

# Oil & gas macro outlook

## Supply/demand rebalancing some time away

The oil sector is firmly in a new cycle, with a dramatically lower cost profile across the industry. Inventories in the US remain at elevated levels (only just below last year's record levels). Although demand growth is steady, the production growth from the US shales alone is seen to be enough to provide for this growth from (Q217-Q218), with OPEC playing a role as the swing producer to cover seasonal variation. The market agrees, and the forward curve has progressively lowered and flattened over the last 18 months. We lower our long-term oil price assumption to \$70/bbl in 2022 (equivalent to c \$60/bbl real in 2016).

### Steady demand growth of 1.4% in 2017-18

The IEA forecasts demand to be relatively robust in the coming 12-18 months, growing by 1.41mmb/d 2017-2018 (or 1.4%) driven by Asia. This annual growth (in absolute barrels) is similar to that seen in 2011-16.

### Shales can deliver the required supply growth easily

Between 2017 and 2018, the growth in supply will overwhelmingly come from the US, with 1.1mmb/d (of the 1.4mmb/d demand growth) accounted for by the OECD Americas with other (non-OPEC) sources supplying 0.3mmb/d. As a result, to balance the market, the IEA forecasts that the call on OPEC will fall by 0.1mmb/d. These estimates put a stress on the performance of the US shales (which are that much more elastic to pricing over much shorter timelines than conventional production). Our analysis indicates the shales are well capable of delivering this increase, even if the rig count falls as much as 20% (assuming current productivity per rig). Reductions in rig count or productivity per well only really start to be felt in the 2018-2019 timeline, by which time the production would start to plateau, potentially opening up an environment for higher prices, albeit cushioned by the current high inventories.

### Lowering our long-term oil price assumption

The IEA sees an extended period of ample supply, with non-OPEC supply alone growing more than global demand in 2018. The vast majority of this growth will come from the US, underlining the massive impact that the fracking revolution continues to have. Given the speed at which producers can alter activity levels, we continue to view the oil price through a shale lens. In the short to mid-term, therefore, prices need to incentivise further drilling to fill the estimated 1.8mmb/d growth in demand in Q2-Q417 (of which the IEA expects the US to supply the largest chunk). We retain our methodology of employing the EIA forecasts in the short term (\$50.79/bbl in 2017 and \$51.58/bbl in 2018). In the longer term, US shales are not enough to supply a growing global economy and prices need to encourage conventional development. However, the drop in development costs since 2014 has flattened the supply cost curve, leading us to reduce our long-term oil price assumption to \$70/bbl in 2022 (equivalent to c \$60/bbl real in 2016). Our previous assumption was \$70/bbl real in 2016.

8 August 2017

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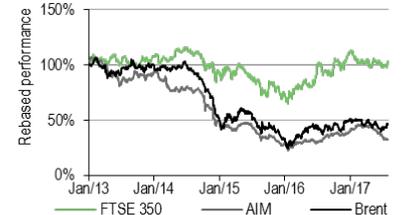
#### WTI vs Brent



#### S&P 500 Oil & Gas Index



#### FTSE 350 Oil & Gas Index



Source: Bloomberg

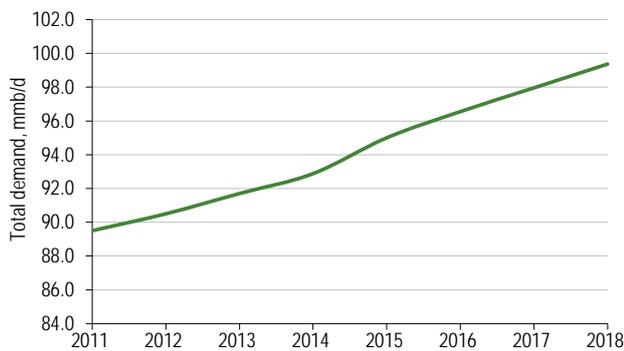
	Brent \$/bbl
2014	99.1
2015	54.2
2016	43.5
2017e	50.8
2018e	51.6

Source: EIA, Edison Investment Research

## Demand continues to tick up

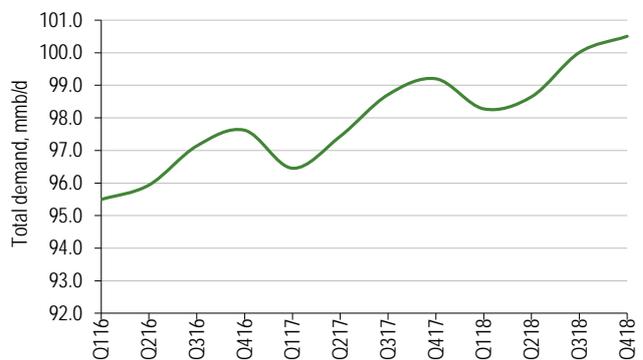
The IEA forecasts global demand to grow at a slightly slower pace than in recent years (1.4% in 2017-18 vs 1.5% CAGR 2011-16), with material seasonality. After a relatively weak Q117, stronger preliminary numbers since then have led the IEA to increase its forecast for 2017 growth by 0.1mmb/d and forecast overall global demand of 98mmb/d. US gasoline demand continues to grow and German gasoil demand also saw a notable increase. Apparent Chinese demand rebounded after a year-on-year decline in April, though full year growth numbers in China remain steady (from last month's report).

**Exhibit 1: Demand growth continues**



Source: IEA, Edison Investment Research

**Exhibit 2: Normal seasonality sees demand growth concentrated in second half of years**

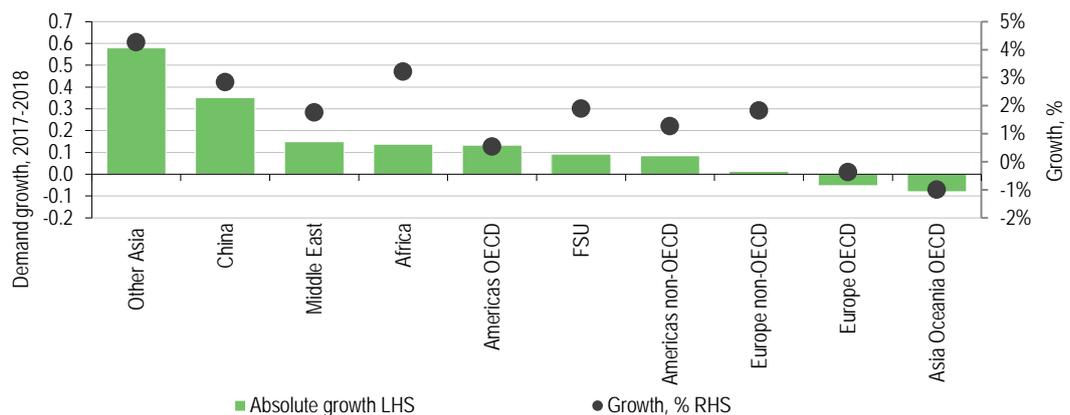


Source: IEA, Edison Investment Research

## Comparison of global supply/demand growth sources

As can be seen below (Exhibit 3), the bulk of demand growth will come from Asia. In 2017-18, the only regions to see a fall in demand are Europe (OECD) and Asia Oceania (OECD).

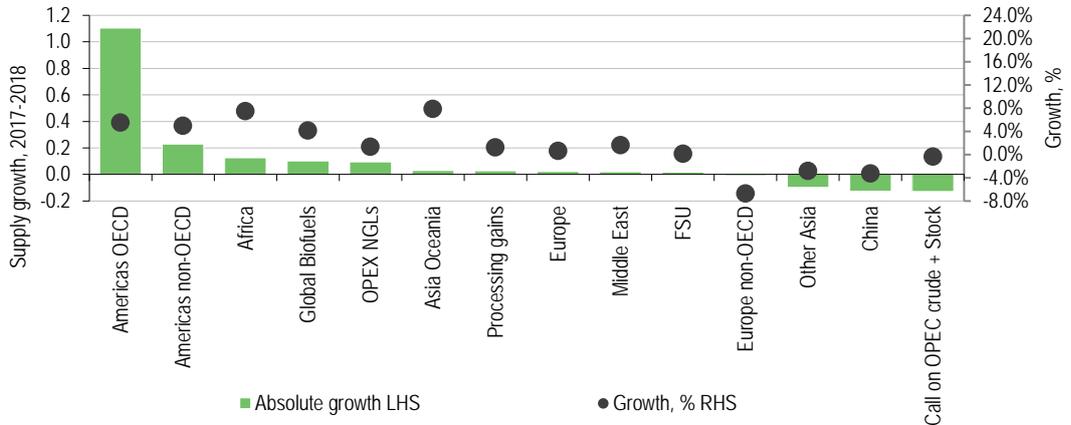
**Exhibit 3: 2017-18 demand growth of 1.41mmb/d concentrated in Asia**



Source: IEA, Edison Investment Research

Growth in supply (Exhibit 4) comes overwhelmingly from the US, with growth in Americas OECD of 1.1mmb/d in 2017-18. In the period 2016-18, production growth in America OECD is forecast to be 1.8mmb/d, well above all other regions (the second highest contributor is an increase in the call on OPEC of 0.4mmb/d). Structural supply growth is therefore centred on the US shales.

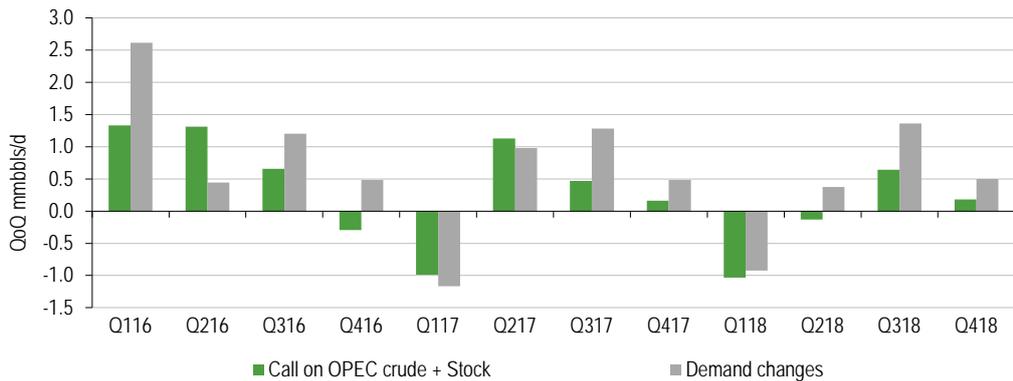
**Exhibit 4: Supply growth seen in US and OPEC 2017/2018**



Source: IEA, Edison Investment Research

In this environment, OPEC is playing the role of the seasonal swing producer (Exhibit 5), increasing production in high demand periods (predominantly Q4) and coming off in Q1, but falling off as demand wains seasonally.

**Exhibit 5: OPEC remains the swing producer, absorbing the seasonality of demand (q-o-q)**

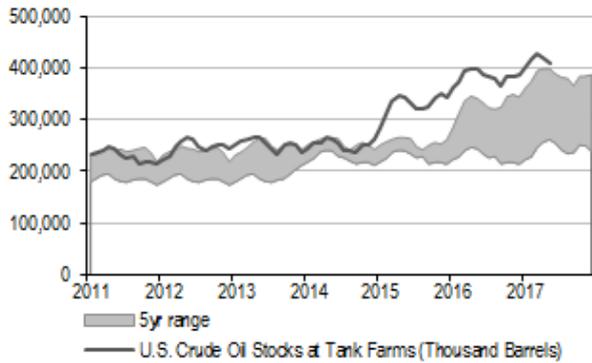


Source: IEA, Edison Investment Research

### Inventories

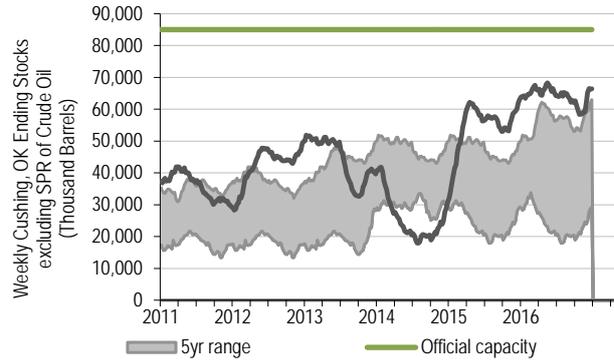
In the US, inventories remain high, representing plenty of cushion should supplies disappoint versus demand growth. OECD data indicate that stocks are still well above five-year averages, but have declined slightly in H17. Crucially, the OPEC cuts are measured not against oil prices but inventory levels (its stated aim is to bring global oil inventories down from the five-year average), which means its job is made easier as peak levels fall slightly (inventories in the OECD are lower than 2016 year-on-year). The absolute level of inventories remains high.

**Exhibit 6: Stocks in tank farms remain elevated**



Source: EIA, Edison Investment Research

**Exhibit 7: SPR levels high**



Source: EIA, Edison Investment Research. Note: SPR is the Strategic Petroleum Reserve. Black line is SPR levels at the time

## How will US production grow by 1mmb/d y-o-y?

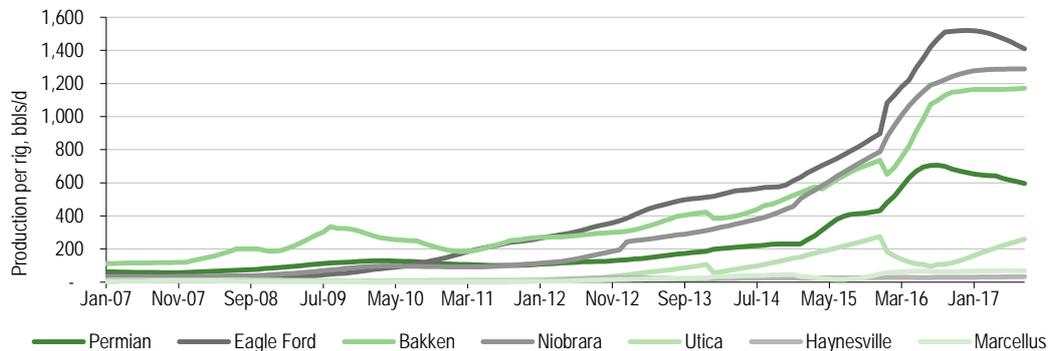
With such a large increase in supply predicted by the IEA, it is worthwhile examining the potential for growth in US production. Our analysis indicates that very substantial reductions in both rig count and productivity per rig would have to occur for US shale production not to grow by over 500mmb/d over the next 12 months.

First we give some background on how shale production has developed.

### Productivity per rig has increased markedly

Productivities have increased hugely since the initial shale fracking wells, initially due to technology advances and operators applying more aggressive techniques (multi-stage fracks, longer horizontals). As the oil price fell, productivities per well drilled increased further as operators concentrated on drilling the “sweet spot” areas with their best rigs. As the oil price has recovered, this has appeared to reverse as development has moved progressively out to less productive areas with less productive rigs, leading to a flattening (and sometimes falling) of the curves.

**Exhibit 8: Rig productivities have increased massively over the last 10 years**



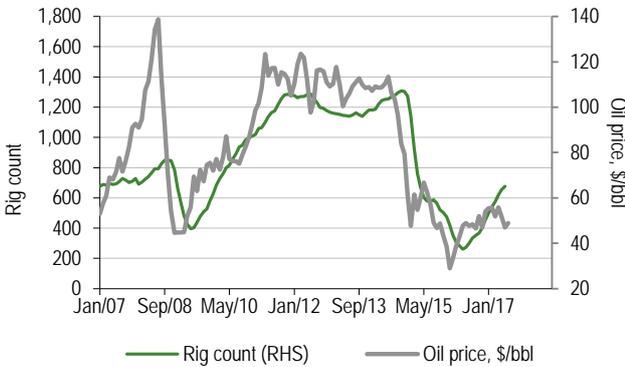
Source: Bloomberg, Edison Investment Research

### Rig count & oil price appear well correlated – rig counts to fall?

Since 2007, there appears to be a good correlation between the prevailing oil price and the rig count, as the charts below indicate. The oil price appears to lead the rig count by around four months, and regression to this trend (with the current \$50/bbl oil price) would suggest that a fall in rig count is possible.

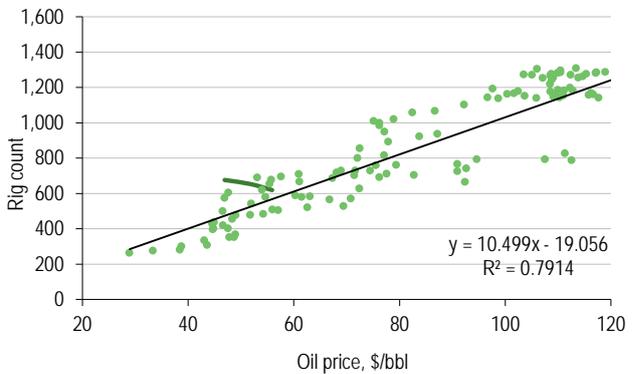
A reduction in activity has been flagged by large onshore players. Pioneer Natural Resources has flagged that capex in its Permian assets will be at the lower end of its full year guidance and Anadarko is trimming its programme by \$300m (to \$4.2bn). Service companies have given similar feedback to the market (Halliburton has suggested its customers are tapping on the brakes).

**Exhibit 9: Relationship between rig count and oil price**



Source: DPR, Edison Investment Research, Bloomberg

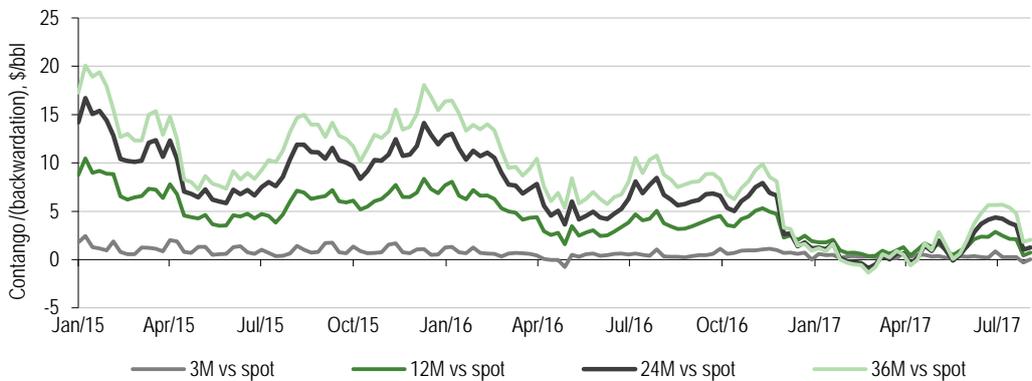
**Exhibit 10: The correlation is strong with a four-month delay**



Source: DPR, Edison Investment Research, Bloomberg. Note: The chart plots the rig counts against the oil price with a four-month delay. The dark green line indicate rig count and oil price over the last three months.

Drilling is not helped by an ever-flattening forward curve on low oil prices, leaving operators with few chances to sell forward and fund drilling, giving weight to the theory of falling activity levels.

**Exhibit 11: Forward curve has progressively flattened**



Source: Bloomberg, Edison Investment Research

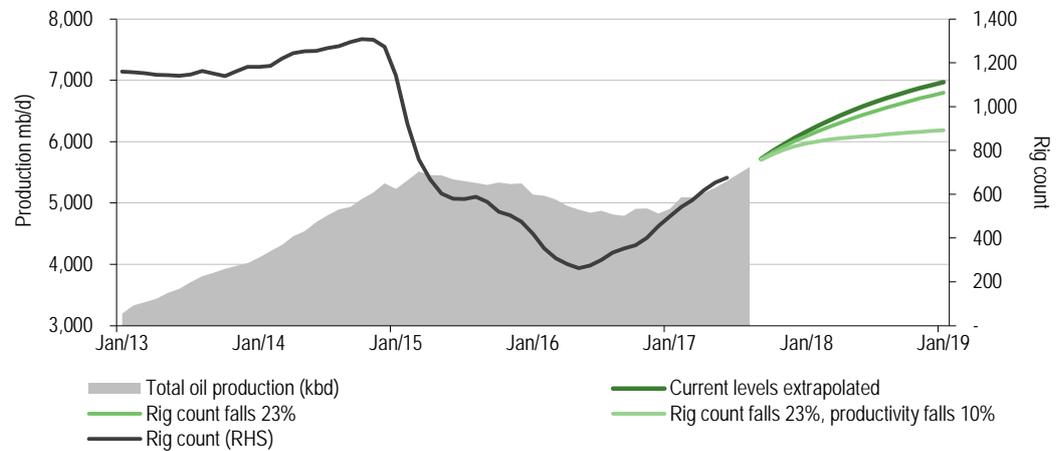
## However, production will still continue to rise

We follow the data from the Drilling Productivity Report (DPR), generating a number of scenarios for future production from US onshore based on a number of assumptions. All of these scenarios result in substantial increases in production. For reference, the IEA forecast for the same period is 1.2mmb/d.

- Most recent data are extrapolated forward (production per rig, rig count, decline rates). This results in an increase (Q2 2017-Q218) of 1.2mmb/d.
- Rig count falls in line with the historical correlation with the oil price, by 23% within six months (other factors remain the same). This still results in an increase of 1.1mmb/d.
- Rig count falls 23%, and production per rig falls by 10% immediately (to roughly April 2016 levels). This still results in an increase of 0.8mmb/d.

Even with scenario three, the production will still rise materially, and any shortfall (vs base case) could be absorbed by OPEC and the bloated inventories. Indeed, if the 0.3mmb/d was all supplied by OECD inventories, it would just about reduce the existing inventories to five-year average levels.

**Exhibit 12: Three scenarios indicate substantial Q2 y-o-y production increases are likely, even with a drop in rig count or productivity per rig**



Source: Bloomberg, Edison Investment Research

The impact of the scenarios is seen further out as the curves (shown above) start to flatten out. In our base case (no changes in rig count or productivity), production increases from 0.62mmb/d in Q218-19, slightly above the 0.57mmb/d that would be seen in scenario two (rig count falls), but well above a growth of only 0.1mmb/d in scenario three.

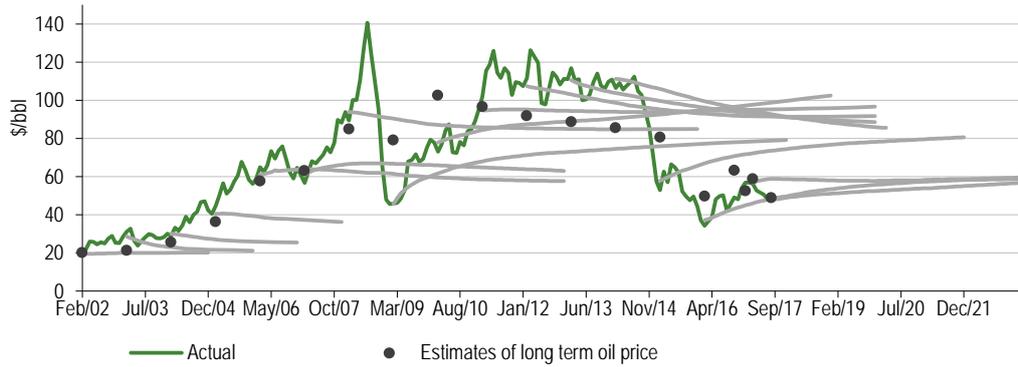
## Long-term prices

We do not have a global database on project economics and therefore have to rely on other market commentators to get an idea of where long-term oil prices may find their level, implicitly assuming this will be at around the price that the marginal development will be sanctioned and produce.

Of course, prices are really the result of an interdependent feedback loop, whereby near-term prices affect costs that affect development economics, which drive mid- and long-term outputs, at least partially explaining why market implied long-term prices (via forwards) so closely relate to current spot prices.

We stress that this interdependency is critical – project development costs are a result of service industry costs. If oil prices increase service costs will increase to capture more margin, forcing up the cost curve. Much of the current cost deflation will revert back as and when oil prices show any sign of meaningful longer-term increases, although at the moment given the glut in US shales, high inventories and voluntary OPEC production restrictions this seems a medium-term prospect.

**Exhibit 13: Long-term oil forward expectations at any point are closely related to spot**



Source: Bloomberg, Edison Investment Research. Note: Grey lines are the forward curves at the time; the dots are the last data point of these curves.

## Break-even prices for developments

With the caveats explained above, we have re-examined our long-term price assumption.

Looking at publicly available information from other participants indicates that break-evens for shale plays may be between \$30-40/bbl WTI (Rystad Energy in February). In March 2017, the Dallas Fed asked 62 companies what WTI price would be needed to profitably drill a new well, to which the (mean) answers were \$46-50/bbl in the Permian, \$48/bbl in the Eagle Ford, \$55/bbl in other shales and \$53/bbl in non-shale plays (but ranged from \$25-100/bbl).

In the same survey, the mean operating costs for existing production were \$24-33/bbl in the Permian, \$29/bbl in the Eagle Ford, \$35/bbl in other shales and \$38/bbl in non-shale plays (but ranged from \$5-65/bbl).

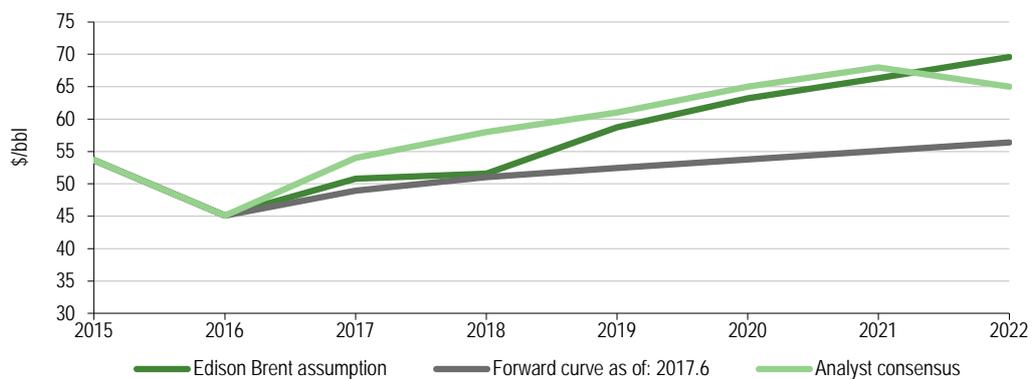
Elsewhere in the world we rely on cost curves, which suggest that the marginal barrel development is economic at \$60/bbl.

## Long-term oil price assumption

We therefore move our long-term assumption to \$60/bbl (for 2016), which corresponds (with a 2.5% inflation rate) to \$70/bbl in 2022. We then blend towards this from the separate 2017/18 assumptions (taken from the EIA), over 2018-22 timeline. We note that our previous assumption \$10/bbl higher.

This is still well above current forward curve implications, but similar to analyst consensus.

**Exhibit 14: Edison oil price assumptions vs forward curve vs analyst consensus**



Source: Bloomberg, Edison Investment Research. The forward curve is from June 2017

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