

2020 Outlook for Energy

The Guinness Atkinson Global Energy Team, January 2020

2019 was a year of attrition for OPEC (Organization of the Petroleum Exporting Countries) as they tried to keep a volatile oil market in balance and deliver an acceptable oil price for its members in the face of strong but slowing US supply. We would like to share our thoughts on 2019 and outlook for 2020 and beyond.

Highlights

2019 IN REVIEW

2019 saw a balanced oil market on average, with a sharp fall in OPEC production and reasonable demand growth being offset by non-OPEC supply growth. Spot oil prices generally traded in a \$55-65/bl range, though longer dated prices drifted lower throughout the year. In December 2019, OPEC (and partners) introduced new quotas in an attempt to keep the market in balance in 2020.

The dominant themes for global oil markets last year were:

Strong non-OPEC supply growth led by US shale. Non-OPEC production likely grew by 1.9m b/day with the US onshore delivering 1.6m b/day. However, in the US year-on-year growth by the end of 2019 was under 1m b/day, brought lower by slowing activity and the impact of high decline rates. Increases in production were also reported in Canada (+0.1m b/day), Russia (+0.1m b/day) and Brazil (0.2m b/day) offset by small declines in Norway and Mexico.

OPEC maintained their discipline and were assisted by further sharp drops in oil exports from Iran and Venezuela. OPEC production likely fell by 1.7m b/day, with Iranian and Venezuelan production declining 1.2m b/day and 0.5m b/day respectively. Saudi cut further than quotas implied, making up for overproduction from Iraq and Nigeria. OPEC and partners met in December 2019 and resolved to reduce their supply by a further 0.5m b/day at the start of 2020, bringing total production quota cuts since January 2019 to 1.7m b/day.

Demand growth of 1m b/day was slower than with initial expectations, but consistent with global GDP growth of 3.0%. This comprises non-OECD (Organization for Economic Cooperation and Development) oil demand growth of 1m b/day (with China up 0.6m b/day and India up 0.2m b/day) and OECD oil demand flat. Demand growth was very weak for the first half of 2019, then picked up. The “loss” of oil demand created by electric vehicle substitution remained negligible.

For **natural gas**, 2019 was a year of weak prices across the globe. In the US, the gas price was anchored around \$2.50/mcf for most of the year. European and Asian gas prices averaged \$4-5/mcf, well

down on 2018. Stockpiling in Asia, together with weak heating demand thanks to a mild winter, combined to create an oversupply that persisted over most of the year.

After a strong start to the year for energy equities in 2019, uncertainty over the balance of the oil market for the year ahead led the sector (MSCI World Energy Index) to finish +11.5%, in USD and behind the broad market (MSCI World +27.7%). Underlying energy company profitability held up; our portfolio of energy equities delivered a 7% return on capital employed (ROCE) and 6% free cash flow (FCF) Return for 2019. The broader market remained skeptical of the sustainability of the sector's free cash flow, keeping valuations depressed.

OUTLOOK FOR 2020

- **We expect OPEC and their partners to remain disciplined in their 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 supply grows in a controlled manner. Saudi are acting as the swing producer within OPEC, and will continue in this role in 2020.
- **The US onshore shale system will grow again this year, albeit at a slower rate than 2019.** A lower average drilling rig count and the “treadmill” challenge of overcoming high natural declines rates, will stunt US shale oil growth, which we expect at around 0.7m b/day (vs 1.2m b/day in 2019). We believe independent producers will remain more disciplined with their capital, with the market rewarding an appropriate balance of growth and free cashflow. Oil majors will remain more aggressively in “shale oil growth” mode.
- **Non-OPEC (ex US onshore) supply will grow by around 1m b/day in 2020 but major project additions then dry up.** Additions in 2020 come mainly from the start-up of the giant Johann Svedrup field offshore Norway, plus production coming through in sub-salt fields offshore Brazil. We see no repeat of this in 2021/22, even if oil prices rise from here, as upstream capex cuts from 2015-19 take effect.
- **Global oil demand will depend on GDP growth, currently expected at around 1.2m b/day** if the IMF's GDP global forecast of 3.4% holds up. The non-OECD will deliver most of the growth in 2019, with China and India leading the way. We will see more than 3m 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-2019** but the path will be bumpy. Looking further ahead, we believe that continued oil demand growth, and a softening of non-OPEC supply growth, will allow OPEC greater control of the market.
- **Global gas demand will grow handsomely again in 2020** led by strong Asian GDP growth and a shift in the region from coal to gas consumption by power utilities, though international gas prices will remain muted as oversupply persists.

- **Energy equity valuations remain at depressed levels.** The MSCI World Energy Index now trades on a price-to-book (P/B) ratio of 1.5x, the lowest level since 1991. This compares to the S&P500 on 3.6x, consistent with late 2001. The relative P/B vs the S&P500 is at a 55-year low. We believe that improving ROCE (we forecast 7% for our portfolio in 2020 assuming \$60 Brent prices, up from 1% in 2016) should drive a higher P/B ratio.
- **Free cash flow remains a priority in 2020.** 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.
- **Energy equities offer attractive upside if our oil price and profitability scenario plays out.** We believe energy equities currently discount an oil price of around \$50/bl. Adopting \$60/bl Brent as a long-term oil price (consistent with the bottom end of OPECs desired range), we see 40-50% upside across the energy complex.

Review of 2019

2019 was a year of attrition for the oil market. OPEC strived to keep spot oil prices in their desired range (Brent at around \$60-70/bl) and were made to work for it by growth in non-OPEC supply that exceeded growth in global oil demand.

OPEC started the year with a cut in production quotas of just over 1m b/day, which they anticipated would be needed in 2019 to keep markets balanced. In the event, OPEC's quota cuts were compounded by further reductions in supply from Iran and Venezuela, both seeing exports impacted by US sanctions, bringing average OPEC production down by 1.7m b/day versus 2018. However, the additional reduction in OPEC supply proved necessary for a balanced market, set against weaker global demand growth (+1.0m b/day vs +1.1m b/day in 2018) and strong non-OPEC supply growth (+1.9m b/day).

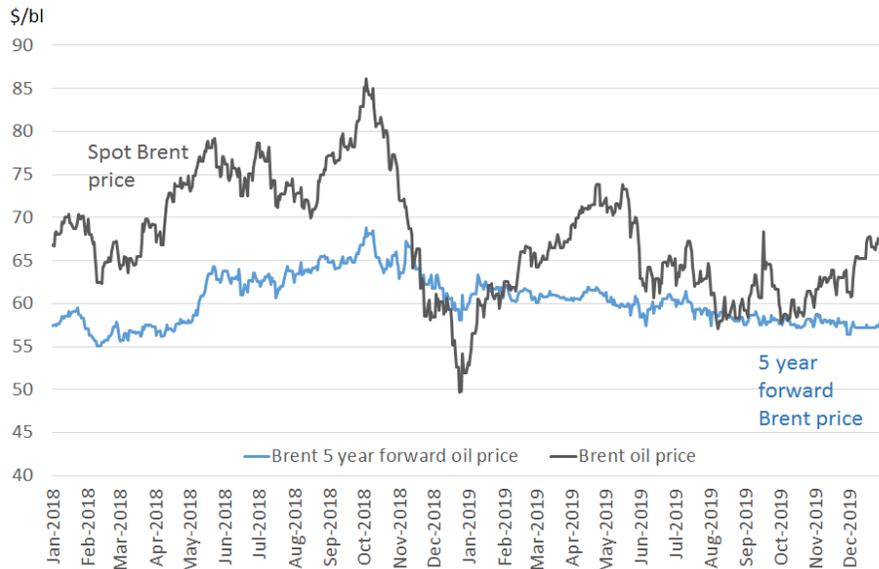
Towards the end of the year, it became apparent that OPEC would need to cut further into 2020, and together with non-OPEC partners, the group resolved to remove a further 0.5m b/day of production in January 2020.

At the heart of OPEC, Saudi acted throughout 2019 as the swing producer, adjusting their own supply by as much as 1m b/day (ignoring the September 2019 outages) to ensure that inventories did not tighten or loosen excessively.

Spot oil prices traded in a relatively wide range during the first half of 2019, then settled into a narrower range in the second half. Brent oil started 2019 at \$53/bl before peaking at \$74/bl in April/May. Since June, the price has traded between around \$60/bl and \$67/bl, before closing at \$66/bl, up by 25% over the year. The average Brent spot oil price in 2019 was \$64.1/bl, \$7/bl lower than the 2018 average of \$71.1/bl. Longer dated crude prices were more sluggish however, with the Brent five year forward price finishing the year down 3% at \$59/bl. WTI spot averaged \$57.0/bl, a discount of \$7/bl to Brent, as continued growth in US production held the discount to Brent at a similar level to 2018 (though by year end it had closed in to \$5/bl).

Similar to Brent, the futures curve for WTI remained in backwardation for most of the year, with five-year forward WTI closing 2019 down by 4% at \$57/bl.

Brent spot vs five-year forward oil prices (2018-19)



Source: Bloomberg

The major components of oil supply/demand for 2019 were as follows:

- OPEC oil supply**, measured for OPEC-14, is likely to have decreased by around 1.7m b/day, averaging 29.8m b/day, versus 31.5m b/day in 2018. The losers included Venezuela, which suffered a second year of significant production decline (falling from an average of 1.4m b/day in 2018 to 0.9m b/day in 2019) together with Iran (a decline of 1.2m b/day) and Saudi (a decline of 0.5m b/day). There were small offsets from Iraq (up 0.2m b/day), Libya and Nigeria (both up 0.1m b/day). OPEC, and various non-OPEC partners, met in December 2019 and resolved to reduce their supply by a further 0.5m b/day at the start of 2020, bringing total production quota cuts since January 2019 to 1.7m b/day. December 2019 also saw the completion of the IPO of Saudi Aramco, though the eventual sale of 1.5% of the company on the local stock exchange was something of a climbdown compared to original ambitions. During the year, we also saw Qatar leave OPEC, and the Democratic Republic of Congo join it.
- Non-OPEC oil and liquids supply** is likely to have grown by 1.9m b/day over the year (64.8m b/day, versus 62.9m b/day in 2018) and was driven almost entirely by growth from the US (+1.6m b/day). US onshore oil supply is expected to have averaged 9.8m b/day in 2019, delivering 1.1m b/day growth for the year. While still impressive, this growth rate was well down on 2018 (+1.8 m b/day), a product of a falling drilling rig count and the growing challenge of overcoming high natural decline rates. Increases in production were also reported in Canada (+0.1m b/day), Russia (+0.1m b/day) and Brazil (0.2m b/day) offset by declines in Norway (-0.1m b/day) and Mexico (-0.1m b/day).

- **Global oil demand** is estimated to have grown by around 1.0m b/day in 2019, according to the IEA. This comprises **non-OECD oil demand** growth of 1.0m b/day (with China up 0.6m b/day and the rest of Asia up 0.3m b/day) and **OECD oil demand** flat. If confirmed, these final figures will be a downgrade to the forecasts for 2019 that were made at the beginning of the year, reflecting the lower global GDP growth now expected for 2019 (the IMF were expecting GDP growth of around 3.4%, but this has now been revised to 3.0%). We regard demand growth of 1.0m b/day to be healthy, but would be the slowest since 2013.
- **OECD oil inventories** at the end of November 2019 were estimated to be at 2,880 million barrels, up slightly from 2,860 million barrels a year before, and still 7% above the 2005-2014 average level. We expect inventories to end 2019 broadly flat with the end of 2018, similar to the previous year.

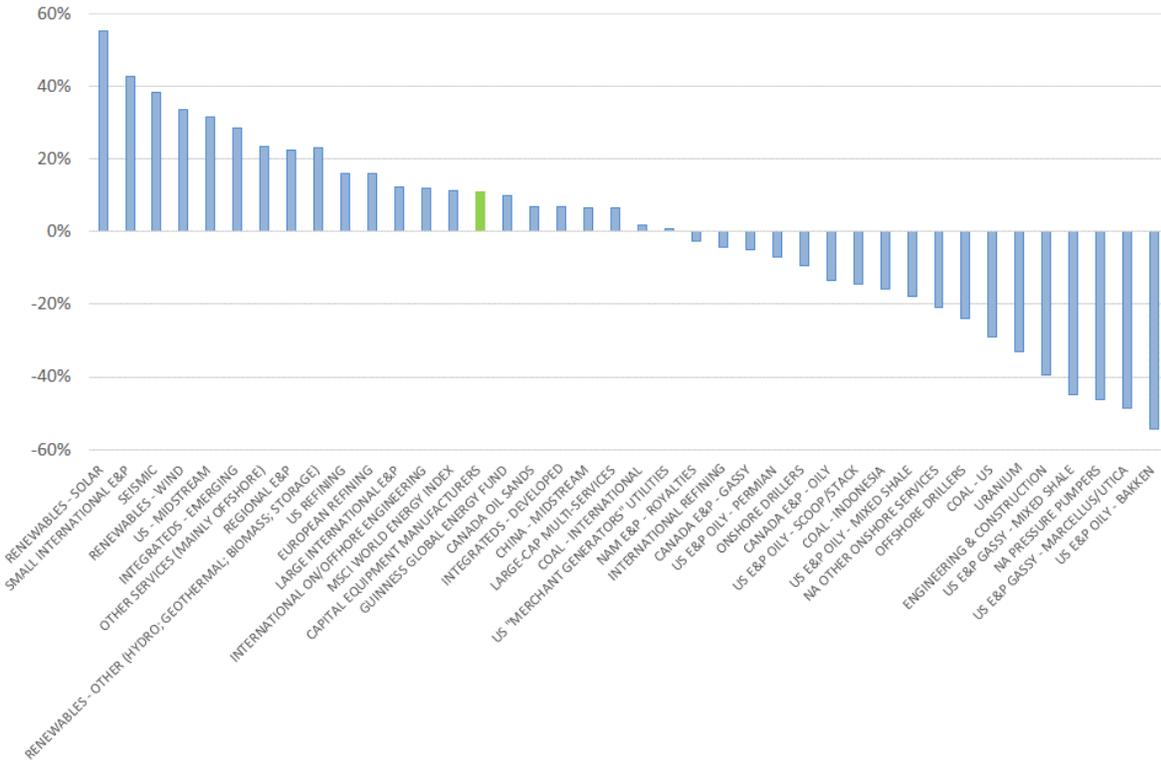
For **natural gas**, 2019 was a year of weak prices across the globe. In the US, the gas price was anchored around \$2.50/mcf for most of the year. The key features were strong growth in associated (by-product) gas supply from shale oil production; a return to strong growth in low-cost Marcellus and neighboring Utica fields in the north-east of the country as pipeline infrastructure came into operation; and an offset of strong demand growth, led by LNG exports.

European and Asian gas prices were higher than US gas prices in 2019, though well down on 2018. The European price averaged \$4.4/mcf (vs \$8/mcf in 2018) while Asia averaged \$5.2/mcf (2018: \$10/mcf). The key factor behind weaker international prices was a warmer than average European/Asian winter at the start of the year. In response to gas shortages in 2018, China and other Asian nations had stockpiled gas to avoid repeat shortages over the winter. In the event, the initial surpluses, plus dampened heating demand due to the warmer conditions, combined to create an oversupply that persisted for much of 2019.

After a strong first half of the year, uncertainty over the direction of the oil market led to weaker returns for **energy equities** in 2019. The sector (MSCI World Energy Index) finished +11.4%, behind the broad market (MSCI World +27.7%). So, although spot oil prices rallied nicely in 2019, the decline in the long-dated end of the oil price curve (i.e. the five-year forward price) acted as an anchor to energy equity performance. Valuation appears subdued relative to the improving levels of free cash flow and return on capital employed from the sector, as we explore in more detail in our equities outlook.

As ever, the performance of the MSCI World Energy Index was only part of the story, with 2019 being a year of extreme divergence between the energy equity subsectors.

Global energy equity subsectors: median total return in 2019 (%)



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 2019:

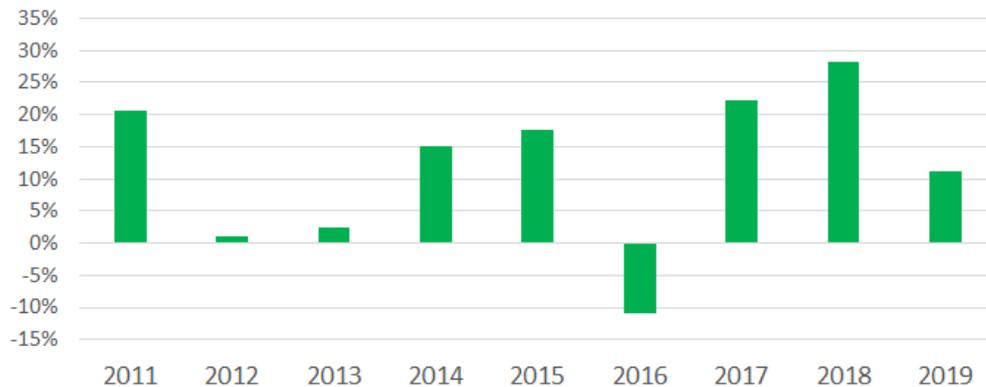
- Integrated oil and gas companies** again delivered above average performance. Emerging Market integrated companies outperformed the developed market integrated companies, and all were strong versus other subsectors. On average, the big “5” supermajors delivered a total return of 9% as their underlying financial profitability, general commitment to capital discipline (Exxon aside), growing dividends and share buybacks provided relative support against a weak long dated oil price 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 IMO 2020 regulations. European refining was the strongest of the three regions.
- Renewables** delivered healthy performance across the board. Companies involved in the installation of solar and wind assets were particularly strong, as global installations in both sectors rebounded to new highs. Generation assets also performed very well, helped by a combination of lower interest rate expectations and greater expectations for the pace of expansion of the installed renewables base of assets.

- **Exploration and production (E&P)** was a mixed bag. Typically, non-North American E&Ps fared better, being exposed to global Brent oil prices rather than WTI prices and enjoying a renaissance in offshore activity. 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 in a range of -5% to -55% over the year. As well as the weakness in WTI and Henry Hub, North American E&Ps generally suffered from a downgrade in growth expectations.
- **Energy services** were also mixed, though generally on the weak side. North American pressure pumpers were hardest hit, falling by 60% or more, as issues over excess capacity were compounded by a slowdown in activity. Large cap diversified service providers (e.g. Halliburton, Schlumberger and Baker Hughes) were up a little, rebounding after a particularly weak 2018. Some parts of the international service industry fared better (e.g. diversified offshore services) but offshore drillers suffered another year of overcapacity and excess financial gearing.

The **Guinness Atkinson Global Energy Fund** in 2019 produced a total return of 9.8%. This compares to the total return of the MSCI World Energy Index of 11.4%. The underperformance of the Fund versus the Index 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 (Exxon, Chevron, Royal Dutch Shell, TOTAL and BP). The median total return for a super-major in 2019 was 11% greater than that of the exploration & production, services and refining sectors. Regular observers of the energy fund sector will recognize this explanation as it has recurred over the last few 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. The divergence in performance between large cap and small cap energy stocks is also exemplified by the MSCI World Energy Small Cap Index, which produced a total return (net) in 2019 of -2.8%, more than 14% behind the MSCI World Energy Index.

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 visiting www.gafunds.com or calling 800-915-6566.

Supermajors relative performance vs the median E&P, services and refining company



Source: Bloomberg; Guinness Atkinson Asset Management

On a stock by stock basis in the fund, we saw particularly strong performance from Gazprom (+99%) as the market rewarded the arrival in May of new management and more progressive dividend policy. We had long viewed Gazprom as an extremely cheap stock in our portfolio, so were pleased to see this recognized. Anadarko (+70% to the point that we sold in July) was our best performing E&P stock, benefitting from a bidding war for the company between Chevron and Occidental, which eventually resulted in a sale to Occidental. In the large cap E&P space, we also saw strength from Canadian Natural Resources (+40%), enjoying another year of improved profitability and the narrowing of light-heavy oil price differentials in Canada.

It was a poor year for our holding in international E&P, Tullow (-61%), as the stock was pulled lower by operational issues at its West African production sites, plus poor exploration results offshore Guyana. Occidental (-28%), which we held in the portfolio alongside Anadarko, reacted poorly to the acquisition, with shareholders concerned about the high valuation implied by Occidental's winning bid. And we saw mixed results in the service names we owned, with Schlumberger (+18%) doing fine thanks to international exposure, but Halliburton's (-5%) greater focus on US onshore activity saw it caught up in a second year of excess capacity and slowdown.

The outlook for 2020

The message from OPEC, and in particular from Saudi over the last twelve months, has been a desire to normalize global oil inventories, and stabilize oil at a price which benefits producers without placing stress on consumers. We believe the price being sought is Brent at around \$60-70/bl.

Oil supply

The world oil supply outlook in 2020 is, in some ways, unchanged from the outlook that we have seen in previous years as US onshore shale oil is likely to grow (albeit more slowly), complemented by growth from the rest of the non-OPEC world. These will be balanced against disciplined OPEC production due to quota reductions as well as declining production from a number of maturing countries. 2020 sees a final roll-out for large project additions that were sanctioned in 2013-2015, with the lack of reinvestment since that time impacting supply growth in 2021 and beyond.

OPEC oil supply

Similar to 2019, OPEC starts the year with the market focusing on their ability to deliver on promised production quotas (this time of around 0.3m b/day, together with 0.2m b/day from "OPEC+ members"). We see the cuts, agreed at an OPEC meeting in December 2019, as a step on the path towards achieving an oil price in 2020 which reasonably satisfies OPEC economies as a whole but that does not cause excess US onshore supply or lower global oil demand. However, with non-OPEC supply growing by nearly 2m b/day in 2020 and demand by 1.2m b/day, it is clear that action from OPEC was needed.

OPEC production quotas vs October 2019 production

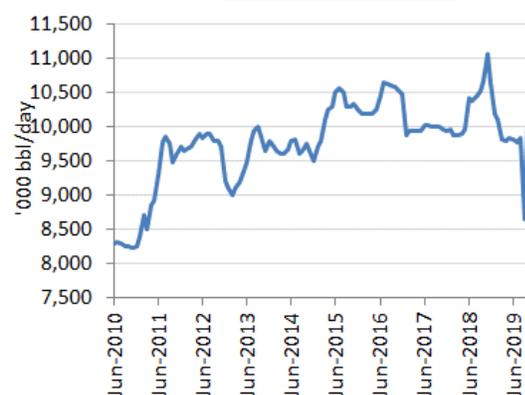
(m b/day)	'Baseline' for cuts	Oct 2019 production	Jan 2020 quota (indicative)		
	m b/day	m b/day	m b/day	vs 'baseline'	vs Oct 2019
Saudi*	10.63	10.20	10.14	-0.49	-0.06
Iran	3.33	2.15	Exempt	Exempt	Exempt
Iraq	4.65	4.72	4.46	-0.19	-0.26
UAE	3.17	3.09	3.01	-0.16	-0.08
Kuwait	2.81	2.63	2.70	-0.11	0.07
Nigeria	1.78	1.77	1.75	-0.03	-0.02
Venezuela	1.21	0.69	Exempt	Exempt	Exempt
Angola	1.53	1.37	1.48	-0.05	0.11
Libya	1.12	1.16	Exempt	Exempt	Exempt
Algeria	1.06	1.02	1.01	-0.05	-0.01
Equatorial Guinea	0.13	0.12	0.12	-0.01	0.00
Congo	0.33	0.32	0.31	-0.02	-0.01
Gabon	0.19	0.21	0.18	-0.01	-0.03
Ecuador	0.52	0.46	0.46	-0.06	0.00
OPEC (ex exempt)	26.80	25.91	25.62	-1.18	-0.29
Russia	10.69	10.46	10.39	-0.30	-0.07
Other non-OPEC+	6.41	6.01	6.19	-0.22	0.18
OPEC+ (ex exempt)	43.90	42.38	42.20	-1.70	-0.18

Source: Goldman Sachs; Guinness Atkinson Asset Management

The additional cut represents 1.2% of OPEC's production, bringing the total cut since Dec 2018 to around 3.9% of current production. Iran, Venezuela and Libya are all producing below what any notional quota would be and remain exempt from the cuts.

In addition to their reduced formal production quota, Saudi have committed until March 2020 to a further 0.4m b/day of voluntary cuts, taking the total OPEC+ cut since December 2018 to 2.1m b/day. However, Saudi have stated that the voluntary deeper cuts are contingent on 100% compliance from other OPEC+ members.

In October 2019, average production from OPEC-11 (the "core" members of OPEC) was 29.3m b/day. Assuming 100% compliance from those countries with quota cuts, Saudi following through with their voluntary cut, OPEC-11 production would drop to 28.5m b/day. This represents a decline of 0.8m b/day – roughly to the amount needed to balance the market in 2020.

Saudi oil production

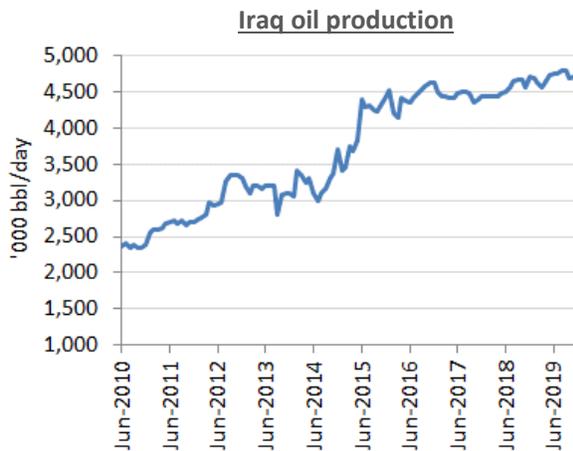
Source: IEA; Guinness Atkinson Asset Management

OPEC+'s decision, then, comes down to concerns of an oversupplied market in 2020, and is designed to keep the market in balance. However, their actions raise questions about whether they are simply "kicking the can

down the road” again, given the strength in non-OPEC supply seen since 2016. We would make two observations here: one, that Saudi et al have little stomach for a return to the extremely low oil prices experienced in 2015/2016 (particularly for Saudi with the performance of Saudi Aramco’s listing about to be scrutinized) and two, OPEC do see an end in sight to the strength in non-OPEC supply, with non-OPEC (ex US shale) slowing in 2021 as large project additions finally dry up. Growth rates for US shale are also coming down, thanks to the impact of high natural decline rates.

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 produced 9.8m b/day in November 2019, down from around 10.6m b/day at the start of the year. The Saudi oil industry was rocked in September by the rocket attacks on oilfield and processing facilities which, for a brief period, caused the largest oil supply outage on record. Repair and recovery were swift, however. On Dec 5th, Saudi completed the local IPO of Saudi Aramco, and will want to see a reasonable oil price maintained to support initial months of trading.

Within the OPEC community, there is likely to be greater attention in 2020 on **Iraq’s** compliance to quotas. In 2019, Iraq produced an average of 4.7m b/day, 0.2m b/day over the quota agreed to in December 2018. In the recent OPEC meeting, Saudi stated that they would only follow through on their additional voluntary cut of 0.4m b/day if other members of OPEC were fully in compliance. We believe this condition is directed, in particular, at Iraq. Full compliance from Iraq would imply them cutting production by around 0.25m b/day.

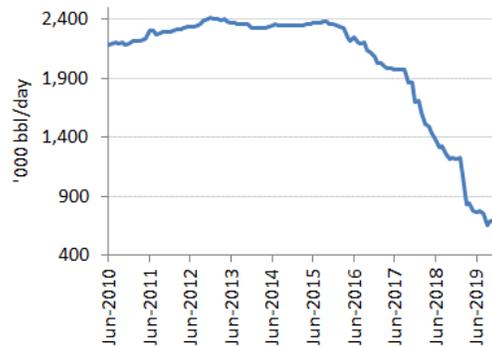


Source: IEA; Guinness Atkinson Asset Management

The wildcards for OPEC in 2020 are most likely Venezuela and Iran. As of November 2019, these two countries together produce a total of 3m b/day with a market share of 10% (down from 18% 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 are key issues behind the rapidly falling production levels; now at a fifty-year low. The economic stress of low oil prices, compounded in 2019 by further 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, the importing of foreign diluent is currently banned. 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.

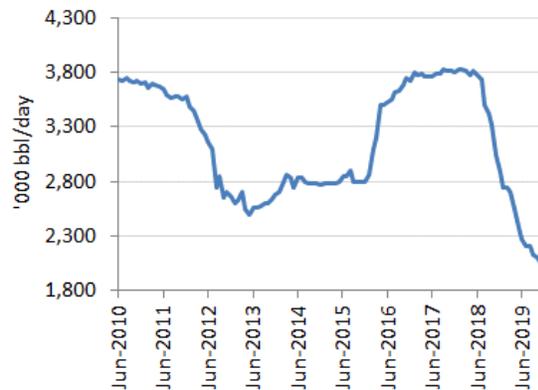
Venezuela oil production



Source: IEA; Guinness Atkinson Asset Management

For **Iran**, oil production in 2020 will depend upon the extent to which the US maintains sanctions on oil exports. In early 2019, the removal of imports exemption waivers for a number of Iran’s largest customers caused a further leg down in Iranian supply, falling from around 2.7m b/day at the start of the year to around 2.2m b/day by November 2019. The outlook is far from clear, but the assassination of Iranian General Soleimani by US forces in early January 2020 does not bode well for any meaningful resolution.

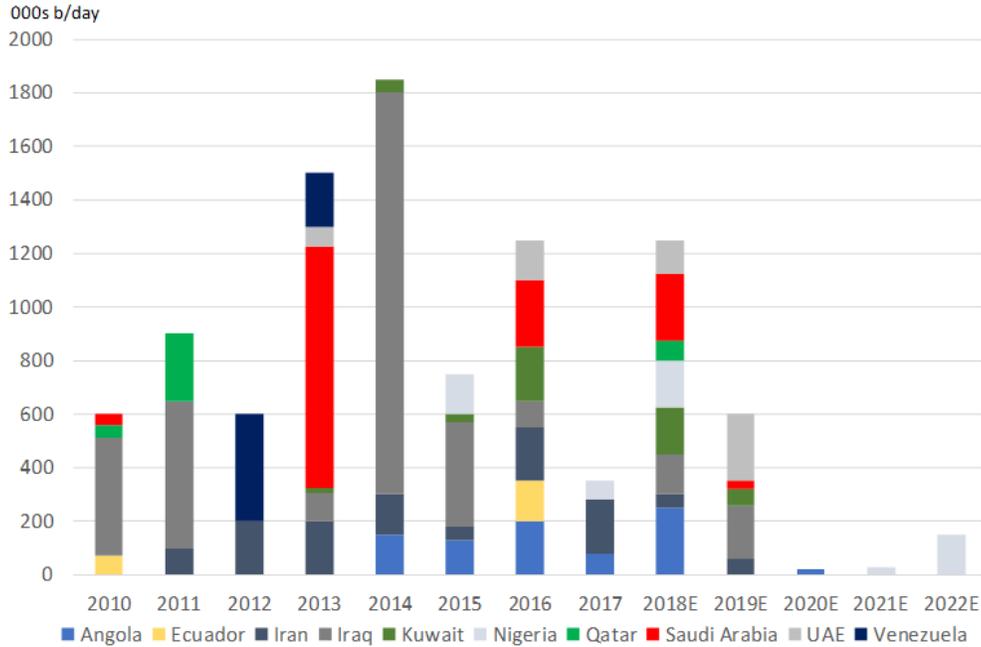
Iran oil production



Source: IEA; Guinness Atkinson Asset Management

Longer term, we expect OPEC production capacity to stagnate. A hiatus in investment in 2015-2019 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

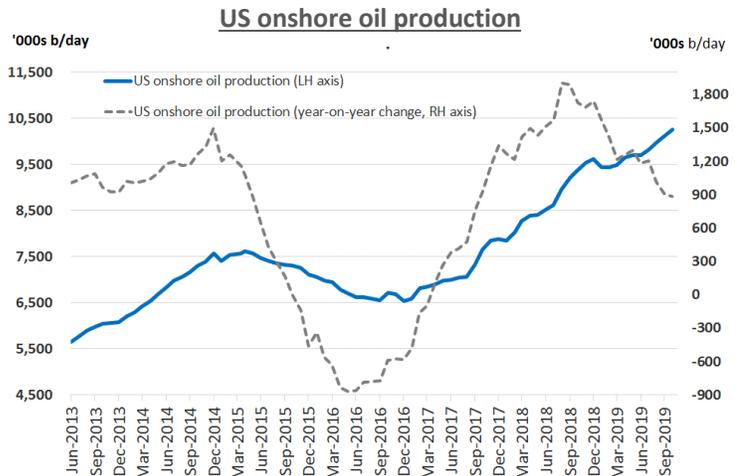


Source: Piper Jaffray; Guinness Atkinson Asset Management

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

Performance from the US onshore (shale) industry in recent years 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 to 12-month timeframe.



Source: EIA; Guinness Atkinson Asset Management

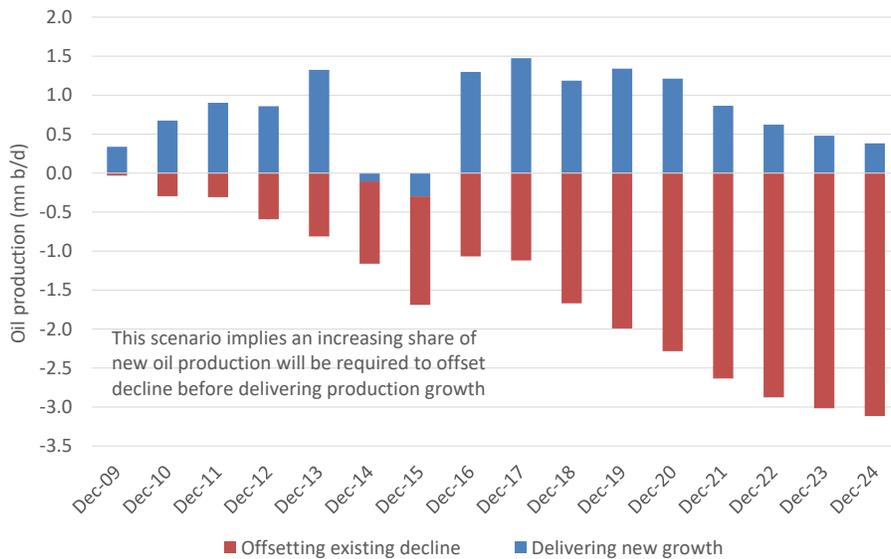
Some additional challenges are, however, emerging. The most recent monthly data for onshore supply indicates leading edge growth of 1m b/day between October 2018 and October 2019,

US

considerably slower than the peak growth rate of 1.8m b/day seen in September 2018. There have been two factors at play here:

- First, reduced capital budgets as a result of lower average oil prices and a reluctance by banks and equity holders to finance the US shale oil industry as much as in previous years. The outcome here was a lower rig count in 2019; currently running at around 670 oil directed rigs versus 888 at the peak in November 2018.
- Second, there is a “treadmill” effect starting to show up in the production data. As more shale wells are drilled, so the underlying annual decline of US oil production has increased, meaning that a larger number of wells are needed to be drilled every year to deliver a fixed level of production growth. In December 2017, for example, we estimate that around 1m b/day of new production was needed to keep the US shale system flat. Two years later, in December 2019, we estimate that the production needed to keep production flat has doubled to around 2m b/day.

US onshore oil supply required to offset existing declines (2009-24)



Source: Guinness Atkinson Asset Management

Given these impacts, and on the assumption that WTI averages in the high \$50s next year (consistent with Brent at \$60/bl), we believe US shale oil production growth will shrink to around 0.5m b/day in 2020.

In summary, we expect US shale oil to be available in the near term to dampen any shorter-term oil price spikes, but the “call on the US onshore” after 2020 could move substantially higher depending on the maturation of traditional non-OPEC and OPEC production.

Non-OPEC (ex US onshore) oil supply

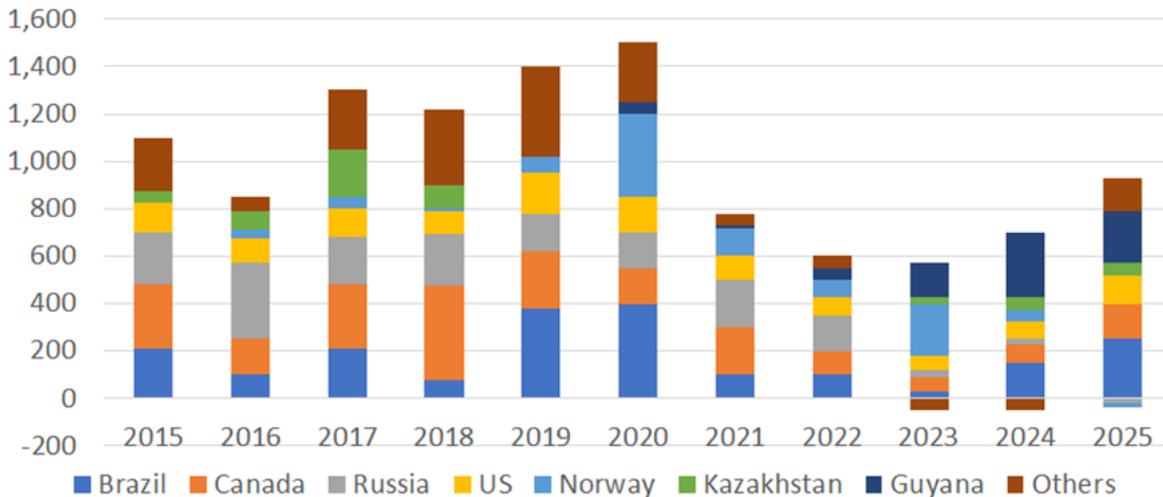
Despite representing over half of world oil supply (estimated 52m b/day in 2019), non-OPEC (ex US-onshore) production receives relatively little attention.

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 2017, 2018 and 2019. And the timescale from final investment decision to production ramp up is such that still in 2020, the volume of new oil coming into the market remains high.

Already in late 2019, we have seen the successful startup of the Johan Svedrup development in waters offshore Norway. Svedrup is expected to reach an initial production plateau in the first quarter of 2020 at just over 0.4m b/day. The next largest contributor to growth is expected to be sub-salt field start-ups offshore Brazil, at around 0.4m b/day. We are cautious that growth will be this strong – recent guidance from Petrobras implies a lower number – but still growth nonetheless. A range of smaller project start-ups in the Canadian oil sands and US Gulf of Mexico will also contribute.

Overall, we believe that net non-OPEC (ex US onshore) supply may grow in 2020 by around 1m b/day (note that the graph below is for gross large additions and doesn't account for declines).

Major non-OPEC (ex-US) project additions (2015-25E)



Source: Bloomberg; Guinness Atkinson Funds

Since 2015, we have been in a period when companies have been drawn towards the short-term project returns available from investments in the US onshore, at the expense of investing in longer cycle offshore and oil sand projects. This shows up in 2021 and beyond, when oil production from this broad area faces a downturn, as the last of the major project start-ups dries up. Gross project additions in 2021 are expected to drop by around 0.7m b/day versus 2020, translating into little if any net growth.

Any shortfall will need to be offset either via greater OPEC production, greater US onshore production or lower oil demand growth. While this may not be impacting world oil markets today, there is increasing risk of a non-OPEC supply shortage over the next few years.

Oil demand

According to the IEA, global oil demand for 2019 will end up at around 1.0m b/day, down from a forecast of 1.3m b/day made at the start of the year. Demand growth for the first half of 2019 averaged just 0.5m b/day, the slowest pace of growth since 2008. The second half of 2019 did see an acceleration, but the full year growth number of 1.0m b/day remains the lowest since 2013.

The IEA are forecasting slightly higher growth in oil demand in 2020, around 1.2m b/day, lower than the average annual global oil demand growth seen over the past 10 years (1.5m b/day).

As has been the pattern for many years, oil demand growth was biased to developing markets, with China contributing a significant share. China oil demand averaged 13.6m b/day in 2019 (up from 9.9m b/day in 2012) and has grown lockstep with overall economic growth. Despite Chinese car sales falling in 2019 versus the year before, reportedly suffering from early implementation of new vehicles emissions standards, motor gasoline and diesel demand both grew by around 5%. The highest rate of growth came from jet fuel and kerosene (up 6%), while residual fuel oil (used in heating) saw a decline in use. Further strength in demand from the aviation sector, personal transportation and other personal demand is expected to drive oil demand growth up another 0.3m b/day in 2020.

Elsewhere in the non-OECD, Russian oil demand looks to have grown for the third consecutive year in 2019, after being in slow decline earlier in the decade.

In the OECD, oil demand in Europe and Japan fell slightly. One factor in Europe has been falling demand in the petrochemical industry, driven by a slowdown in economic activity as well as a shift to low cost ethane-based producers in North America. Japanese oil demand is in a structural downtrend, the fall in 2019 of 0.1m b/day being the seventh consecutive annual decline. The growth in US oil demand is slanted towards ethane rather than oil: oil demand is expected to have grown by just 0.05m b/day, well down on growth in 2018 of 0.55m b/day.

World oil demand 2006-20E

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019E	2020E
OECD demand														IEA	IEA
North America	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	25.7	25.8
Europe	15.7	15.6	15.5	14.7	14.7	14.3	13.8	13.6	13.5	13.8	14.0	14.4	14.3	14.2	14.3
Pacific	8.7	8.7	8.3	8.0	8.2	8.2	8.5	8.3	8.1	8.1	8.1	8.1	8.1	7.9	8.0
Total OECD	48.9	50.1	48.3	46.4	47.0	46.5	45.9	46.1	45.8	46.5	47.1	47.6	47.8	47.8	48.1
<i>Change in OECD demand</i>	-1.5	1.2	-1.8	-1.9	0.6	-0.5	-0.6	0.2	-0.3	0.7	0.6	0.5	0.2	0.0	0.3
NON-OECD demand															
FSU	4.0	4.0	4.2	4.0	4.1	4.4	4.6	4.5	4.6	4.6	4.4	4.5	4.7	4.8	4.9
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	0.8	0.8	0.8
China	7.2	7.6	7.7	7.9	8.9	9.3	9.9	10.4	10.8	11.6	12.0	12.5	13.0	13.6	14.0
India	2.7	2.9	3.1	3.2	3.3	3.5	3.7	3.7	3.8	4.2	4.4	4.7	4.9	5.0	5.2
Other Asia	6.6	6.9	6.8	7.1	7.5	7.6	7.6	7.9	8.0	8.3	8.8	9.0	9.1	9.3	9.5
Latin America	5.2	5.3	5.6	5.7	6.1	6.2	6.5	6.6	6.8	6.7	6.5	6.4	6.4	6.4	6.4
Middle East	6.1	6.4	6.7	7.1	7.3	7.5	7.9	8.0	8.4	8.5	8.4	8.4	8.3	8.3	8.3
Africa	2.9	3.3	3.3	3.4	3.5	3.5	3.8	3.8	3.9	4.2	4.2	4.2	4.2	4.3	4.4
Total Non-OECD	35.4	37.1	38.1	39.1	41.4	42.7	44.8	45.6	47.4	48.8	49.3	50.6	51.5	52.5	53.4
<i>Change in non-OECD demand</i>	1.3	1.7	1.0	1.0	2.3	1.3	2.1	0.8	1.8	1.4	0.5	1.3	0.9	1.0	0.9
Total Demand	85.1	87.2	86.4	85.5	88.4	89.2	90.7	91.7	93.1	95.3	96.4	98.2	99.3	100.3	101.5
<i>Change in demand</i>	1.3	2.1	-0.8	-0.9	2.9	0.8	1.5	1.0	1.4	2.2	1.1	1.8	1.1	1.0	1.2

Source: IEA; Guinness Atkinson Funds

Overall flat OECD demand in 2019 represented the weakest year of “growth” since 2014. In the early summer, with Brent prices over \$70/bl, President Trump made his customary grumbles about fuel prices being too high, but generally we note that US gasoline prices sit comfortably towards the lower end of the historic range, cheap in a global context and cheap relative to US consumer personal disposable income.

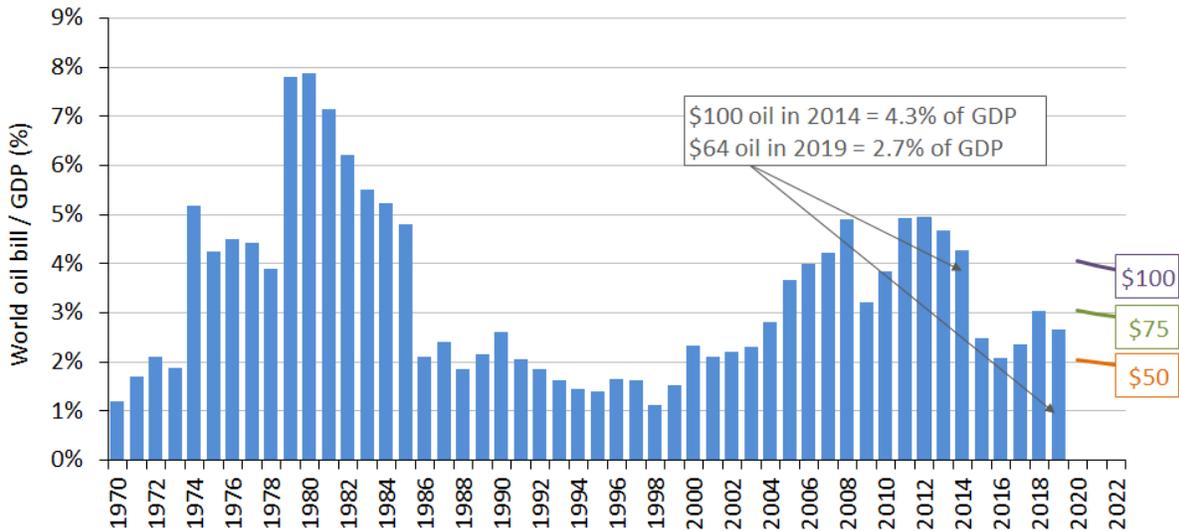
Globally, we believe that oil remains a “good value” commodity. Based on Brent oil price of around \$64/bl in 2019, we calculate that the world spent just around 2.7% of GDP on oil, below the 30-year average of around 3%. If Brent averages \$60/bl in 2020, we expect the GDP intensity to fall slightly to around 2.4%. 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 contributory 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; Guinness Atkinson Asset Management

The world oil “bill” as a percentage of GDP



Source: IEA; Bloomberg; Guinness Atkinson Asset Management

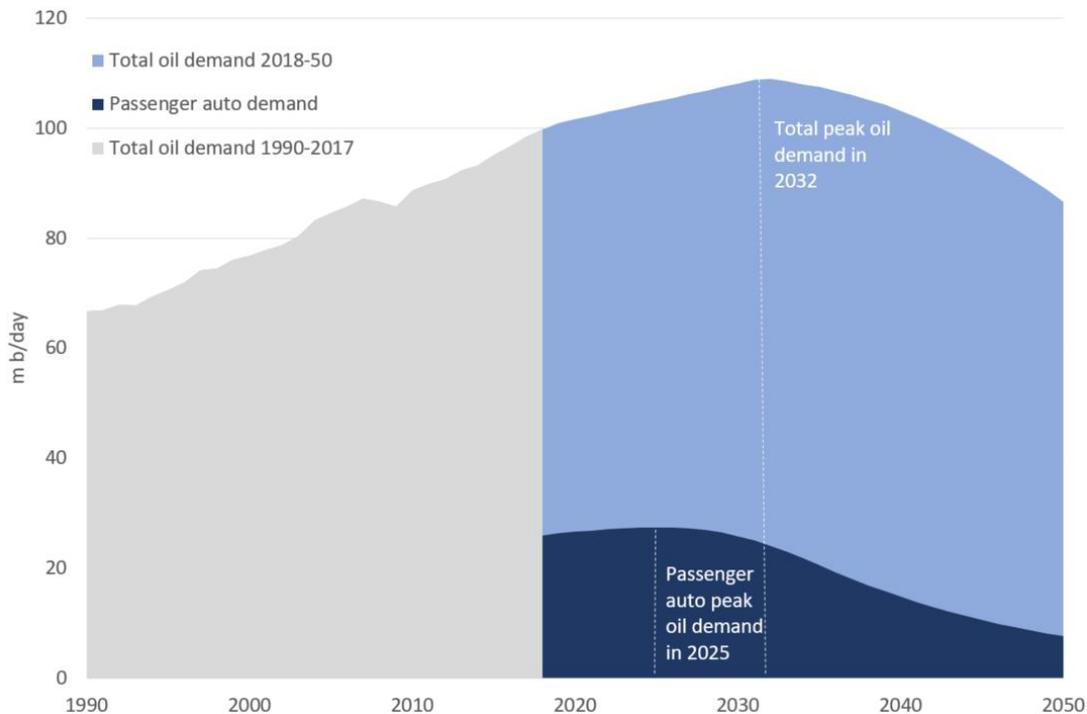
The IEA’s forecast for global oil demand growth in 2020 of 1.2m b/day is founded on the IMF’s global GDP growth forecast of 3.4%, up from 3.0% in 2019. However, there remain questions over whether a greater slowdown in the world economy is coming. The analysis we perform on the sensitivity of oil demand 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 (i.e. in line with 2019). 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.

There may also be a short-term boost to oil demand in 2020 thanks to the International Maritime Organization’s new rules (“IMO 2020”) on the use in shipping of heavy sulfur fuel oil. IMO 2020 restricts the use of heavy sulfur fuel oil and will force some users to switch to a lighter distillate barrel. This may seem like a simple swap of one barrel to another, but the make-up of the global refining slate is such that there is a limit on the amount of distillate that can currently be produced. The net result is more barrels of oil required to create distillate, with fuel oil being a less wanted by-product. Ultimately, the issue will be solved via ships adding scrubbers and being able to process fuel oil again in a compliant fashion, and the refining slate adjusting.

Looking longer term, the key issue for global oil demand is the electrification of personal transportation. In 2019, we saw more automobile manufacturers announce increasing ranges of Electric Vehicles (EVs), governments and capital cities bringing forward long-dated targets for banning the sales of non-EVs. 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 mid to 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 early 2030s, somewhere around 110m b/day.

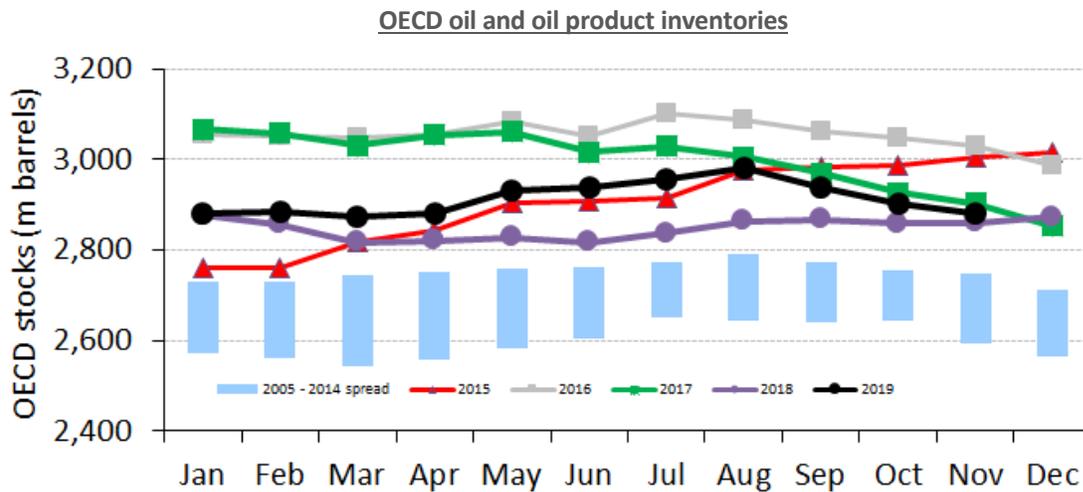
World Oil Demand (1990-2050E)



Source: IEA; Guinness Atkinson Asset Management

Oil inventories and conclusions

As ever, the picture of oil supply and demand in 2020 will be dynamic, depending on price, OPEC delivery, corporate behavior and macro-economic factors. Our base case for 2020, 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.



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

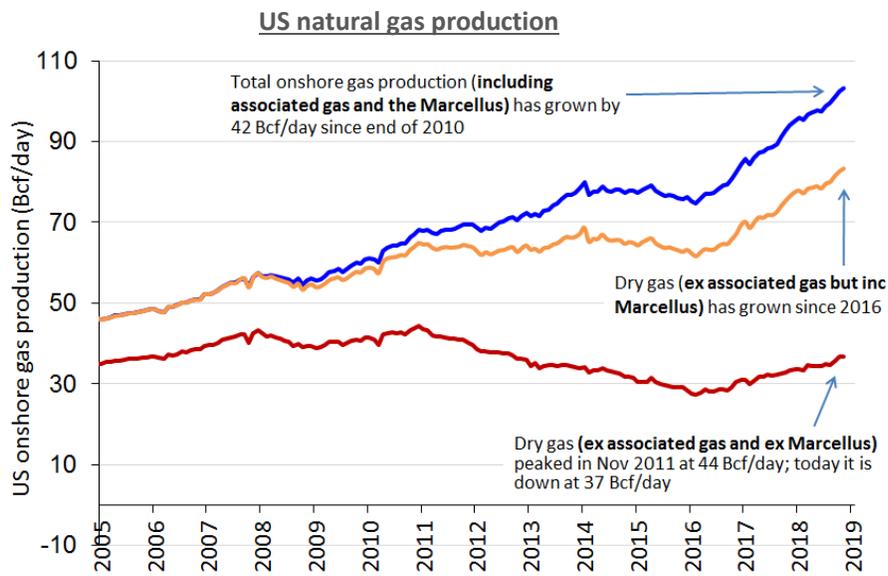
The US natural gas market was oversupplied in 2019 with natural gas inventories ending the “injection” season on November 1, 2019 around 100 Bcf above the ten year average level, having been significantly undersupplied twelve months earlier. The Henry Hub gas price was anchored around \$2.50/mcf for most of the year. 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;
- Strong demand growth; including LNG exports. The biggest contributors being power generation (+1.7 Bcf/day from price-driven coal to gas switching and the start-up of numerous gas plants increasing gas' share over coal) and LNG exports (+2.2 Bcf/day from 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.

US natural gas demand model (2008 – 2020)

Bcf/day	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019E	2020E
US natural gas demand:													
Residential/commercial	22.0	21.6	21.6	21.6	19.2	22.4	23.4	21.4	20.5	20.9	23.4	23.9	23.3
Power generation	18.2	18.8	20.2	20.8	24.9	22.3	22.3	26.5	27.3	25.3	29.0	30.7	30.8
Industrial	18.2	16.9	18.5	19.0	19.7	20.3	20.9	20.6	21.1	21.6	23.0	23.0	23.2
Pipeline exports (Mexico)	1.0	0.9	0.9	1.4	1.8	1.9	1.9	2.7	3.8	4.0	4.6	5.1	5.7
LNG exports	-	-	-	-	-	-	-	0.1	1.0	2.6	3.4	5.6	8.6
Pipeline/plant/other	5.3	5.5	5.6	5.8	6.1	6.7	6.3	6.5	6.4	6.5	7.1	7.7	8.0
Total demand	64.7	63.7	66.8	68.6	71.7	73.6	74.8	77.8	80.1	80.9	90.5	96.0	99.6
Demand growth	0.6	- 1.0	3.1	1.8	3.1	1.9	1.2	3.0	2.3	0.8	9.6	5.5	3.6
Bcf/day	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019E	2020E
US natural gas supply:													
US (onshore & offshore)	55.1	56.5	58.4	62.7	65.7	66.3	70.9	74.2	73.4	73.6	84.0	91.9	95.6
Net imports (Canada)	8.3	7.1	7.0	5.8	5.4	5.0	4.9	4.9	5.5	5.8	5.4	4.9	4.8
LNG imports & other	1.2	1.4	1.4	1.0	0.8	0.6	0.5	0.5	0.4	0.3	0.1	0.1	0.1
Total supply	64.6	65.0	66.8	69.5	71.9	71.9	76.3	79.6	79.3	79.7	89.5	96.9	100.5
Supply growth	0.4	0.4	1.8	2.7	2.4	-	4.4	3.3	- 0.3	0.4	9.8	7.4	3.6
(Supply)/demand balance	0.1	- 1.3	-	- 0.9	- 0.2	1.7	- 1.5	- 1.8	0.8	1.2	1.0	- 0.9	- 0.9

Source: EIA; Bloomberg; Goldman Sachs; Guinness Atkinson Asset Management

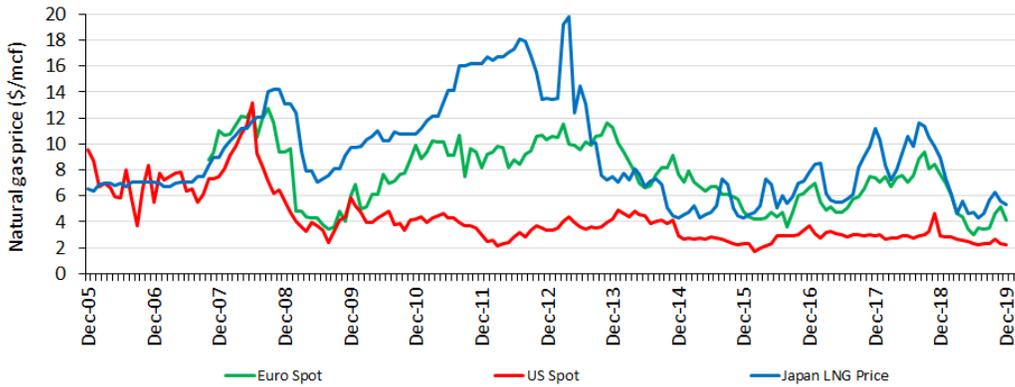
The US natural gas price since 2010 has fluctuated in a band between around \$2 and \$4/mcf. The extremes of this range have tended to coincide with warm and cold winters, and any sustained recovery over \$3/mcf has generally been muted by strength in gas supply, particularly from the Marcellus/Utica and from gas produced as a by-product of shale oil. We still expect prices to be held, for now, in the \$2.25-2.75/mcf range, but will keep an eye on the effect of these new LNG export terminals.

International natural gas

European and Asian gas prices were higher than US gas prices in 2019, though well down in 2018. The European price averaged around \$4.4/mcf (vs \$8/mcf in 2018) while Asia averaged \$5.4/mcf (2018: \$10/mcf).

The key factor behind weaker international prices was a warmer than average European/Asian winter at the start of the year. In response to gas shortages in 2018, China and other Asian nations had stockpiled gas to avoid repeat shortages over the winter. In the event, the initial surpluses, plus dampened heating demand due to the warmer conditions, combined to create an oversupply that persisted for much of 2019.

International natural gas prices 2005-19



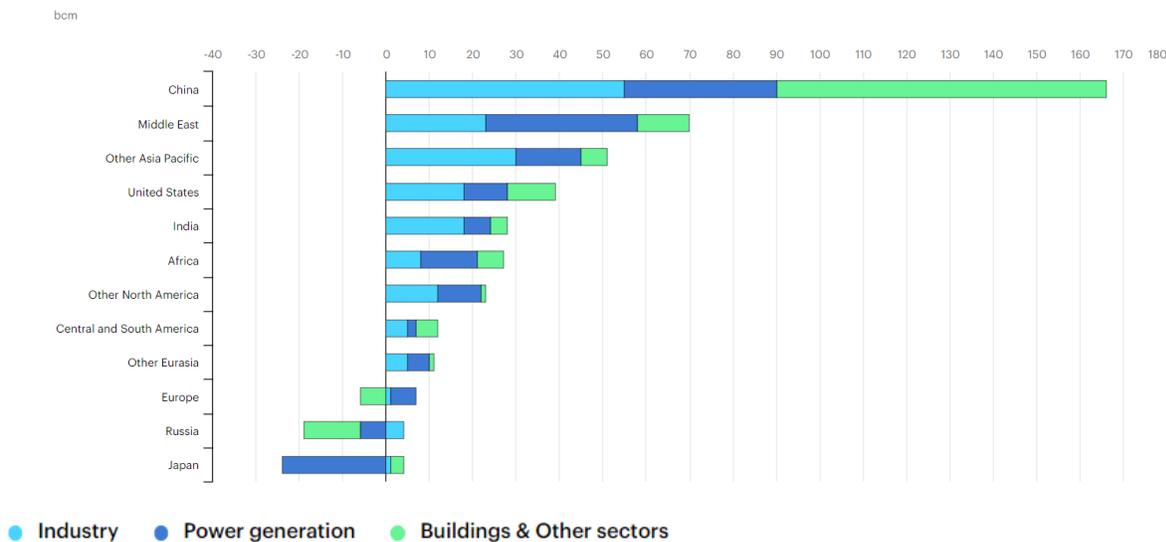
Source: Bloomberg; Guinness Atkinson Funds

Looking ahead, we expect Chinese gas demand to grow strongly again in 2020, reflecting the 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). As ever, European demand will be weather dependent, but assuming average winter conditions, we expect demand to be significantly higher in early 2019 than early 2018. Otherwise, we expect the structural shift from coal to gas and renewables to continue.

One of the main swing factors in international gas markets will be the ramp up of LNG exports. Our model for US gas above assumes an additional 3 Bcf/day of LNG exports from the US.

Looking further ahead, we see a wave of new LNG project sanctions that will lift global LNG capacity. In 2018, total LNG supply was around 320mpta (c.32 Bcf/day), and by 2025 we expect this to grow by nearly 50% to 460mpta (c.46 Bcf/day). On the consumption side, growth in demand over the next five years will be dominated by China, Middle East and other parts of the Asia Pacific region, whilst the rise of renewables in Europe and Japan will hold demand back.

Natural gas consumption growth in selected countries and regions (2018-24E)



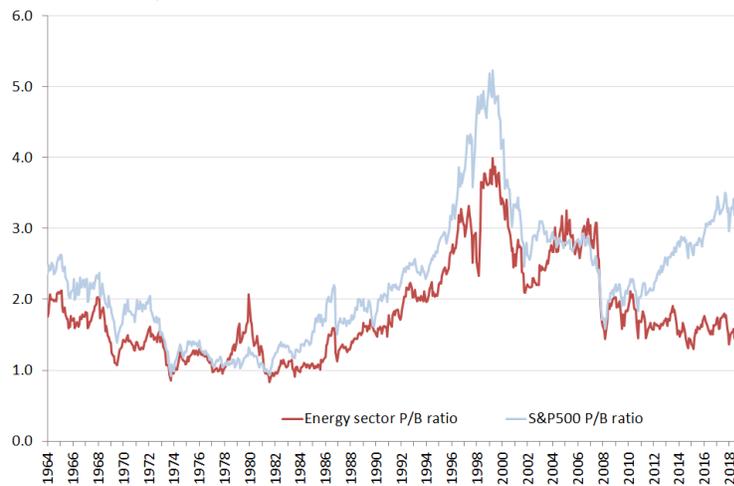
Source: IEA; Guinness Atkinson Asset Management

Energy equities

After a strong first half of the year, uncertainty over the direction of the oil market led to weaker returns for energy equities in 2019. The sector (MSCI World Energy Index) finished +11.4%, behind the broad market (MSCI World +27.7%). So, although spot oil prices rallied nicely in 2019, the decline in the long-dated end of the oil price curve (i.e. the five-year forward price) acted as an anchor to energy equity performance. Valuation appears subdued relative to the improving levels of free cash flow and return on capital employed from the sector, as we explore in more detail below.

The MSCI World Energy Index now trades on a price to book ratio of 1.5x, the lowest level since 1991. This compares to the S&P500 on 3.6x, consistent with late 2001.

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 0.42x, consistent the level that they were at in February 2016 when Brent oil was \$29/bl.



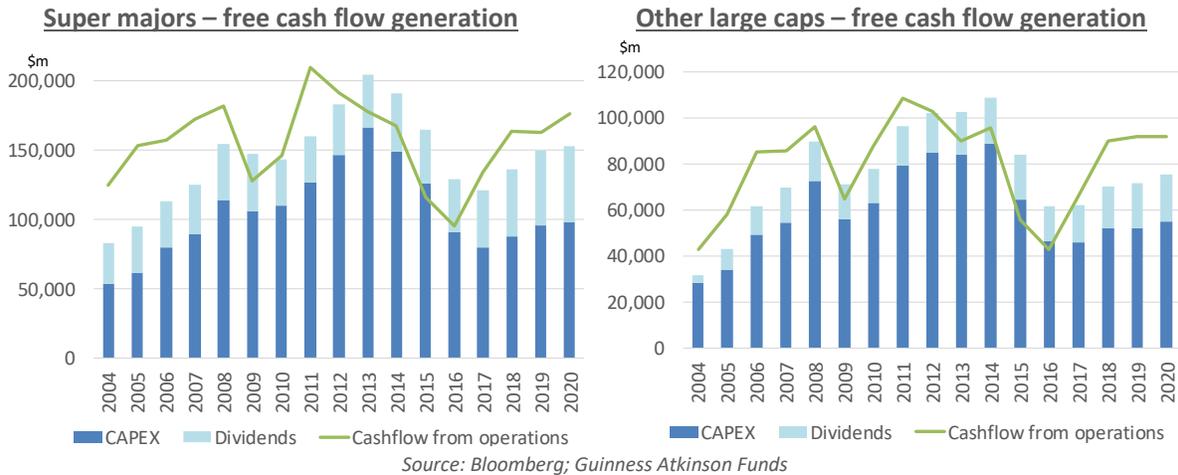
Source: Bernstein; Bloomberg; Guinness Atkinson Asset Management

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 have seen a partial recovery in sector ROCE, which has not yet been matched by a re-rating of the equities.

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. In response, the super majors have been rewarding their shareholders with higher ordinary dividends, up in 2019 by around 30% versus 2017. Arguably though, dividend yields remain too low.

Looking to 2020 and 2021, in a \$60/bl Brent oil price environment, we see room for distributions to shareholders from the super majors to rise by around 40%. This is quite a thought and, we believe, some way from the market view. In practice, we expect ordinary dividends not to increase so much (because the market would not tolerate them being cut again), but the returns to shareholders may come in the form of enhanced share buybacks and a reduction of debt.



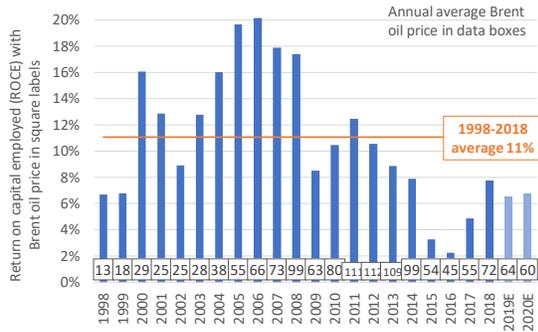
The inflection in free cash flow for the super majors is impressive, but we see an even greater improvement occurring for the next tier of companies: mid-cap integrated; large cap E&Ps and Canadian oil sands majors. These companies too have restructured dramatically and can cover dividends at an oil price of around \$50/bl. However, projecting forward with a \$60/bl oil price in 2020 and 2021, we see room for an 80% 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 remains an important focus in the Guinness Atkinson portfolio.

Valuation of the Guinness Atkinson Global Energy portfolio

Looking ahead, we make the following observations for the Guinness Atkinson Global Energy portfolio:

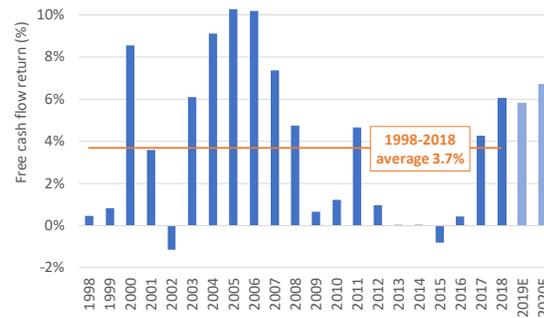
- Our preferred method for monitoring longer term profitability, return on capital employed (ROCE), continues to recover from a low of 2% in 2016 to around 6.5% in 2019 (based on an average Brent oil price of \$64/bl). The long run average ROCE for our portfolio is around 11% and we see good reason to believe that profitability has the potential to 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 if we see 7% ROCE in 2020, it would be based on a \$60/bl price.
- The more “immediate” metric of free cashflow return (FCF return) continues to look strong. We forecast our portfolio to generate a FCF return in 2020 to be up around 1% vs 2019 despite an assumption for 2020 of Brent at \$60/bl vs \$64/bl in 2019. A FCF at that level would sit comfortably above the long term average.

ROCE is recovering but still below average



Source: Bloomberg, Guinness Atkinson Asset Management estimates

FCF return has recovered sharply



Source: Bloomberg, Guinness Atkinson Asset Management 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.

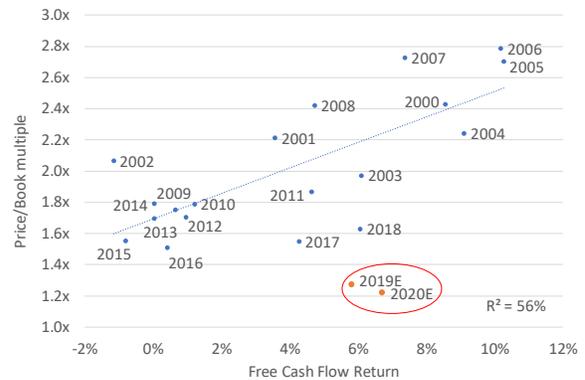
- Current valuation implies that the ROCE of our companies will stay at about 2%. If ROCE improves to 11-12% and the market were to pay for it sustainably, it would imply an increase in the equity valuation of around 65%.
- Current valuation implies that the FCF return of the portfolio will fall considerably 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 around 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 Asset Management estimates

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

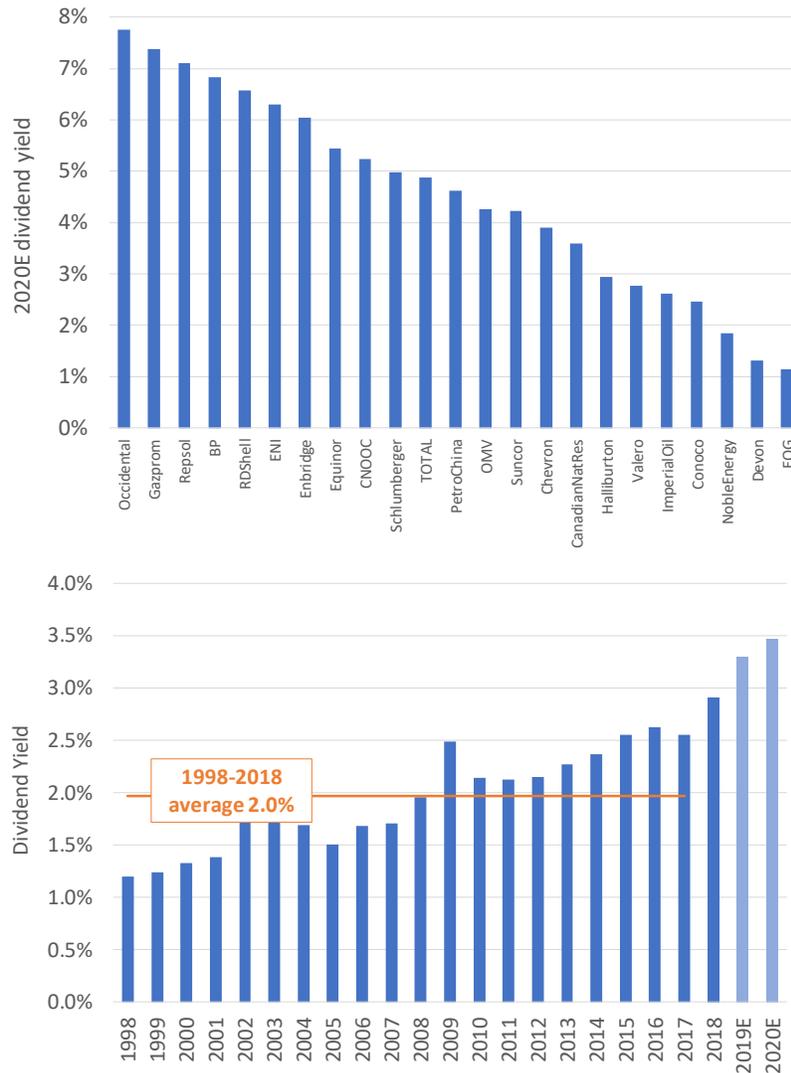


Source: Bloomberg, Guinness Atkinson Asset Management estimates

In summary, the market remains skeptical of the self-help improvements that the energy sector is delivering, and is skeptical that the long-term oil prices will be anything over \$50/bl. This skepticism can also be seen in the 2019 and 2020 dividend yield for the Guinness Atkinson Energy Fund holdings (based on \$64/bl and \$60/bl Brent oil prices respectively). Our holdings are trading at a substantially higher yield (3.4% on average)

than the long run average level of 2.0%, reflecting a continued lack of confidence from the market that current dividends can be sustained. We believe that the cash flow generation capability of the companies has changed substantially in the last few years and that our portfolio will comfortably cover its forecast dividend.

Illustrative yield of all dividend paying holdings in the current Guinness Atkinson Global Energy portfolio



Source: Bloomberg, Guinness Atkinson Asset Management estimates

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 2019 and look forward to further improvements in 2020.

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 Global Energy portfolio

Theme	Example holdings	Weighting (%)
1 Expanding free cashflow yields from large-cap oil & gas	  	28.0%
2 Growing return on capital from oil & gas majors	  	23.6%
3 North American shale oil & gas growth	  	18.8%
4 Emerging market natural gas demand growth	 	11.4%
5 Strong refining margins resulting from global GDP growth	 	7.7%
6 Increasing offshore capital expenditure	 	5.6%
7 Other (incl cash)		4.9%
		100.0%

Source: Bloomberg, Guinness Atkinson Asset Management estimates

Specialist global energy sector equity funds have historically provided the best exposure to an improving energy market.

Will Riley, Jonathan Waghorn & Tim Guinness

January 2020

as of 12.31.2019 (in USD)	YTD	1 year	3 years	5 years	10 years	Since Inception
GAGEX	10.40%	10.40%	-3.97%	-3.85%	-1.47%	5.16%
MSCI World Energy NR USD	11.45%	11.45%	-0.52%	-0.77%	1.38%	4.79%

All returns after 1 year annualized.

Expense ratio: 1.60% (gross) 1.45% (net)

Performance data quoted represent past performance and 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. For most recent month-end and quarter-end performance, visit https://www.gafunds.com/our-funds/#fund_performance or call (800) 915-6566.

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, 2020. To the extent that the Advisor absorbs expenses to satisfy this cap, it may recoup a portion or all of such amounts absorbed at any time within three fiscal years after the fiscal year in which such amounts were absorbed, subject to the expense cap in place at the time recoupment is sought, which cannot exceed the expense cap at the time of the waiver.

The Fund's portfolio may change significantly over a short period of time; no recommendation is made for the purchase or sale of any particular stock.

Forecasts are inherently limited and cannot be relied upon. Holdings are subject to change.

The Fund's investment objectives, risks, charges and expenses must be considered carefully before investing. The statutory and summary prospectuses contain this and other important information and can be obtained by calling 800- 915-6565 or visiting www.gafunds.com. Read and consider 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.

The Fund invests in foreign securities, which involve political, economic, currency risks, greater volatility, and differences in accounting methods. These risks are greater for emerging markets. The Fund invests in smaller and mid-cap companies, which involve additional risks such as limited liquidity and greater volatility than investments in larger companies. 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.

MSCI World Energy Index is the energy sector of the MSCI World Index (an unmanaged index composed of more than 1400 stocks listed in the US, Europe, Canada, Australia, New Zealand, and the Far East) and as such can be used as a broad measurement of the performance of energy stocks.

MSCI World Index is a free float-adjusted market capitalization weighted index that is designed to measure the equity market performance of developed markets.

The 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.

One cannot invest directly in an index.

West Texas Intermediate (WTI) crude oil is produced, refined, and consumed in North America and it is an oil benchmark. WTI crude oil is the underlying commodity of the New York Mercantile Exchange's oil futures contracts and is considered a "sweet" crude because it is about 0.24% sulfur, which is a lower concentration than North Sea Brent crude.

The Henry Hub pipeline is the pricing point for natural gas futures on the New York Mercantile Exchange.

The Organization of Petroleum Exporting Countries (OPEC) and its new crude-producing allies make up OPEC+, with the “+” consisting of ten additional oil-producing nations, the largest three being Russia, Mexico and Kazakhstan.

The New York Mercantile Exchange is the world’s largest physical commodity futures exchange.

Debt/EBITDA is a measure of a company’s ability to pay off its incurred debt. This ratio gives the investor the approximate amount of time that would be needed to pay off all debt, ignoring the factors of interest, taxes, depreciation and amortization.

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 a

Free Cash Flow (FCF) 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.

Price to Book (P/B) Ratio 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.

Organization for Economic Cooperation and Development (OECD) is a group of 34 member countries that discuss and develop economic and social policy. OECD members are democratic countries that support free-market economies.

Opinions expressed are subject to change, are not guaranteed and should not be considered investment advice.

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