, partially displacing fossil fuels.

## 2035 increased productivity \$ billion 2015

Technology acceleration Moderate case



Resource producers will be able to deploy a range of technologies including robotics, Internet of Things, and data analytics in their operations to raise productivity.

## Conclusions



- oil market will rebalance soon
- oil prices will oscillate within a \$20 dollar “shale band” around \$50/bbl until rebalance is recognised or “the love affair with shale” ends
- marginal costs for shale will increase, as they will for the rest of the industry
- shale will deliver sufficient new volumes in 2017 but borrowing & service costs will increase and break-even prices will rise, easing pressure on oil prices
- the future is in natural gas and offshore oil, where new projects will become increasingly competitive from 2018
- skills shortages will become acute
- M&A already strong
  - weaker shale E&Ps are snapped up.
  - a megamerger is not impossible
  - and a feeding frenzy amongst the oil field service companies
- Longer-term outlook for oil & gas looks bright

Tomorrow's upstream industry will not be about doing the same work for less, it will be about doing less work for the same result

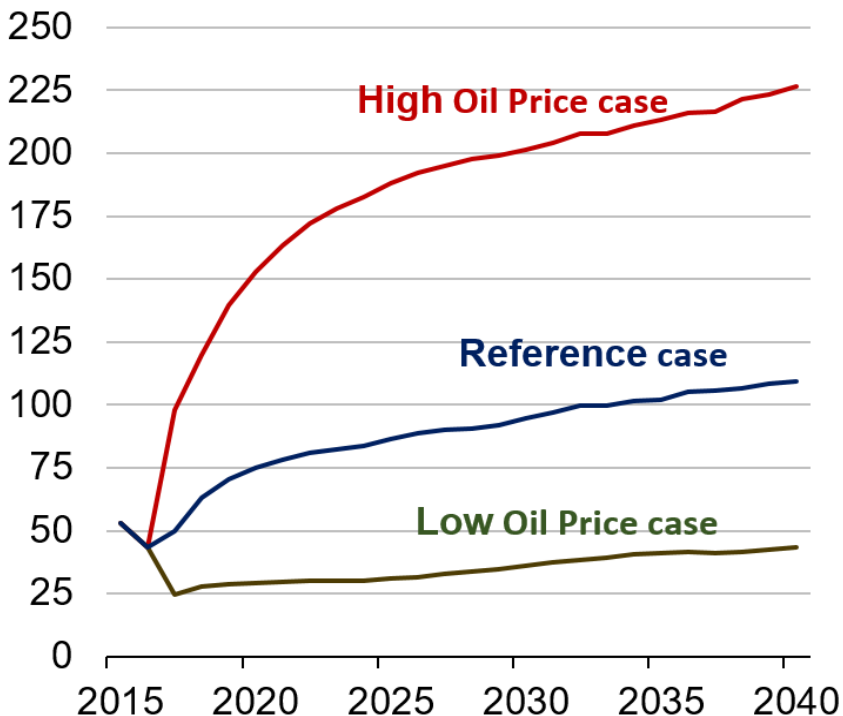
Risk management in E&P will gradually shift from the traditional subsurface resource knowledge to managing an increasingly complex energy system



# The oil price prediction

**World oil prices in three cases**  
real 2016 dollars per barrel

**International Energy  
Outlook 2017**



# Global Upstream Trends and the Impact of Sustainable Energy

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“For myself I am an optimist - it does not seem to be much use being anything else.”

Winston Churchill