

2019 Outlook for Energy

The Guinness Atkinson Global Energy Team, January 2019

2018 was a tough year as OPEC tried to keep a volatile oil market in balance and deliver an acceptable oil price for its members in the face of strong US production growth. We would like to share our thoughts with you on 2018 and our outlook for 2019 and beyond.

Highlights

2018 IN REVIEW

2018 saw a balanced oil market on average, though it loosened at the end of the year. OPEC (Organization of the Petroleum Exporting Countries) acted rationally with an output surge mid year, responding to the threat of very tight markets and unsustainably high prices, but their effort was mistimed and coincided with Iranian import waivers and strong US onshore supply. Oil prices corrected sharply lower and the year ended with OPEC (and some of non-OPEC) introducing new quotas in order to re-balance the market in 2019.

The dominant themes for global oil markets last year were:

- i) **Strong non-OPEC supply growth led by US shale.** Production likely grew by 2.4m barrels per day (b/day) with the US onshore delivering 1.6m b/day. An average WTI oil price of \$65/barrel (bl) was sufficient to incentivize growth in the onshore oil rig count of 100 rigs (around 870 rigs as of Dec 2018) and a significant lift in completions activity. Production grew in Canada (+0.3m b/day) and the rest of the United States (+0.5m b/day), offset by declines in Norway (-0.1m b/day) and Mexico (-0.1m b/day). Other large non-OPEC producers like Brazil and China were flat.
- ii) **OPEC acted rationally to balance the market, but volatility persisted.** OPEC-14 production was likely down by 0.1m b/day with production declines in the first half followed by a concerted surge of production in the second half. Venezuela, Angola and Iran saw production declines over the year while Iraq, Kuwait, UAE and Saudi gained market share. Saudi delivered record production of 11.1m b/day in November 2018. OPEC announced new quotas in December 2018 in order to maintain market balance in 2019.
- iii) **Demand grew in line with initial expectations at 1.3m b/day.** This comprises **non-OECD (Organization for Economic Co-operation and Development) oil demand** growth of 0.9m b/day (with China up 0.5m b/day and India up 0.2m b/day) and **OECD oil demand** growth of 0.4m b/day. Overall growth was consistent with the last five years. Non-OECD demand growth was tempered due to higher oil prices and the strong US dollar. The 'loss' of oil demand created by electric vehicle substitution remains negligible.

For natural gas, 2018 was a year of both strong US supply and demand yielding a Henry Hub gas price of sub \$3/million cubic feet (mcf) for most of the year. International gas markets were tighter than expected reflecting a combination of short-term issues (weather, operational issues and higher

transportation costs) as well as a structural shift in electricity generation demand towards lower carbon fuels.

After a strong start to the year for energy equities in 2018, extreme commodity price weakness in the fourth quarter led the sector (MSCI World Energy Index) to finish -15.8% and behind the broad market (MSCI World -8.2%). Underlying energy company profitability continued to improve; our portfolio of energy equities likely delivered a 7% **Return on Capital Employed (ROCE)** and 6% Free Cash Flow (FCF) Return for 2018. The broader market remained skeptical of the sustainability of the sector's free cash flow potential, keeping valuations depressed.

OUTLOOK FOR 2019

- **We expect OPEC to remain disciplined in its pursuit of normalized oil inventories and will seek to manage the Brent oil price at around \$60/bl.** OPEC are striving to find a 'happy medium' for the oil market where their own economics are better satisfied, the world economy is kept stable and US oil production grows in a controlled manner.
- **The US onshore shale system will grow strongly again this year, up by just over 1m b/day if Brent averages \$60/bl.** E&Ps (Exploration & Production) will continue to react to oil prices (despite higher levels of capital discipline) and growth will be higher if prices are higher. Permian pipeline constraints will be solved by year end and oil service activity is likely to pick up as the year progresses.
- **Non-OPEC (ex US onshore) supply will hold up in 2019 but will come under increasing pressure** as upstream capex cuts from 2015-18 take effect. A dearth of new project sanctions and increasing decline rates on existing fields means that non-OPEC (ex US onshore) supply will stagnate to the end of the decade, even if oil prices rise from here.
- **Global oil demand will depend on GDP growth, currently expected at around 1.4m b/day** if the IMF's GDP global forecast of 3.5% holds up. The non-OECD will deliver most of the growth in 2019, with China and India leading the way. We will see more electric vehicles sold this year, but they will pose a negligible threat to oil demand growth.
- **OECD oil inventories likely to be similar to end-2018** but the path will be bumpy. Looking further ahead, we believe that continued oil demand growth, and a decline in non-OPEC supply outside the US, will raise the call on the US shale system and OPEC, we expect OPEC to manage the market to a higher price in this environment.
- **Global gas demand will grow handsomely again in 2019** led by strong Asian GDP growth and a shift in the region from coal to gas consumption by power utilities.
- **Energy equity valuations remain at depressed levels.** On a relative price-to-book (P/B) basis (versus the S&P500), the valuation of energy equities sits at a 50-year low, at 0.5x, just below

level that it was at in February 2016 when Brent oil was \$29/bl. We believe that improving ROCE should drive a higher P/B ratio.

- **Free cash flow remains a priority in 2019.** Shareholder pressure for energy companies to live within cash flow, cover dividends and buyback shares should keep free cash flow in sharp focus. We expect improvements here even in a static oil price environment.
- Looking ahead to 2020, with a \$60 oil price, **we expect oil & gas companies to be able to grow shareholder distributions meaningfully for the first time in a decade.** Super majors could raise distributions by 50%, whilst mid & large cap producers could raise them by 100%.
- **Energy equities offer attractive upside if our oil price and profitability scenario plays out.** If you believe, as we do, in long term \$60 Brent with ROCE and FCF Returns being sustained at long run average levels, then there should be 40-50% upside across the energy complex.

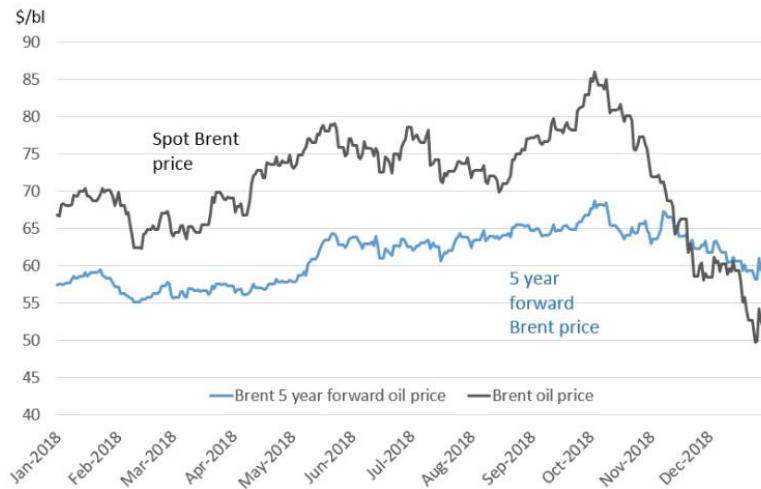
Review of 2018

2018 was a year of two halves for the oil market. OPEC compliance on their 2017 quota cuts reached a level of 135% in February 2018, causing global oil inventories to draw and spot prices to rise. Persistent production declines from Venezuela combined with the threat of stringent US-led sanctions against Iran then led to concerns that there would be physical oil supply shortages in the second half of the year, bringing the spot Brent oil price as high as \$86/bl. After pressure from the US, and a realization that prices were unsustainably high, OPEC (and Saudi in particular) delivered a surge of production in the second half of the year that coincided with the announcement of waivers for Iranian oil exports and a peak in US onshore shale oil supply. The ensuing oversupply pushed oil and product inventories higher, causing a sharp correction in spot oil prices. OPEC responded by re-introducing quotas for 2019, to maintain reasonable prices for their members.

Spot oil prices traded in a wide range during the year. Brent oil started 2018 at \$67/bl before peaking at \$86/bl in early October and then falling sharply to end the year at \$54/bl, close to its lows for the year, and down by 19% over the year. The sharp drop in spot prices at the end of the year was accelerated by financial activity in oil. Over the fourth quarter, the net long non-commercial crude oil futures open position (WTI) fell from 560,000 contracts to 309,000 contracts. The average Brent spot oil price in 2018 was \$71.7/bl, \$17/bl higher than the 2017 average of \$54.8/bl. WTI spot averaged \$64.9/bl, a discount of \$7/bl to Brent, as resurgent US production brought numerous infrastructure issues and widened the discount to Brent. Also of note was the fact that Canadian oil prices, as measured by the Western Canadian Select crude blend, averaged only \$38.6/bl during the year, dropping as low as \$13.5/bl in mid-November, leading the Alberta government to instigate production quotas for 2019.

There was also a marked change in the shape of the oil futures curve over the year. Both Brent and WTI moving from shallow backwardation to extreme backwardation by the middle of the year, then swinging into contango

in the fourth quarter. Importantly, longer dated crude prices were more resilient, with the Brent five year forward price finishing the year up 4% at \$60/bl.



Source: Bloomberg

The major components of oil supply/demand for 2018 were as follows:

- **OPEC oil supply**, measured for OPEC-14, is likely to have decreased by around 0.1m b/day, averaging 32.1m b/day, versus 32.2m b/day in 2017. The losers included Venezuela, which suffered a dramatic production decline (falling from 1.6m b/day at the start of the year to 1.2m b/day in December 2018) together with Angola (a decline of 0.1m b/day) and Iran (a decline of 0.8m b/day predominantly at the end of the year caused by US-sanctions). The winners were Saudi Arabia, Kuwait, UAE and Iraq which together increased production by 1.7m b/day to offset declines elsewhere. After several years of problems, Libya and Nigeria also posted gains over the year. OPEC met in December 2018 and resolved to reduce their supply by around 0.7m b/day in 2019, effectively reversing the surge of production brought on in the middle of 2018 to balance the impact of Iranian sanctions. During the year, Saudi delayed its planned IPO of Saudi Aramco that Qatar announced its intention to leave OPEC.
- **Non-OPEC oil supply** is likely to have grown by 2.4m b/day over the year (60.4m b/day, versus 58.0m b/day in 2017) and was driven almost entirely by growth from the US onshore, Canada and Russia. US onshore oil supply is expected to have averaged 8.7m b/day in 2018, delivering a record 1.6m b/day growth for the year, as WTI oil prices of \$60/bl and above incentivized an increase of 100 oil directed drilling rigs in the first half of 2018 (around 870 rigs as of December 2018). Increases in production were also reported in Canada (+0.3m b/day) and the remainder of the United States (+0.5m b/day), offset by declines in Norway (-0.1m b/day) and Mexico (-0.1m b/day) while other large non-OPEC producers like Brazil and China managed to keep production flat.
- **Global oil demand** is estimated to have grown by around 1.3 m b/day in 2018, according to the International Energy Agency (IEA). This comprises **non-OECD oil demand** growth of 0.9m b/day (with China up 0.5m b/day and India up 0.2m b/day) and **OECD oil demand** growth of 0.4m b/day. If confirmed, these final figures will be in line with the forecasts for 2018 that were made at the beginning of the year. Non-OECD demand growth was tempered somewhat due to higher oil prices and the strong US dollar in

the middle of the year. OECD demand growth of 0.4m b/day in 2018 was at the lower end of the recent historic range, reflecting a greater level of price elasticity.

- **OECD oil inventories** at the end of November 2018 were estimated to be at 2,873 million barrels, down from 2,903 million barrels a year before, but still 7% above the 2005-2014 average level. We expect inventories to end 2018 broadly flat with the end of 2017, having been undersupplied by around 0.3m b/day in 2017.

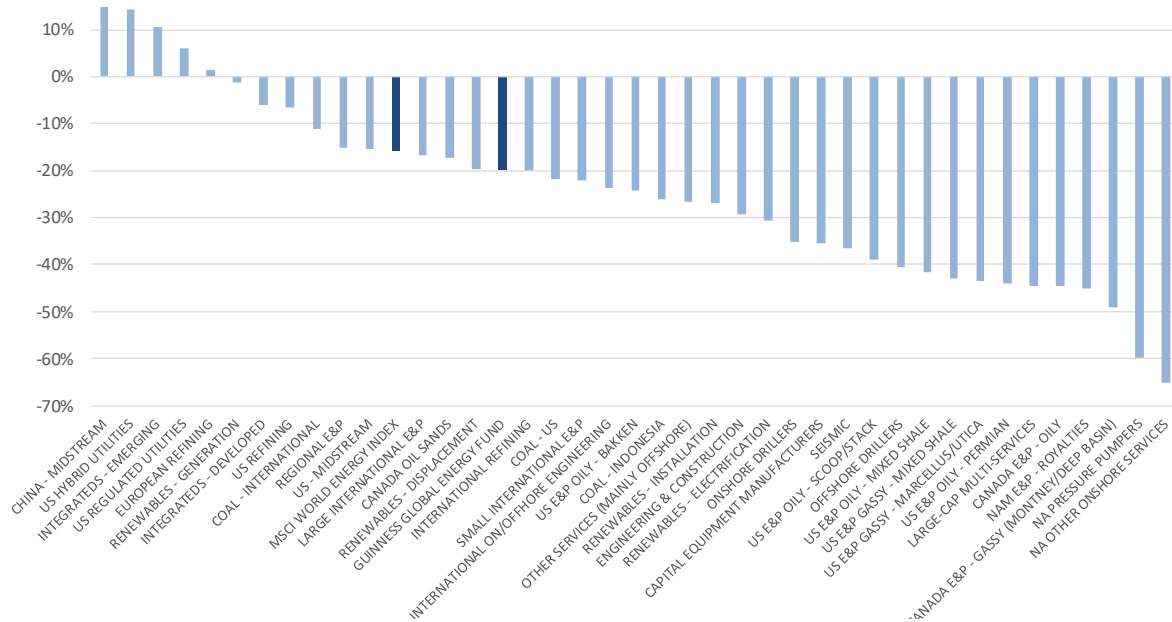
For **natural gas**, 2018 was a year of further divergence between the US, Europe and Asia. In the US, the gas price was anchored sub \$3/mcf until prices spiked briefly to \$4.8/mcf in early November as a result of the onset of colder weather and lower levels of natural gas in storage. The stronger end to the year brought the average gas price to \$3.07/mcf (up from \$3.02/mcf in 2017) but longer-term gas prices (such as the five year forward gas price) saw less price increase as a \$3/mcf price was deemed sufficient to justify new drilling to offset lower inventory levels.

Outside the US, gas prices were substantially higher, with Europe averaging around \$8/mcf and Asia averaging around \$10/mcf. Thanks to strong Asian demand, a feared glut of liquified natural gas (LNG) supply never transpired. Instead, the global gas industry embraced a next phase of LNG liquefaction projects to satisfy the longer-term energy decarbonization targets of China and many developing countries. Two new US LNG plants, with 1 billion cubic feet (Bcf)/day of capacity, came into operation but 2019 is expected to be a substantially bigger year of LNG export capacity increase. The wide North American/International gas price arbitrage led to the sanction in October of a new LNG project in Canada.

After a strong first three-quarters of the year for **energy equities** in 2018, the commodity price weakness in the fourth quarter led the sector (MSCI World Energy Index) to finish -15.8%, and behind the broad market (MSCI World -8.2%). It was noticeable that energy equities did not react to the increasing spot oil price in the beginning of 2018. It was only when the long-dated oil price started to move up, in the second quarter of 2018, that the sector started to gain traction (the MSCI World Energy Index was up 10%, 8% ahead of the MSCI World index, by the end of May 2018). However, the severity of the spot price decline at the end of the year reversed the outperformance, and more. Valuation appears subdued relative to the improving levels of free cash flow and return on capital employed from our portfolio of energy equities and the sharp energy equity correction in the fourth quarter only served to increase the market's skepticism towards the improving return on capital and free cash flow generation of the sector.

As ever, the performance of the MSCI World Energy Index was only part of the story, with 2018 being a year of extreme divergence between the energy equity subsectors.

Global energy equity subsectors: median total return in 2018 (%)



Source: Bloomberg; Guinness Atkinson Asset Management

A quick tour of some of the main energy sub-sectors paints a picture for the overall performance of energy equities in 2018:

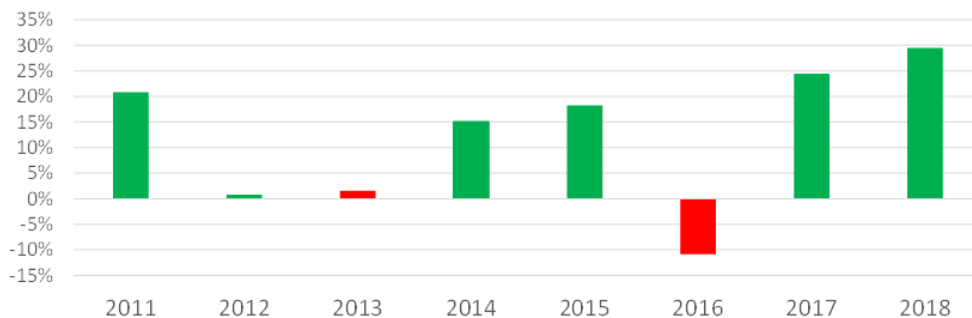
- Integrated oil and gas companies** again delivered above average performance. Emerging Market integrated companies outperformed the developed market integrated companies, and all were strong versus other subsectors. On average, the big '5' supermajor oil and gas companies (Exxon, Chevron, Royal Dutch Shell, TOTAL and BP) delivered a total return of -8% as their improving underlying financial profitability (and commitment to capital discipline, growing dividends and share buybacks) provided relative support against an extremely weak fourth quarter environment.
- Oil refiners** also delivered relatively better share price performance, reflecting the generally strong oil product demand environment, and an eye to the expanded distillate margins resulting from International Maritime Organization (IMO) 2020 regulations. European refining was the strongest of the three regions.
- Renewables** delivered a mixed bag of performance with those companies involved in the generation of renewable energy delivering small positive returns while those involved in the electrification of energy demand (including those companies involved in the electric vehicle supply chain) delivered negative returns of -20% to -30%.
- Exploration and production** was a poorer performer. Typically, non-North American E&Ps fared a little better, being exposed to global Brent oil prices rather than WTI prices but were still down by around 20%. The worst returns were delivered from the North American onshore E&P sector, with both oil and gas-oriented E&Ps based in both Canada and the United States delivering returns of -40% to -50%

range over the year. The Bakken-oriented E&Ps were the better performers in the region but were still down 25% over the year.

- **Energy services** were also particularly weak. North American onshore oil services providers and pressure pumpers fell by 60% or more, as excess capacity trumped the rise in activity. Even the large cap diversified service providers (e.g. Halliburton, Schlumberger and Baker Hughes GE) declined by over 40%. The international service industry fared slightly better but even the best performing sub sectors here (diversified offshore services and engineering & construction companies) were down by 24%.

The **Guinness Atkinson Global Energy Fund** in 2018 produced a total return of -19.7%. This compares to the total return of the MSCI World Energy Index of -15.8%. The underperformance of the Fund versus the Index is disappointing and can be explained in broad terms by the Index’s heavy composition bias (c.50% vs 15% in our portfolio) towards the big five ‘super-major’ oil and gas companies. The average total return for a super-major in 2018 was -8%, compared to -42% for the E&P sector, -44% for the energy services sector and -19% for the refining sector. Regular observers of the energy fund sector will recognize this explanation as having recurred often over the last five years. Put simply, in the energy bear market that has persisted since 2014, large defensive integrated oil & gas companies have offered a defensive haven that other sectors have not come close to matching.

Supermajors relative performance vs the median E&P, Services and Refining company



Source: Bloomberg

On a stock by stock basis in the fund, we saw particularly strong peer-relative performance from ConocoPhillips (+16%) as the market rewarded the delivery of growth together with dividend and share buyback increases and from Equinor (previously Statoil, +2%) as capex was restrained and the economics of new projects continued to improve. CNOOC and Gazprom performed well (+12% and +13% respectively), Gazprom enjoying elevated European gas prices, while ENI and TOTAL were the best of our developed market integrated oils.

It was a very poor year for our two diversified oil services companies (Schlumberger and Halliburton) that were both down by 45%. Given the positive long-term outlook for the North American onshore oil and gas industry, we were surprised to see such severe equity weakness. Devon Energy and Newfield Exploration (-45% and -54% respectively) were noticeably weak within the poorly performing US onshore E&P sector with their underperformance reflecting a combination of weak regional pricing, negative regional politics or poorly performing assets.

Performance as of 12/31/18

	2018	1 Year	3 Years*	5 Years*	10 Years*
Global Energy Fund	-18.92%	-18.92%	0.63%	-9.77%	2.46%
MSCI World Energy Index Net Return	-15.84%	-15.84%	3.79%	-5.26%	2.65%

*Periods over 1 year are annualized returns

Performance data quoted represents past performance; past performance does not guarantee future results. The investment return and principal value of an investment will fluctuate so that an investor's shares, when redeemed, may be worth more or less than their original cost. Current performance of the fund may be lower or higher than the performance quoted. Performance data current to the most recent month end may be obtained by calling 800-915-6566 and/or visiting www.gafunds.com.

Prospectus expense ratio: 1.62% (gross), 1.45% (net) The Advisor has contractually agreed to reimburse expenses (excluding Acquired Fund Fees and Expenses, interest, taxes, dividends on short positions and extraordinary expenses) in order to limit the Fund's Total Annual Operating expenses to 1.45% through June 30, 2019.

As of November 2018, the MSCI World Energy Index Net return was used instead of the Gross Return. MSCI World Energy Index Net Return reflects deduction for withholding tax but reflects no deduction for fees and expenses. Net Return is net of local withholding taxes that any investor would typically pay.

The Outlook for 2019

Oil supply

The world oil supply outlook in 2019 is, in many ways, unchanged from the outlook that we have seen in previous years as US onshore shale oil is likely to grow (though this will be sensitive to price), complemented by small growth from the rest of the non-OPEC world. Both will be balanced against lower OPEC growth due to quota reductions as well as declining production from a number of maturing countries. While US onshore investment will be a destination for capital, we expect the remainder of the world to suffer from lower reinvestment, which will show through in maturing international production profiles in coming years.

OPEC oil supply

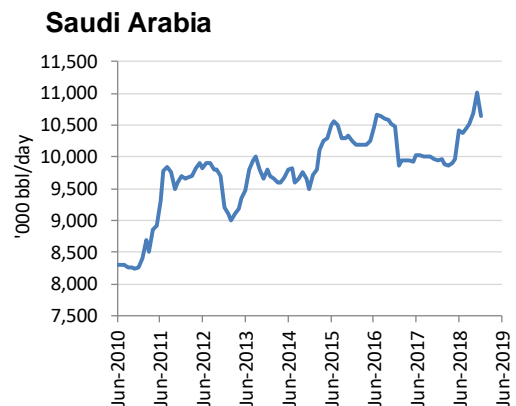
Similar to 2017, OPEC starts the year with the market focusing on their ability to deliver on promised production quota cuts (this time of 0.8m b/day). We see the cuts, agreed at a difficult OPEC meeting in December 2018, as a step on the path towards achieving an oil price in 2019 which reasonably satisfies OPEC economies as a whole but that does not cause excess US onshore supply or lower global oil demand. It will be a difficult path to tread.

OPEC-14 (including Congo and excluding Qatar) production for October 2018 was 32.4m b/day; a record level for the year. The cut announced in December of 0.8m b/day (relative to the October production) was not allocated between individual countries. We expect Saudi, Kuwait and the UAE to cut more (as they have in recent cuts) because they have enjoyed higher market share within OPEC in recent years. The three countries represented 53% of OPEC-14 production in November 2018, having been 49% in November 2014. We expect OPEC to comply with the new quotas, and the divide in the organization between 'haves' and the 'have nots' to become clearer cut, with swing production being carried out by a small number of core Middle Eastern producers.

We continue to believe that **Saudi Arabia** is attempting to manage the oil price in a rational fashion: maximizing revenues by supporting as high a price as possible that does not over-stimulate US shale oil production. According to the IEA, Saudi achieved record production of 11.1m b/day in November 2018 and we question whether this surge in production (up 0.6m b/day over two months) came from underlying production and how much came from de-stocking.

(m b/day)	Oct 2018	Jan 2019 quota		
	mn b/d	mn b/d	Adjustment	% adjustment
Saudi	10.65	10.33	-0.32	-3.0%
Iran	3.34	3.34	<i>Exempt</i>	0.0%
Iraq	4.65	4.51	-0.14	-3.0%
UAE	3.21	3.11	-0.10	-3.0%
Kuwait	2.76	2.68	-0.08	-3.0%
Nigeria	1.67	1.62	-0.05	n/a
Venezuela	1.26	1.26	<i>Exempt</i>	0.0%
Angola	1.50	1.46	-0.05	-3.0%
Libya	1.07	1.07	<i>Exempt</i>	n/a
Algeria	1.07	1.04	-0.03	-3.0%
Equatorial Guinea	0.13	0.13	0.00	-3.0%
Congo	0.32	0.31	-0.01	-3.0%
Gabon	0.19	0.18	-0.01	-3.0%
Ecuador	0.52	0.50	-0.02	-3.0%
OPEC-14	32.35	31.54	-0.80	-2.5%

Source: IEA, Bloomberg, Guinness Atkinson Funds



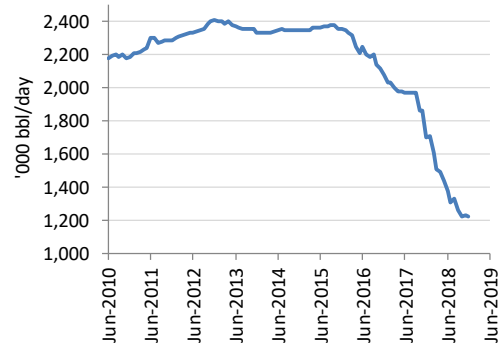
Source: Bloomberg

We are not convinced that Saudi could keep this production level for a sustained period, should a global oil supply shock emerge.

The problem countries for OPEC in 2019 will likely be mostly Venezuela and Iran, with Libya and Nigeria still being areas of supply risk. As of November 2018, these countries together produce a total of 7m b/day with a market share of 22% (down from 26% market share in November 2014) reflecting a combination of political, economic, social or technical issues.

In **Venezuela**, a lack of investment and low oil field activity is the key issue behind the rapidly falling production levels; now at a fifty year low. The economic stress of low oil prices, compounded by US sanctions, has led to sharply lower oil production and caused the economy to halve over the last five years. There has been insufficient diluent to allow the Orinoco belt heavy oil fields to maintain production while low reinvestment has caused refinery capacity to become unusable and even the main refining complex operated at only 30% capacity during 2018. While higher oil prices could facilitate higher reinvestment, we note that several ‘oil for loan’ deals with Russia and China will limit the ability for Venezuela to rebalance the economy and invest back in the oil fields as oil sales cash flows are used to service the outstanding debts. With inflation running at 1,370,000% and GDP likely to weaken further in 2019, it is unlikely that Venezuelan production will improve any time during 2019.

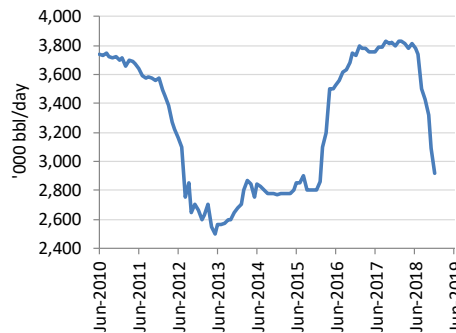
Venezuela



Source: Bloomberg

For **Iran**, oil production in 2019 will depend upon the extent to which the US imposes sanctions on oil exports. In October 2018, the US granted eight waivers to allow Iranian oil importers (notably Korea, China and India) to import Iranian crude oil for a further six months. If the waivers are not extended, Iranian oil production could fall to less than 2.5m b/day in mid-2019. The outlook is far from clear as President Trump attempts to balance a strong line against Iran with a domestic agenda of low gasoline prices. Iranian production is already 0.8m b/day below the mid 2018 peak of 3.8m b/day and remains a wild card for the year ahead.

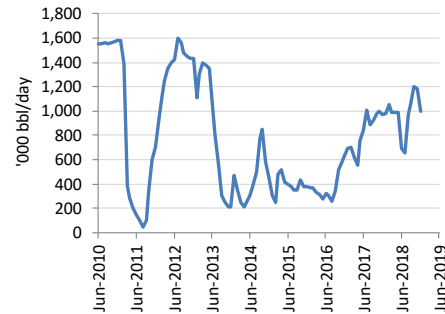
Iran



Source: Bloomberg

Oil production from **Libya** has continued to be volatile in 2018 and is worthy of discussion because we believe that the country is exempt from the 2019 OPEC production quotas. A number of political agreements (and the promise of UN-sponsored elections being held in 2019) have improved the security environment and allowed production to recover to 1.1m b/day (close to the pre-crisis capacity level of around 1.5m b/day). Given the scale of the conflict, we believe that production infrastructure has been impaired, and we do not expect a return to pre-crisis levels of 1.5m b/day in the near term. As such, there is limited upside to production from here and more risk of a swing lower. We see a similar situation for **Nigeria**, where production has improved steadily through 2017 and 2018 and now sits at 1.8m b/day, a three high.

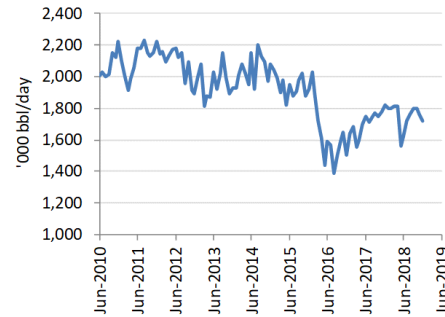
Libya



Source: Bloomberg

We see the potential for further declines in Angolan production (as a result of low reinvestment in new fields), while Iraqi production maintains robust levels as a result of a high level of new redevelopments starting.

Nigeria

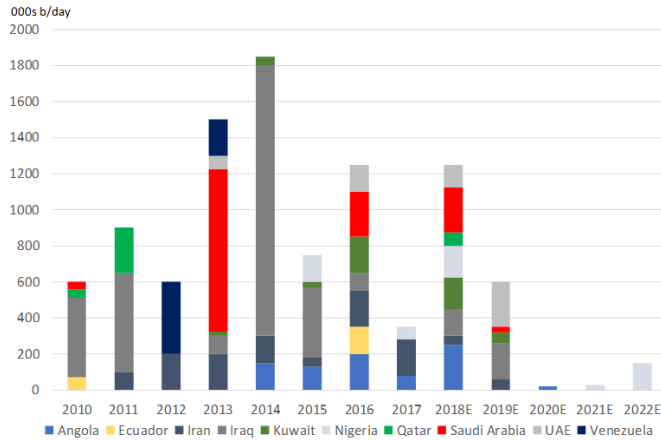


Source: Bloomberg

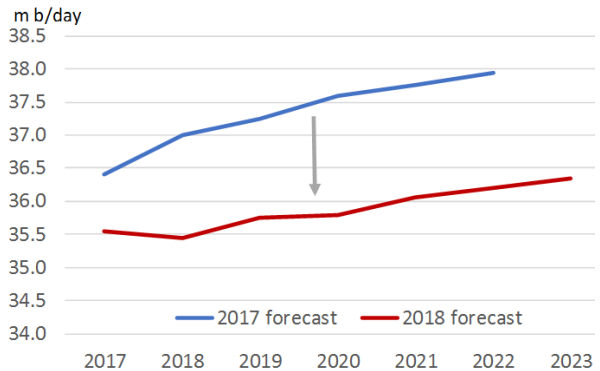
While the market will focus on compliance with 2019 production quotas, we must not forget the risk of escalated political instability within OPEC and the increased conflict between the ‘haves’ and the ‘have nots’ within the organization. 2018 witnessed further Shia-Sunni tensions in the region and we remind ourselves that almost all of Saudi’s oil output passes through the Shia heartland of Saudi Arabia. Proxy Sunni-Shia wars are either brewing or being fought in Syria, the Yemen and the Lebanon and the risk of associated supply disruption has increased.

Longer term, we expect OPEC production capacity to stagnate. A hiatus in investment in 2015-2018 means that there will be close to zero new capacity added in OPEC countries in the 2020-2022 period; a sharp reduction versus the 1m b/day or so of new production capacity per annum that has been added over the last ten years. The long-term investment cycle of the oil and gas industry implies that this capacity shortfall cannot be quickly replaced. With OPEC spare capacity already likely to be less than 2m b/day level, the longer-term outlook for spare capacity remains under question and we note the IEA’s recent reduction in its view of OPEC’s future capacity. This leads us to believe that world oil markets are vulnerable to OPEC supply disruption in the coming years.

Major OPEC project start-ups



OPEC capacity forecast (per the IEA)



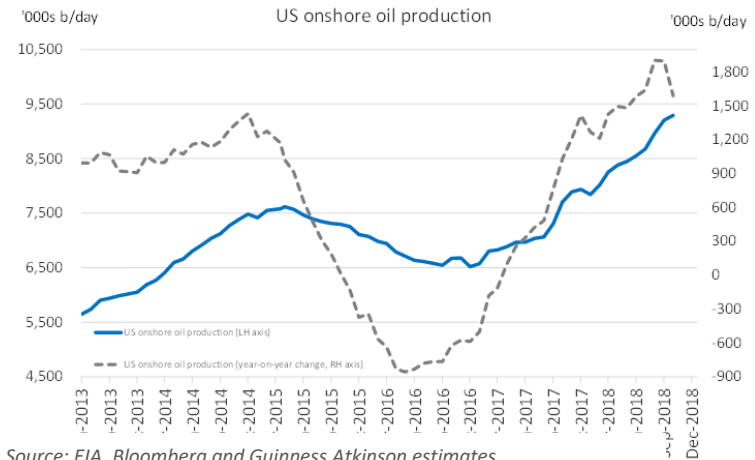
Source: IEA, Simmons, Bloomberg and Guinness Atkinson estimates

In the near term, Saudi Arabia (as de facto leader of OPEC) recognizes that 10m b/day of production at a \$60-\$70/bl oil price creates more revenue than 11m b/day at \$50/bl and that, therefore, Saudi should target a price that maximizes their revenue while supporting world oil demand growth and sustainable supply growth from the US onshore shale industry.

US onshore (shale) oil supply

Recent performance from the US onshore (shale) industry shows clearly that the US has the resource and capability to grow oil production handsomely, at the right price. The short cycle nature of the industry ensures that the US onshore will react to higher oil prices with greater investment (in drilling and fracturing activity) and deliver price-responsive production growth within a 6-12 month timeframe.

The most recent monthly data for US onshore supply indicates record leading edge growth of 1.6m b/day between October 2017 and October 2018. The US system has adapted to lower oil prices and is well placed to continue to deliver growth with the nexus of activity being the Permian Basin, where shale oil production has increased from 1.8m b/day in early 2016 to 4m b/day currently.



Source: EIA, Bloomberg and Guinness Atkinson estimates

We maintain our view that additional US oil supply will be incentivized by higher oil prices and that, if Brent oil prices are sustained in a \$50-60/bl range, the US onshore system will deliver supply growth of between 0.6 and 1.2m b/day. An average Brent oil price of \$72/bl in 2018 has taken annual growth in 2018 to around 1.6m b/day

Brent oil price	Production change
\$30-40/bl	Declining 0.3-0.5m b/day
\$40-50/bl	Broadly flat
\$50-60/bl	Increasing around 0.6-1.2m b/day
\$60-70/bl	Increasing around 1.2-1.6m b/day

greater than 2017. Structural improvements in terms of the length of laterals being drilled, the speed of drilling and the intensity and location of fracturing jobs all mean that the US is delivering more production and reserves per dollar invested than it was in the previous peak of activity in 2013/14.

In the short term, there have been pipeline and other infrastructure constraints in 2018 and we see further infrastructure constraints in 2019 as the Permian grows. However, a build out of 2.8m b/day of new pipeline capacity by Q3 2020 means that there is sufficient room for Permian shale oil growth to continue through 2020.

Look further forward, as more shale wells are drilled the underlying annual decline of US oil production will increase meaning that a larger number of wells will need to be drilled every year to deliver a fixed level of production growth. On the assumption that the US onshore oil industry continues to deliver top line growth of around 1.2m b/day, new annual production of over 2m b/d will be needed just to offset the decline from existing shale wells in 2022. Any growth will then have to be added on top of this. This implies that actual oil field activity will need to continue to increase further and, while US companies are incentivized to deliver the new growth, it is likely put severe strain on the industry and its infrastructure in order to deliver this.

In summary, we expect US shale oil to be available in the near term to dampen any shorter-term oil price spikes, but into the end of the decade, the 'call on the US onshore' could move substantially higher depending on the maturation of traditional non-OPEC and OPEC production.

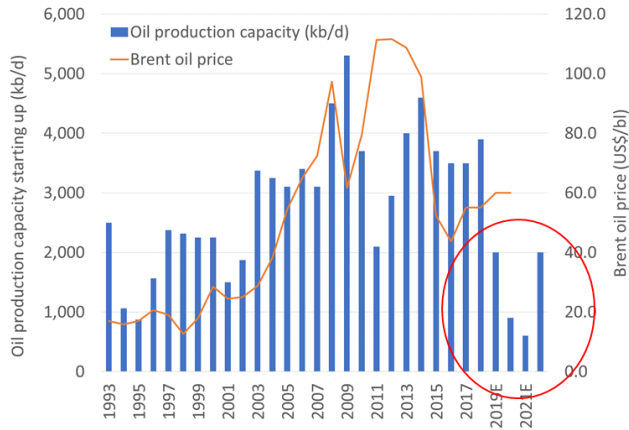
Non-OPEC (ex US onshore) oil supply

Despite representing over half of world oil supply (estimated 51.7m b/day in 2018), non-OPEC (ex US-onshore) production receives relatively little attention and is, we believe, sleepwalking towards a multi-year production decline as a result of low reinvestment levels.

Upstream capital expenditure growth, having been down 31% in 2016 and down 26% in 2015, has not recovered particularly in either 2017 or 2018. While cost deflation (approx. 25%) and project streamlining/standardization has improved offshore project economics, we still see a muted outlook for new oil field investment. Without higher levels of capex, we believe that oil production from this broad area in the coming five years will face an uncertain outlook as existing production continues to decline and new project start-ups remains muted at best.

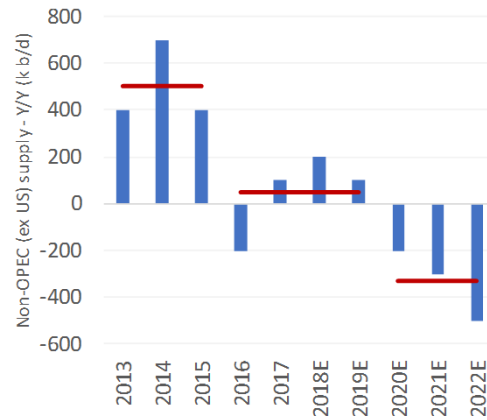
The simple fact is that there are better short-term project returns available from investments in the US onshore than there are in a typical deepwater offshore project at the current time. Even if project level forecast investment returns are similar, we believe that the substantially longer cash flow payback profile of the typical deepwater project (together with higher technical, political and fiscal risks) means that operators will continue to favor the US onshore for incremental investments.

Major non-OPEC (ex-US) project start-up schedule



Source: Bloomberg; Guinness Atkinson Funds

Non-OPEC (ex-US) supply: 2013-2022



Source: Bloomberg; Guinness Atkinson Funds

The near-term production profile for non-OPEC (ex US-onshore) has remained reasonably healthy as those projects that were sanctioned as late as 2014 come into production and deliver growth through 2018 and 2019. Beyond 2019, we believe that the slowdown will become more obvious and that the region will likely suffer a number of years of flat to declining production. Any shortfall will need to be offset either via greater OPEC production, greater US onshore production or lower oil demand growth. Whilst this may not be impacting world oil markets today, there is increasing risk of a non-OPEC (ex US- onshore) supply shortage over the next few years.

Oil demand

According to the IEA, global oil demand for 2018 will end up at around 1.3m b/day, in line with forecasts made at the start of the year. The IEA are forecasting slightly higher growth in oil demand in 2019, around 1.4m b/day, and consistent with the average annual global oil demand growth seen since 2012.

As has been the pattern for many years, oil demand growth was biased to developing markets, with China and India contributing a significant share:

- China oil demand exceeded 13m b/day in 2018 (up from 9.9m b/day in 2012) and has grown lockstep with overall economic growth. Despite fears over GDP slow-down and individual areas of weak economic data, Chinese oil demand growth remains solid. We expect oil demand to continue to grow as China stays focused on the transition of the economy away from coal demand (current representing 60% of overall energy demand) towards oil, natural gas and renewables. Strength in demand from the aviation sector, personal transportation and other personal demand is expected to drive oil demand growth up another 0.4m b/day in 2019.
- Indian oil demand was particularly strong at the start of 2018 but the rate of demand growth fell mid-year as a result of higher oil prices and weakness in the Indian Rupee (causing higher domestic oil product prices). Later in 2018, demand appears to have recovered and the expectation is that 2019 oil demand growth will be around 0.3m b/day, slightly higher than that delivered in 2018. Representing 17.7% of the world population and only 5% of world oil demand, there is scope for a tremendous increase in oil demand should per capita consumption achieve the same, albeit low by a global standard, levels as China.

World oil demand 2004-19E

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018E	2019E
OECD demand															IEA	IEA
North America	25.7	25.8	24.5	25.8	24.5	23.7	24.1	24.0	23.6	24.2	24.2	24.6	24.9	25.1	25.5	25.8
Europe	15.6	15.7	15.7	15.6	15.5	14.7	14.7	14.3	13.8	13.6	13.5	13.8	14.0	14.3	14.3	14.4
Pacific	8.8	8.9	8.7	8.7	8.3	8.0	8.2	8.2	8.5	8.3	8.1	8.1	8.1	8.1	8.0	7.9
Total OECD	50.1	50.4	48.9	50.1	48.3	46.4	47.0	46.5	45.9	46.1	45.8	46.5	47.0	47.4	47.8	48.1
<i>Change in OECD demand</i>		0.3	-1.5	1.2	-1.8	-1.9	0.6	-0.5	-0.6	0.2	-0.3	0.7	0.5	0.4	0.4	0.3
NON-OECD demand																
FSU	3.8	3.9	4.0	4.0	4.2	4.0	4.1	4.4	4.6	4.5	4.6	4.6	4.5	4.5	4.7	4.8
Europe	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8
China	6.4	6.7	7.2	7.6	7.7	7.9	8.9	9.3	9.9	10.4	10.8	11.6	12.0	12.6	13.1	13.5
India	2.6	2.6	2.7	2.9	3.1	3.2	3.3	3.5	3.7	3.7	3.8	4.2	4.4	4.6	4.8	5.1
Other Asia	6.4	6.4	6.6	6.9	6.8	7.1	7.5	7.6	7.6	7.9	8.0	8.2	8.6	8.8	8.7	9.0
Latin America	4.9	5.0	5.2	5.3	5.6	5.7	6.1	6.2	6.5	6.6	6.8	6.7	6.4	6.5	6.4	6.3
Middle East	5.5	5.9	6.1	6.4	6.7	7.1	7.3	7.5	7.9	8.0	8.4	8.4	8.5	8.5	8.4	8.5
Africa	2.8	2.9	2.9	3.3	3.3	3.4	3.5	3.5	3.8	3.8	3.9	4.3	4.3	4.3	4.3	4.4
Total Non-OECD	33.1	34.1	35.4	37.1	38.1	39.1	41.4	42.7	44.8	45.6	47.4	48.6	49.4	50.5	51.4	52.5
<i>Change in non-OECD demand</i>		1.0	1.3	1.7	1.0	1.0	2.3	1.3	2.1	0.8	1.8	1.2	0.8	1.1	0.9	1.1
Total Demand	82.5	83.8	85.1	87.2	86.4	85.5	88.4	89.2	90.7	91.7	93.1	95.1	96.4	97.9	99.2	100.6
<i>Change in demand</i>		1.3	1.3	2.1	-0.8	-0.9	2.9	0.8	1.5	1.0	1.4	2.0	1.3	1.5	1.3	1.4

Source: IEA; Guinness Atkinson Funds

OECD demand growth of 0.4m b/day in 2018 was at the lower end of the recent historic range, reflecting a greater sensitivity to higher oil prices than the non-OECD. Despite grumbling from President Trump about fuel prices being too high, we note that US gasoline prices are comfortably within the historic range, cheap in a global context and cheap relative to US consumer personal disposable income.

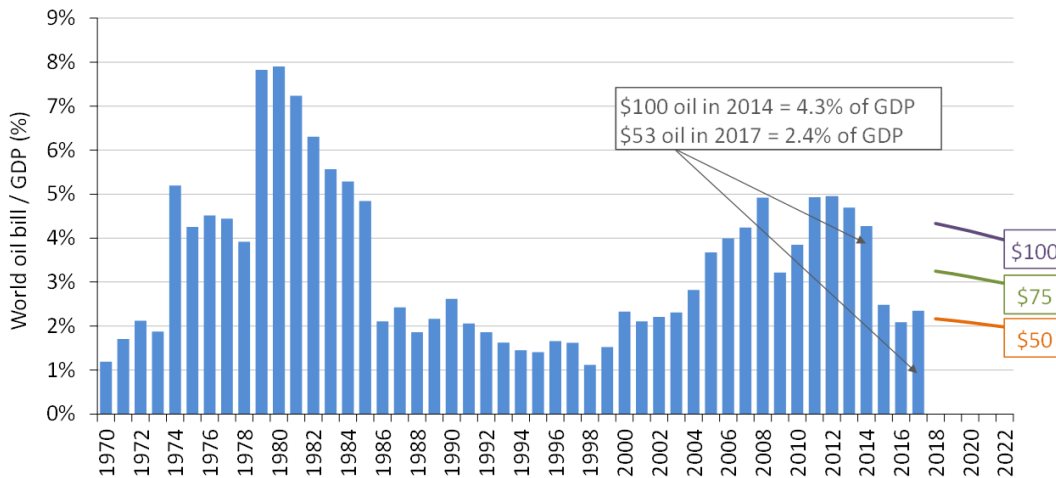
Globally, we believe that oil remains a ‘good value’ commodity. Based on an oil price (weighted blend of Brent and WTI) of around \$68/bl in 2018, we calculate that the world spent just under 3% of GDP on oil, broadly in line with the 30-year average. If Brent averages \$60/bl this year, we expect the GDP intensity to fall to a very comfortable level of around 2.5%. We believe that oil would need to increase to around \$100/bl, reflecting 4% of world GDP in 2020, if it were to have a noticeable negative impact on the global economy. While high oil prices are often a contributing factor to economic slowdowns and recessions, our analysis suggests that a price of around \$60/bl would not be particularly stressful for the global economy.

US retail gasoline prices (US\$/gallon)



Source: Bloomberg

The world oil ‘bill’ as a percentage of GDP



Source: Bloomberg, IMF and Guinness Atkinson estimates

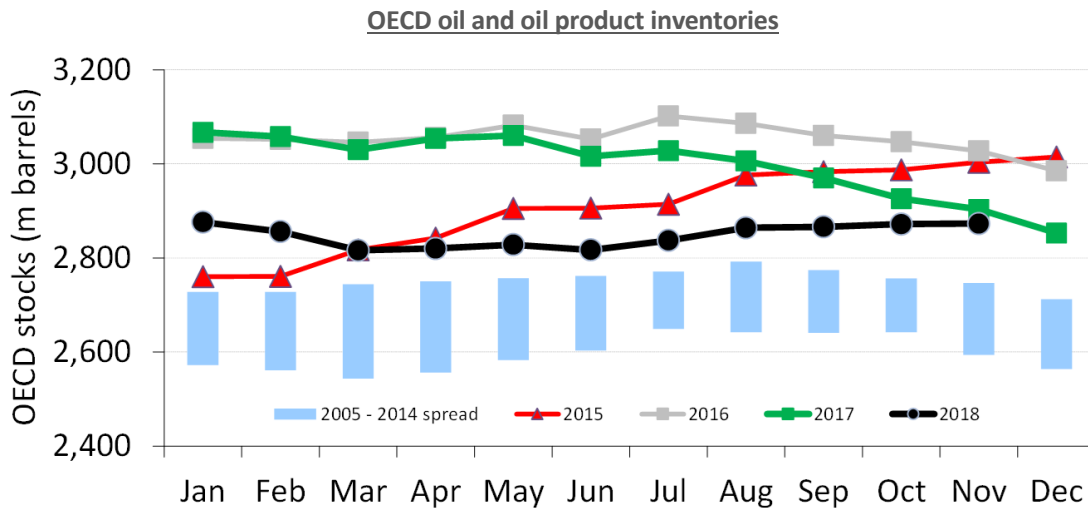
The IEA’s forecast for global oil demand growth in 2019 of 1.4m b/day is founded on the IMF’s global GDP growth forecast of 3.5%, down from 3.7% in 2018. As we write, there are increasing questions over whether a greater slowdown in the world economy is coming. The analysis we perform on the sensitivity of oil demand to GDP and price (adjusting for the relationship in the OECD being different to that in the non-OECD) tells us that if global GDP slowed to around 3%, this would reduce oil demand growth to around 1m b/day. A deeper GDP slowdown to 2% (consistent say with the 1992/93 recession) would likely reduce oil demand growth to around 0.5m b/day. In these scenarios, OECD oil demand would fall into negative territory, but non-OECD

demand would likely stay positive. Indeed, it remains a remarkable thought that non-OECD demand grew by 1m b/day in each of the worst years of the 2008/09 financial crisis.

Looking longer term, the key issue for global oil demand is the electrification of personal transportation. In 2018, we saw more automobile manufacturers announce increasing ranges of Electric Vehicles (EVs), governments and capital cities introduce long dated targets for banning the sales of non-EVs and we also saw the start of commercial production of Tesla’s Model 3 electric vehicle. Overall, we have not changed our outlook for the EV substitution threat and believe that oil product demand (gasoline and diesel) for personal transportation will peak in the late 2020s, shortly after improvements in battery technology allow EVs to be price competitive with internal combustion engine vehicles. We expect the other areas of global oil demand, such as petrochemicals and aviation, to continue to grow with global GDP, and the net of this activity suggests a peak in global oil demand in the mid 2030s, somewhere between 110m and 120m b/day.

Oil inventories and conclusions

As ever, the picture of oil supply and demand in 2019 will be dynamic, depending on price, OPEC delivery, corporate behavior and macro-economic factors. Our base case for 2019, making assumptions for the key sensitivities discussed in this report, is that the world oil market will remain roughly in balance. This is based on the assumption that OPEC production will be down slightly on average and that global oil demand growth will be offset by a rise in US onshore production and other non-OPEC countries.



Source: Bloomberg, IEA and Guinness Atkinson estimates

Reconciling our base case view on supply and demand with the current state of OECD inventories, we expect inventories to stay around flat. The state of inventories in the middle of the year, together with oil prices will be key factors for Saudi and other participating producers in deciding whether to continue with the adopted quota cuts or start to taper them. We expect that the level of US shale activity will be critical in their decision making at that time.

OPEC are striving to find a ‘happy medium’ for the oil market where their own economics are better satisfied, the world economy is kept stable and US oil production grows in a controlled manner. Absent a supply shock, we believe that the Brent oil price that achieves this in 2019 is around \$60/bl. Looking further ahead, we believe that continued oil demand growth, and a decline in non-OPEC supply outside the US, will raise the call on the US shale system and OPEC, and allow OPEC to manage the market to a higher price.

Natural gas markets

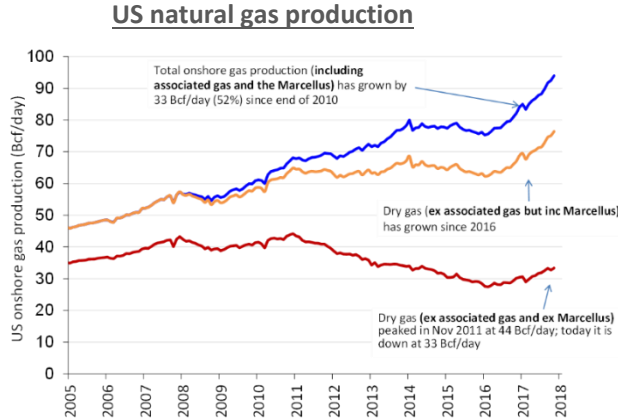
US natural gas

The US natural gas market was undersupplied in 2018 with natural gas inventories ending the ‘injection’ season on November 1, 2018 around 600 Bcf below the five year average level; the lowest level heading into winter since 2005. The Henry Hub gas price was anchored sub \$3/mcf for most of the year, until prices spiked to \$4.8/mcf in early November as a result of the onset of colder weather together with the low storage levels. The key features were:

- Strong growth in associated (by-product) gas supply from shale oil production;
- A return to strong growth in low-cost Marcellus and neighboring Utica fields in the north-east of the country as pipeline infrastructure came into operation;
- Very strong demand growth; including LNG exports. The biggest contributors being power generation (hot summer and start-up of numerous gas plants increasing gas’ share over coal), industrial demand (US GDP growth and petrochemical plant start-ups), and LNG exports (opening of new export terminals).

The outlook for natural gas in the US in 2019 is likely to be defined by various factors:

- A significant rise in onshore production, as another year of strong shale oil production growth brings with it around 3 Bcf/day of associated gas production. In addition, continued growth of supply from the Marcellus/Utica fields (as infrastructure bottlenecks are further overcome) assuming that local price differentials stay close enough to ‘national’ Henry Hub pricing;
- Further sustained strong demand growth of around 4 Bcf/day, assuming prices remain around \$3/mcf. Normalized weather would keep a cap on power generation demand, but there should be a surge in LNG exports (c.3 Bcf/day, see below), as a wave of new export terminals come into service.



Source: Bloomberg, EIA and Guinness Atkinson estimates

US natural gas demand model (2007 – 2019) source: Guinness Atkinson, EIA and Bloomberg

Bcf/day	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018E	2019E
US natural gas demand:													
Residential/commercial	21.2	22.0	21.6	21.6	21.6	19.2	22.4	23.4	21.4	20.5	20.9	22.1	21.5
Power generation	18.7	18.2	18.8	20.2	20.8	24.9	22.3	22.3	26.5	27.3	25.3	28.5	28.5
Industrial	18.2	18.2	16.9	18.5	19.0	19.7	20.3	20.9	20.6	21.1	21.6	22.8	23.2
Pipeline exports (Canada & Mexico)	2.1	2.5	2.8	2.9	4.1	4.4	4.4	4.1	4.9	6.3	6.2	7.0	7.8
LNG exports	-	-	-	-	-	-	-	-	0.1	1.0	2.6	3.4	6.7
Pipeline/plant/other	5.2	5.3	5.5	5.6	5.8	6.1	6.7	6.3	6.5	6.4	6.5	6.8	6.8
Total demand	65.4	66.2	65.6	68.8	71.3	74.3	76.1	77.0	80.0	82.6	83.1	90.6	94.5
Demand growth	4.0	0.8	- 0.6	3.2	2.5	3.0	1.8	0.9	3.0	2.6	0.5	7.5	3.9
Bcf/day	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018E	2019E
US natural gas supply:													
US onshore	45.1	48.8	49.8	52.2	57.7	61.5	62.7	67.5	70.6	70.0	71.1	79.2	84.8
US offshore (Gulf of Mexico)	7.7	6.3	6.7	6.2	5.0	4.2	3.6	3.4	3.6	3.4	2.5	2.1	2.0
Pipeline imports (Canada)	10.4	9.8	9.0	9.0	8.5	8.0	7.5	7.1	7.1	8.0	8.0	8.0	8.0
LNG imports & other	2.3	1.2	1.4	1.4	1.0	0.8	0.6	0.5	0.5	0.4	0.3	0.3	0.3
Total supply	65.5	66.1	66.9	68.8	72.2	74.5	74.4	78.5	81.8	81.8	81.9	89.6	95.1
Supply growth	3.2	0.6	0.8	1.9	3.4	2.3	- 0.1	4.1	3.3	-	0.1	7.7	5.5
(Supply)/demand balance	- 0.1	0.1	- 1.3	-	- 0.9	- 0.2	1.7	- 1.5	- 1.8	0.8	1.2	1.0	- 0.6

The US natural gas price since 2010 has fluctuated in a band between around \$2 and \$4/mcf. The extremes of this range have tended to coincide with warm and cold winters, and any sustained recovery over \$3/mcf has generally been muted by strength in gas supply, particularly from the Marcellus/Utica and from gas produced as a by-product of shale oil. We still expect prices to be held, for now, in the \$2.75-3.25/mcf range, but will keep an eye on the effect of these new LNG export terminals.

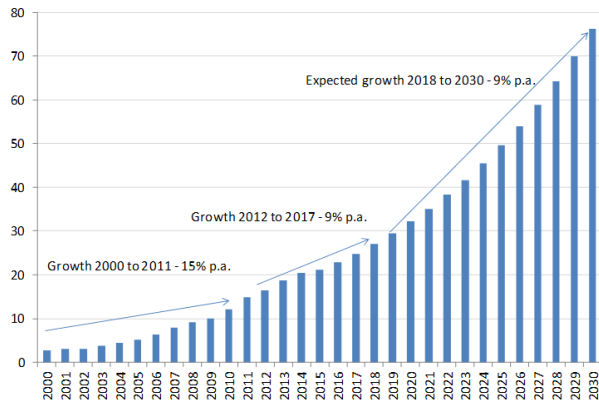
International natural gas

Outside the US, gas prices were substantially higher in 2018, with Europe averaging around \$8/mcf and Asia averaging around \$10/mcf.

Key factors behind stronger global gas prices were: very hot summer weather conditions, production problems at a number of LNG export terminals, an increase in the price of high calorific value thermal coal and also higher LNG transportation costs. In addition, a strong push from China to decarbonize its economy (and therefore increase the share of natural gas in the power generation mix at the expense of coal) brought greater demand with limited price elasticity.

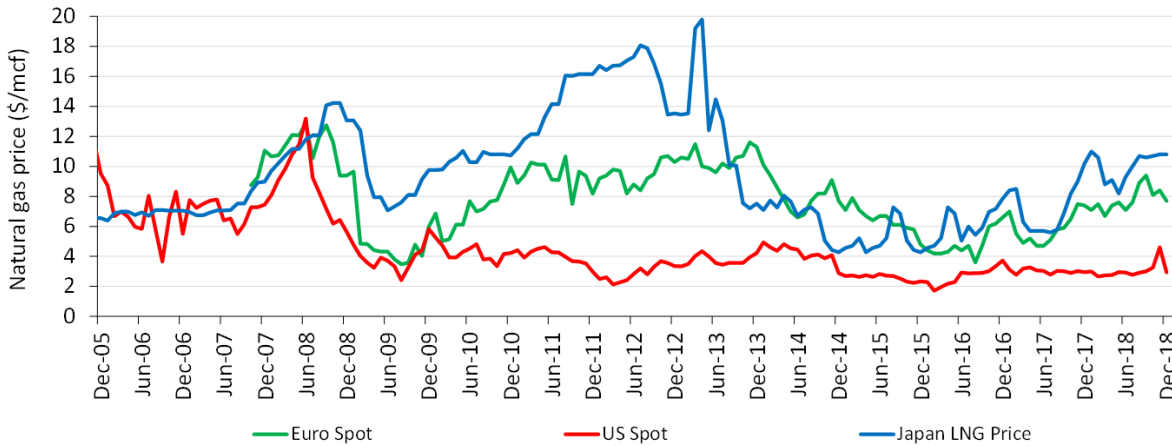
During the year, the global gas industry moved towards the start of the next phase of LNG infrastructure investment with US plants receiving expansion permits and Canada sanctioning a new LNG export terminal on October 1st. We expect a continuation of this investment phase over the next few years.

China natural gas demand (Bcf/day)



Source: Bloomberg and Guinness Atkinson estimates

International natural gas prices 2005-18



Source: Bloomberg; Guinness Atkinson Funds

Energy equities

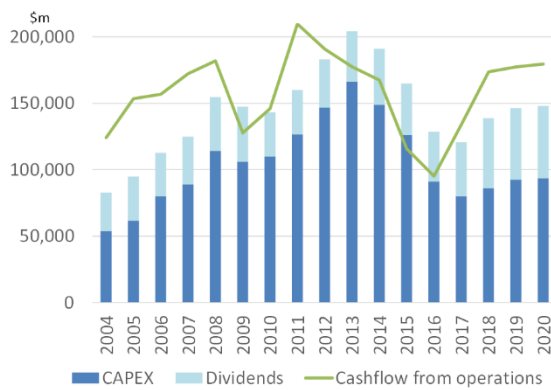
After a strong first three-quarters of the year for energy equities in 2018, the commodity price weakness in the fourth quarter led the sector (MSCI World Energy Index) to finish -15.8%, and behind the broad market (MSCI World -8.2%). It was noticeable that energy equities did not react to the increasing spot oil price in the beginning of 2018. It was only when the long-dated oil price started to move up, in the second quarter of 2018, that the sector started to gain traction (the MSCI World Energy Index was up 10%, 8% ahead of the MSCI World index, by the end of May 2018). However, the severity of the spot price decline at the end of the year reversed the outperformance, and more. Valuation appears subdued relative to the improving levels of free cash flow and return on capital employed from our portfolio of energy equities and the sharp energy equity correction in the fourth quarter only served to increase the market’s skepticism towards the improving return on capital and free cash flow generation of the sector.

On a relative price-to-book (P/B) basis (versus the S&P500), the valuation of energy equities has fallen back to a 50 year low, at 0.46x, just below the level that they were at in February 2016 when Brent oil was \$29/bl. We see the low P/B ratio for the energy sector as driven by historically poor levels of return on capital employed (historically the two measures are closely correlated). However, we saw clear signs of improvement in return metrics in 2018, particularly in improving free cash flow returns, which tend to lead ROCE at the start of an upcycle. Here, we explore the current energy equity valuations in more detail, assess what the re-rating potential of the sector could plausibly be, and explain how these views shape our current portfolio.

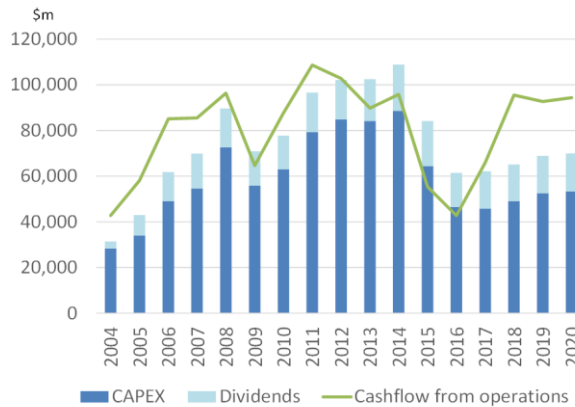
Improving capital discipline

For the super majors and other large cap oil & gas companies, capital indiscipline reached an extreme in 2013 and 2014, such that they were unable to cover dividends from free cash flow, even though oil prices averaged around \$100/bl. By 2016, in response to lower oil prices and falling revenues, cost cutting was underway, but the concept of energy companies covering their dividends at \$55/bl Brent remained a significant stretch. In 2017, however, covering the dividend at \$55/bl oil became a reality, with most companies removing their scrip dividends (or their discounts to their scrip dividends) and some introducing share buyback programs. This has been broadcast most widely for the super majors but is arguably not reflected in their dividend yields yet. And looking towards the end of the decade, in a \$60/bl Brent oil price environment, we see room for distributions to shareholders from the super majors to rise by around 50%. This is quite a thought and, we believe, far from the market view. In practice, we expect ordinary dividends not to increase (because the market would not tolerate them being cut again), but the returns to shareholders to come in the form of enhanced share buybacks and a reduction of debt.

Super majors – free cash flow generation



Other large caps – free cash flow generation



Source: Bloomberg; Guinness Atkinson Funds

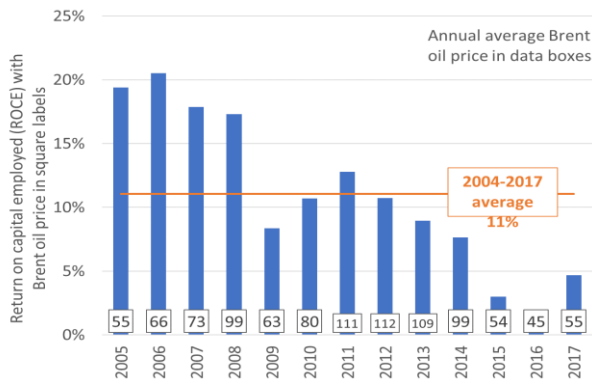
The inflection in free cash flow for the super majors is impressive, but we see an even greater improvement occurring for the next tier of companies: mid-cap integrators; large cap E&Ps and Canadian oil sands majors. These companies too have restructured dramatically and have covered dividends and capital expenditure commitments in 2017 at a \$55/bl oil price. However, projecting forward with a \$60/bl oil price in 2019 and 2020, we see room for a 100% increase in shareholder distributions. There are now a number of large cap companies within the energy sector that offer the potential for dividend growth at \$60/bl Brent, and this is an important focus in the Guinness Atkinson portfolio.

Valuation of the Guinness Atkinson Energy portfolio

Updating our company models to incorporate oil and gas prices seen so far this year, plus reported results and any changes in company outlooks, we make the following observations for the Guinness Atkinson Global Energy portfolio:

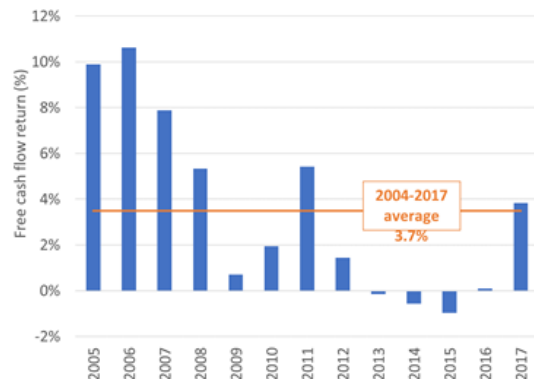
- Our preferred method for monitoring longer term profitability, return on capital employed (ROCE), continues to recover from a low of 2% in 2016 to around 7% in 2018 (based on an average Brent oil price of \$68/bl). The long run average for our portfolio is around 11% and we see good reason to believe that profitability will return to around the long run average level, just as it did after 1998 when oil prices last hit a cyclical low. It takes time for ROCE to improve (depreciation per barrel is a slow-moving metric) but we have increasing confidence that this will happen. The journey continues, and we anticipate positive ROCE will continue to improve in 2019 based on a \$60/bl price.
- The more ‘immediate’ metric of free cashflow return (FCF return) continues to stage a very strong recovery. We anticipate our portfolio could generate a FCF return in excess of the long run average in 2018 and again in 2019, based on a \$60/bl Brent oil price.

ROCE is recovering but still below average



Source: Bloomberg, Guinness Atkinson estimates

FCF return has recovered sharply



Source: Bloomberg, Guinness Atkinson estimates

The stock market has historically valued energy companies based on their sustainable levels of profitability (generally a combination of both ROCE and FCF Return) whether it is delivered by self-help improvements or via increases in the long-term oil price.

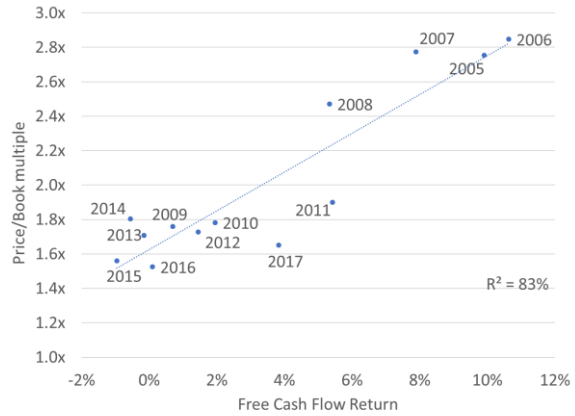
- Current valuation implies that the ROCE of our companies will stay at about 5%. If ROCE improves to 11-12% and the market were to pay for it sustainably, it would imply an increase in the equity valuation of around 65%.
- Current valuation implies that the FCF return of the portfolio will fall considerably from current levels. If FCF Return maintains these levels, and the market paid for it sustainably, it would imply an uplift in equity valuation of over 80%. Currently, the market is very skeptical that the energy companies will sustain their capital discipline and free cash flow generation.

Energy equities are priced as if their ROCE will fall to new low levels



Source: Bloomberg, Guinness Atkinson estimates

Energy equity valuation implies that current FCF Return will not be sustained



Source: Bloomberg, Guinness Atkinson estimates

In summary, the market remains skeptical of the self-help improvements that the energy sector is delivering, and this skepticism can also be seen in 2018 dividend yield for the Guinness Atkinson Energy Fund holdings (based on \$68/bl and \$60/bl Brent oil prices respectively). The underlying profitability and free cash flow generation of our portfolio will depend as much on improving capital discipline, lower unit capex and operating costs, and a continued rationalization of balance sheets as well as a strengthening oil price. We are encouraged by the steps that many investee companies have taken in 2018 and look forward to further improvements in 2019.

In our portfolio, we currently combine the themes of expanding free cash flow for mid to large caps, higher ROCE for the super majors, and North American shale oil & gas growth as key areas of exposure:

Key themes in the Guinness Atkinson energy portfolio

Theme	Example holdings	Typical Weighting (%)
1 Expanding free cashflow yield investments from large-cap oil & gas		30.5%
2 North American shale oil & gas growth		23.3%
3 Growing return on capital from oil & gas majors		19.2%
4 Emerging market natural gas demand growth		11.5%
5 Strong refining margins resulting from global GDP growth		7.5%
6 Deleveraging balance sheets		2.9%
7 Other (incl cash)		5.1%
		100.0%

Source: Bloomberg, Guinness Atkinson estimates

Logos displayed do not necessarily reflect current portfolio holdings; logos reflect past and/or existing holdings. Holdings are subject to change without notice.

Will Riley, Jonathan Waghorn & Tim Guinness

January 2019

Opinions expressed are those of Guinness Atkinson Funds, are subject to change, are not guaranteed and should not be considered investment advice.

The Fund's investment objectives, risks, charges and expenses must be considered carefully before investing. The statutory and summary prospectus contains this and other important information about the investment company, and it may be obtained by calling 800-915-6566 or visiting gafunds.com. Read it carefully before investing.

The Fund's holdings, industry sector weightings and geographic weightings may change at any time due to ongoing portfolio management. References to specific investments and weightings should not be construed as a recommendation by the Fund or Guinness Atkinson Asset Management, Inc. to buy or sell the securities. Current and future portfolio holdings are subject to risk.

Mutual fund investing involves risk and loss of principal is possible. The Fund invests in foreign securities which will involve greater volatility, political, economic and currency risks and differences in accounting methods. The Fund is non-diversified meaning it concentrates its assets in fewer individual holdings than a diversified fund. Therefore, the Fund is more exposed to individual stock volatility than a diversified fund. The Fund also invests in smaller companies, which involve additional risks such as limited liquidity and greater volatility. The Fund's focus on the energy sector to the exclusion of other sectors exposes the Fund to greater market risk and potential monetary losses than if the Fund's assets were diversified among various sectors. The decline in the prices of energy (oil, gas, electricity) or alternative energy supplies would likely have a negative effect on the fund's holdings.

S&P 500 Index is a broad-based unmanaged index of 500 stocks, which is widely recognized as representative of the equity market in general.

MSCI World Energy Index is a free-float weighted equity index based on the energy sector.

MSCI World Index is a capitalization weighted index that monitors the performance of stocks from around the world.

One cannot invest directly in an index.

Price to Book Ratio (P/B) is used to compare a stock's market value to its book value and is calculated by dividing the current closing price of the stock by the latest quarter's book value per share.

Standard Deviation (SD) is applied to the annual rate of return of an investment to measure the investment's volatility. Standard deviation is also known as historical volatility and is used by investors as a gauge for the amount of expected volatility.

Return on Capital Employed (ROCE) is a return from an investment that is not considered income. The return of capital is when some or all of the money an investor has in an investment is paid back to him or her, thus decreasing the value of the investment.

FCF (Free Cash Flow) yield represents the cash that a company is able to generate after laying out the money required to maintain or expand its asset base. Data presented reflects that of the underlying holdings of the Fund, not of the Fund itself.

Contango is a situation where the futures price of a commodity is above the expected future spot price.

Backwardation is the market condition where the price of a commodities' forward or futures contract is trading below the expected spot price at contract maturity.

OPEC-14 are the 14 countries that make up OPEC (Organization of Petroleum Exporting Countries): Algeria, Angola, Ecuador, Equatorial Guinea, Gabon, Iran, Iraq, Kuwait, Libya, Nigeria, Republic of Congo, Saudi Arabia, United Arab Emirates (UAE), Venezuela.

CAPEX or Capital Expenditure are funds used by a company to acquire or upgrade physical assets such as property, industrial buildings or equipment.

[Click here](#) for a complete list of holdings of the Guinness Atkinson Global Energy Fund.

Top 10 holdings as of December 31, 2018 were 1. ConocoPhillips (4.13%), 2. BP PLC (4.12%), 3. CNOOC Ltd (3.99%), 4. Valero Energy Corp (3.92%), 5. Occidental Petroleum Corp (3.88%), 6. Royal Dutch Shell PLC (3.84%), 7. Canadian natural Resources Ltd (3.81%), 8. Equinor ASA (3.81%), 9. PetroChina Ltd (3.77%) and 10. ENI Spa (3.77%)

Holdings are subject to change.

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