THE GUINNESS GLOBAL ENERGY REPORT

Developments and trends for investors in the global energy sector | July 2019

GUINNESS GLOBAL ENERGY FUND

Fund size: $241m (30.6.2019)

The Guinness Global Energy Fund invests in listed equities of companies engaged in the exploration, production and distribution of oil, gas and other energy sources. We believe that over the next twenty years the combined effects of population growth, developing world industrialisation and diminishing fossil fuel supplies will force energy prices higher and generate growing profits for energy companies.

The Fund is run by Will Riley, Jonathan Waghorn and Tim Guinness. The investment philosophy, methodology and style which characterise the Guinness approach have been applied to the management of energy equity portfolios since 1998.

HIGHLIGHTS FOR JUNE

OIL

Brent and WTI rise; OPEC+ agree to extend existing quotas

Brent and WTI both increased over the month; Brent was up from $63/bl to $64/bl; WTI rose from $54/bl to $59/bl. It was confirmed at the start of July that OPEC+ are extending their existing production quotas for a further nine months. Participating non-OPEC producers have signed a new Charter of Cooperation which formalises their involvement. Otherwise, attacks on tankers in the key Gulf of Oman export route helped to elevate spot prices.

NATURAL GAS

US gas prices lower; Asian & European prices also weak

Henry Hub prices weakened from $2.45/mcf to $2.31/mcf. Large builds in storage showing up, with US gas supply nearly 11 Bcf/day higher than twelve months ago, thanks to growth in Appalachia and in associated gas from US shale oil production. Asian and European gas prices have weakened (c.$5/mcf and c.$4/mcf at end-June) as a result of seasonal glut of LNG.

EQUITIES

Energy outperforms the broad market in June

The MSCI World Energy Index (net return) rose in June by 7.0%, outperforming the MSCI World Index (net return) which rose by 6.6% over the month (all in US dollar terms). Year-to-date, the MSCI World Energy Index has underperformed the MSCI World by 4.3%.

CHART OF THE MONTH

OPEC extend existing production quotas

OPEC met on July 1 and agreed to extend existing quotas until March 2020. OPEC are currently producing around 1.6m b/day less than their official quota of 31.5m b/day. Adjusting for the production outages in Iran (sanctions) and Venezuela (underinvestment and sanctions), the rest of OPEC is producing in-line with their overall production quota. Whilst collective compliance from OPEC has been strong, it has relied on Saudi cutting production beyond their implied quota.

OPEC production vs quotas

	May 2019 production	July 2019 quota	
(m b/day)	m b/day	m b/day	Actual vs quota m b/day
Saudi	9.70	**10.33**	-0.63
Iran	2.40	**3.34**	-0.94
Iraq	4.78	**4.51**	0.27
UAE	3.05	**3.11**	-0.06
Kuwait	2.71	**2.68**	0.03
Nigeria	1.69	**1.62**	0.07
Venezuela	0.81	**1.26**	-0.45
Angola	1.45	**1.46**	-0.01
Libya	1.16	**1.07**	0.09
Algeria	1.03	**1.04**	-0.01
Equatorial Guinea	0.10	**0.13**	-0.03
Congo	0.34	**0.31**	0.03
Gabon	0.20	**0.18**	0.02
Ecuador	0.53	**0.50**	0.03
OPEC-14	**29.95**	**31.54**	**-1.59**

Source: IEA; Guinness Asset Management

Important information about this report

This report is primarily designed to inform you about recent developments in the energy markets invested in by the Guinness Global Energy Fund. It also provides information about the Fund's portfolio, including recent activity and performance. This document is provided for information only and all the information contained in it is believed to be reliable but may be inaccurate or incomplete; any opinions stated are honestly held at the time of writing, but are not guaranteed. The contents of the document should not therefore be relied upon. It is not an invitation to make an investment nor does it constitute an offer for sale.

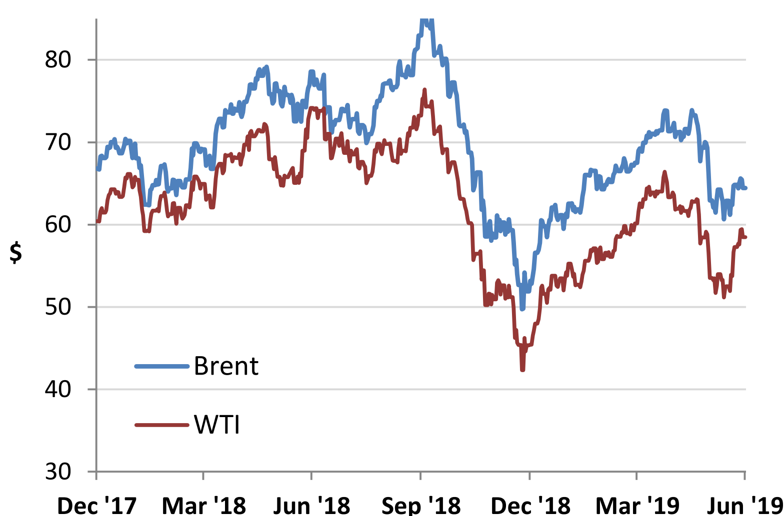
Contents

1. JUNE IN REVIEW 2
2. MANAGER'S COMMENTS 7
1) PERFORMANCE Guinness Global Energy Fund 10
2) PORTFOLIO Guinness Global Energy Fund 11
3) OUTLOOK 14
3. APPENDIX Oil and gas markets historical context 23

1. JUNE IN REVIEW

i) Oil market

Figure 1: Oil price (WTI and Brent $/barrel) 18 months December 31 2017 to June 30 2019



Source: Bloomberg LP

The West Texas Intermediate (WTI) oil price started June at $53.5/bl, dipped to a low of around $51/bl in the middle of the month before moving higher to close at $58.5/bl. WTI has averaged $58/bl so far in 2019, having averaged $65/bl in 2018, $51/bl in 2017, $43/bl in 2016, $49/bl in 2015 and $93/bl in 2014.

Brent oil traded in a similar shape, opening at $62.9/bl, trading down to $61.2/bl before closing the month at $64.4/bl. Brent averaged $72/bl in 2018. The gap between the WTI and Brent benchmark oil prices narrowed sharply over the month, ending June at around $6/bl, versus over $9/bl at the end of May.

Factors which strengthened WTI and Brent oil prices in June:

- **Prospect of OPEC+ maintaining existing quotas**
  OPEC postponed their scheduled meeting from 25 June to 1 July, but it was widely anticipated that OPEC+ would roll over their existing production quotas, as has now been confirmed. OPEC have extended current quotas for a further nine months, whilst the 10 participating non-OPEC producers have signed a new Charter of Cooperation which formalises their involvement. Please see our managers' comments for additional comment on OPEC's actions.

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

- **Heightened tensions around Middle Eastern oil export routes**
  June saw an escalation of tensions around Middle Eastern oil export routes. On June 13, attacks were reported on two tankers in the Gulf of Oman, which were taking refined products to Asia. The attacks were followed on June 20 by the shooting down of a US drone aircraft by Iran, which prompted President Trump to promise intensified sanctions against Iran in response. 21m b/day of crude oil and refined product pass through the Strait of Hormuz/Gulf of Oman each day, of which around two-thirds ends being shipped to Asian markets.

- **Moderating US inventories**
  After a sharp rise in Inventories of crude oil and refined product during May, June saw a reversal, with inventories falling by 16m barrels versus the 5 year average. Total US inventories now sit close to the five year average, but remain around 150m barrels above the ten year average.

Factors which weakened WTI and Brent oil prices in June:

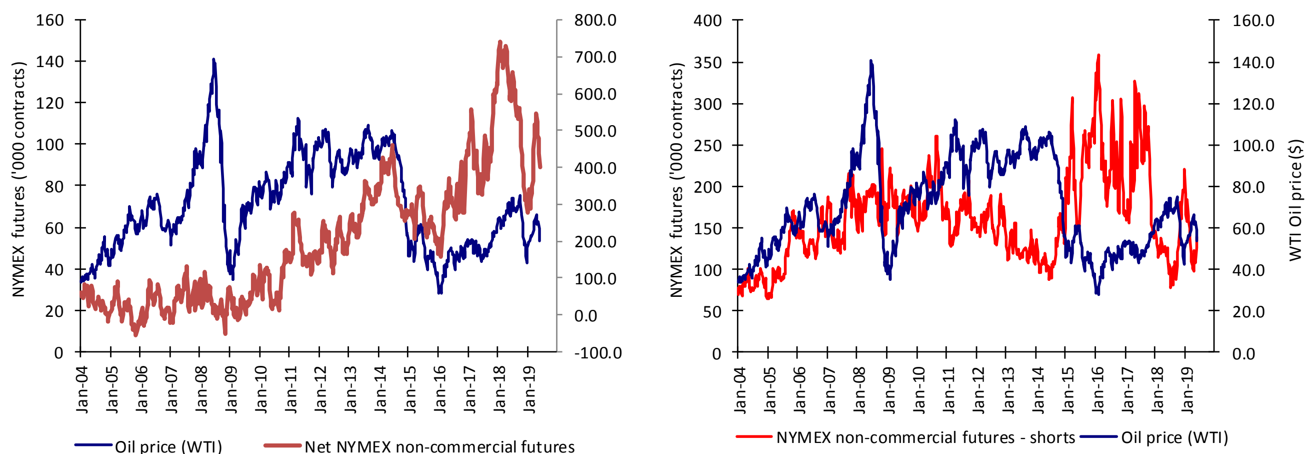
- **US supply growth strong in April**
  The latest EIA production data showed a 175,000 b/day oil production increase in April 2019 (latest data point), taking year-on-year growth up to 1.3m b/day. This was supplemented by 73,000 b/day growth in oil production in the US Gulf of Mexico. The US onshore drilling rig count fell by 7 rigs in June, taking the total decline in 2019 to 95 rigs (-11%). This increases expectations that US shale oil production growth will not accelerate later this year. There is typically a 5-6 month lag from rig count change to production change.

- **IEA outlook for non-OPEC supply in 2020**
  On June 14, the IEA published their outlook for non-OPEC supply in 2020, showing an increase of around 2m b/day versus their 2019 forecast. With demand expected to grow by 1.4m b/day, the IEA report highlighted the risk that OPEC+ may need to cut production further in 2020 to keep inventories at current levels.

Speculative and investment flows

The New York Mercantile Exchange (NYMEX) net non-commercial crude oil futures open position was 379,000 contracts long at the end of June versus 439,000 contracts long at the end of May. The net position peaked in February 2018 at 739,000 contracts long. Typically, there is a positive correlation between the movement in net position and movement in the oil price. The gross short position fell to 118,000 contracts at the end of June versus 125,000 at the end of May.

Figure 2: NYMEX Non-commercial net and short futures contracts: WTI January 2004 – June 2019



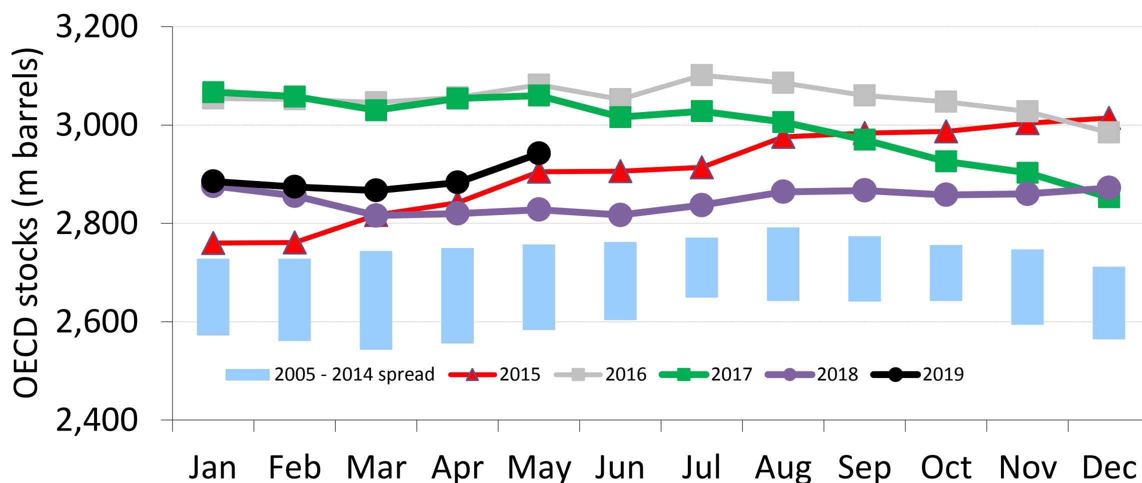
Source: Bloomberg LP/NYMEX/ICE (2019)

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

OECD stocks

OECD total product and crude inventories at the end of May (latest data point) were estimated by the IEA to be 2,942m barrels, up by 59m barrels versus the level reported for April. This compares to a 10-year average increase for May of 22m barrels, implying that the market was oversupplied in May by around 1m b/day. Inventories were broadly flat in 2018.

Figure 3: OECD total product and crude inventories, monthly, 2004 to 2019



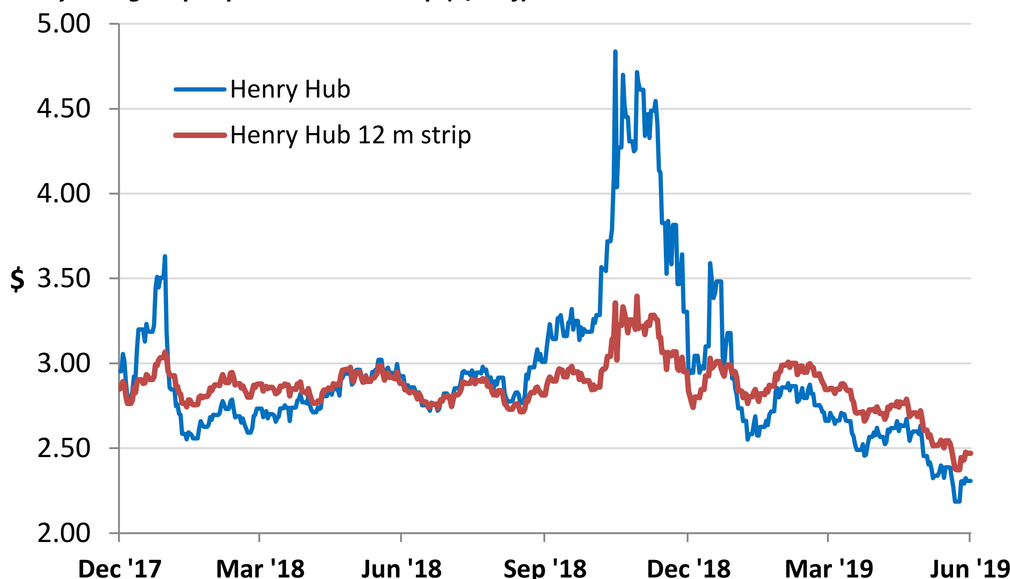
Source: IEA Oil Market Reports (June 2019 and older)

ii) Natural gas market

The US natural gas price (Henry Hub front month) opened June at $2.45/mcf (1,000 cubic feet), declined to a low of $2.19/mcf in the middle of the month, before rallying a little to close at $2.31/mcf. The spot gas price has averaged $2.70/mcf so far in 2019, which compares to an average gas price of $3.07 in 2018, $3.02 in 2017, $2.55/mcf in 2016 and $2.61/mcf in 2015.

The 12-month gas strip price (a simple average of settlement prices for the next 12 months' futures prices) declined over the month, opening at $2.67/mcf and closing at $2.47 /mcf. The strip price averaged $2.90 in 2018, $3.12 in 2017, $2.84 in 2016 and $2.86 in 2015.

Figure 4: Henry Hub gas spot price and 12m strip ($/Mcf) December 31 2018 to June 30 2019



Source: Bloomberg LP

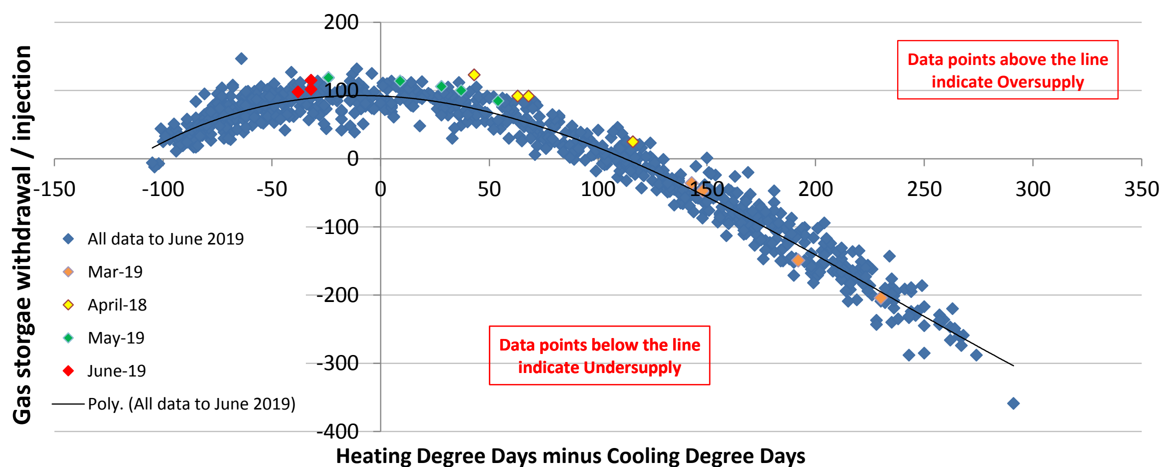
The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

Factors which weakened the US gas price in June included:

- **Strong US onshore natural gas production**
  Onshore US natural gas production averaged 97.4 Bcf/day in April 2019 (the latest available data point), up by 10.6 Bcf/day on the level reported twelve months earlier. Rising associated gas supply from shale oil, and a pickup of activity in the Marcellus basin, are the key reasons for the rise in production: both look set to continue for the rest of 2019.

- **Structurally oversupplied market**
  Adjusting for the impact of weather in May, the most recent movements of gas in storage suggest the market is, on average, operating at a surplus of around 2 Bcf/day (as indicated by the red dots on the graph below).

Figure 5: Weather adjusted US natural gas inventory injections and withdrawals



Source: Bloomberg LP; Guinness Asset Management

Factors which strengthened the US gas price in June included:

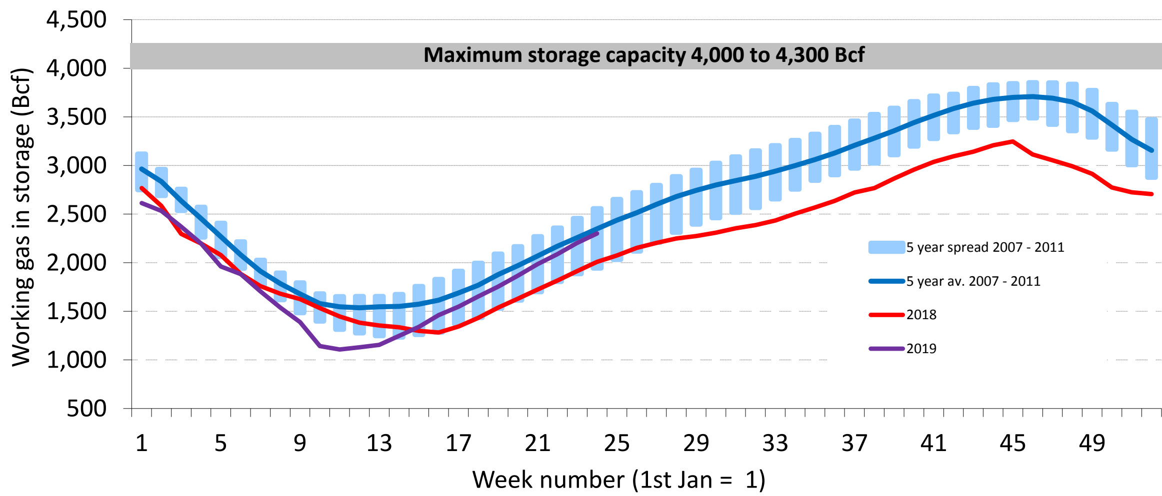
- **FID of additional liquefaction capacity at Sabine Pass**
  In early June, Cheniere Energy confirmed plans to build a sixth liquefaction train at its Sabine Pass LNG export terminal in Louisiana. The project is expected to cost around $2.5bn and will come into service in 2023. Cheniere also confirmed that they are likely to start expanding their Corpus Christi LNG export terminal in 2020.

Natural gas inventories

Swings in the balance for US natural gas should, in theory, show up in movements in gas storage data. Natural gas inventories at the end of June were reported by the EIA to be 2.3 Tcf. Current gas in storage is, below the 10 year average as a result of strong demand plus increasing volumes of gas exported via LNG. Whilst gas inventories today are low, the high visibility of low cost supply growth for 2019 is keeping a cap on prices.

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

Figure 6: Deviation from 5yr gas storage norm vs gas price 12-month strip (H. Hub $/Mcf)



Source: Bloomberg; EIA (July 2019)

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

2. MANAGER'S COMMENTS

OPEC concluded their latest formal meeting on July 1st with an agreement to maintain existing quotas for a further nine months. The meeting produced interesting commentary around Saudi's attitude to global oil inventories, and to the growth of US shale oil.

What has been announced?

At the conclusion of their meeting on July 1st 2019 in Vienna, OPEC's headline announcement was an agreement to maintain existing production quotas for a further nine months. In other words, the OPEC production cut of 0.8m b/day, that was agreed in December 2018, is extended until March 2020. There is an understanding that non-OPEC 'partners' will continue to keep 0.4m b/day from the market (shouldered mostly by Russia), also a continuation of the December 2018 agreement. There remain no individual country quotas were announced but, based on comments from OPEC, we assess the extended quotas as:

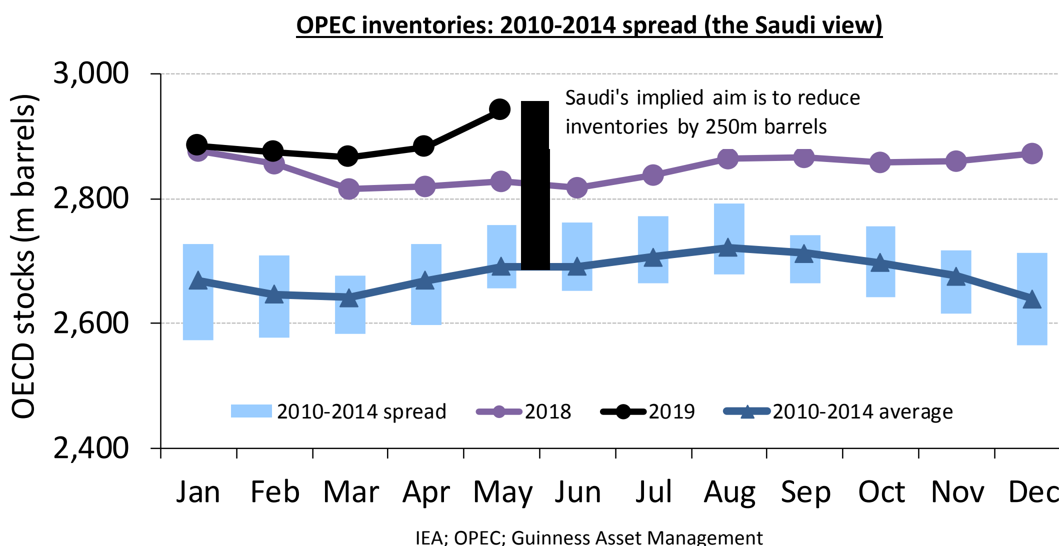
	May 2019 production	July 2019 quota	
(m b/day)	m b/day	m b/day	Actual vs quota m b/day
Saudi	9.70	**10.33**	-0.63
Iran	2.40	**3.34**	-0.94
Iraq	4.78	**4.51**	0.27
UAE	3.05	**3.11**	-0.06
Kuwait	2.71	**2.68**	0.03
Nigeria	1.69	**1.62**	0.07
Venezuela	0.81	**1.26**	-0.45
Angola	1.45	**1.46**	-0.01
Libya	1.16	**1.07**	0.09
Algeria	1.03	**1.04**	-0.01
Equatorial Guinea	0.10	**0.13**	-0.03
Congo	0.34	**0.31**	0.03
Gabon	0.20	**0.18**	0.02
Ecuador	0.53	**0.50**	0.03
OPEC-14	**29.95**	**31.54**	**-1.59**

Source: IEA; OPEC; Guinness Asset Management

Whilst it is evident that OPEC+ maintain the common goal of a stable oil market and reasonable prices, the commentary from OPEC+ members after the meeting illustrated the range of views on how stability might be achieved.

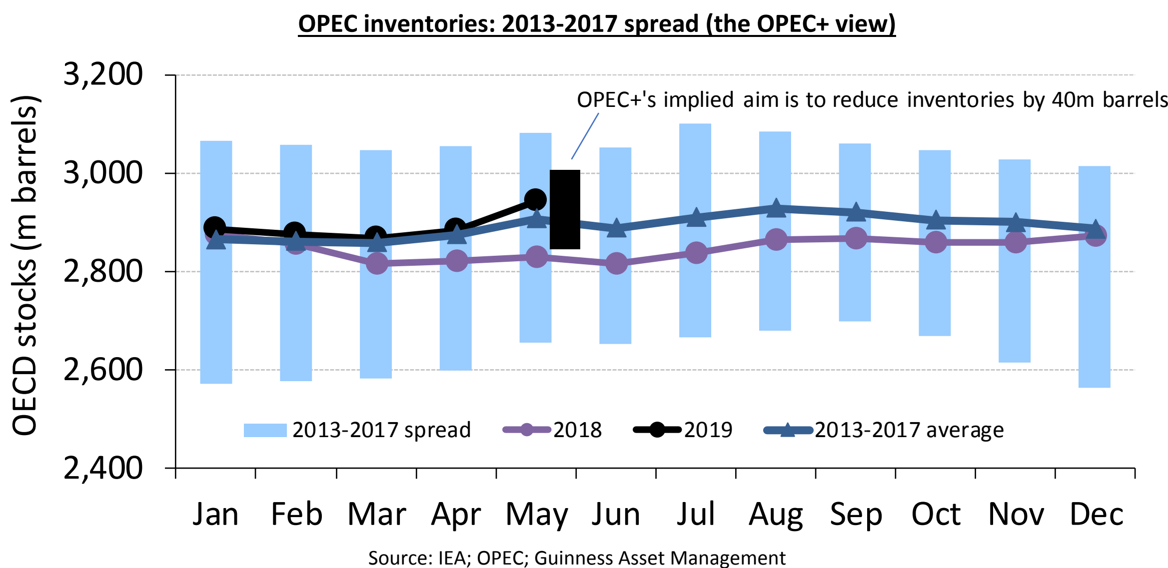
At the OPEC press conference after the meeting, Saudi oil minister Al-Falih indicated that Saudi would like a key goal of oil and product inventories being managed to 2010-2014 average inventory levels. This implies that May 2019 OECD inventories of 2.94bn barrels would need to be managed down by around 250m barrels, to the 2010-14 average of 2.69bn:

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.



Source: IEA; OPEC; Guinness Asset Management

On the other hand, it became clear that the wider OPEC+ consensus is to try to bring inventories in line with the five year average (2013-17) of 2.9bn barrels, which implies a decline of around 40m barrels from the current level. The logic of this softer position is that the growth in demand over the past few years creates room for a higher baseline for inventories (i.e. a days of demand cover being the more relevant metric):



Source: IEA; OPEC; Guinness Asset Management

OPEC are currently producing around 1.6m b/day less than their official quota of 31.5m b/day. Adjusting for the production outages in Iran (sanctions on exports) and Venezuela (underinvestment and sanctions), the rest of OPEC is producing in-line with their overall production quota. Whilst collective compliance from OPEC was strong in the first half of the year, it did rely on Saudi cutting production beyond their implied quota. Reference was made to Iraq (producing nearly 0.3m b/day over quota) as a country which will be under greater pressure to comply in the second half of 2019.

It was interesting to note Al-Falih’s stance after the meeting towards US shale oil. In 2014, OPEC took a specific ‘market share’ approach towards shale and other non-OPEC supply. In this meeting, however, there was effectively an acknowledgement that OPEC were trying to stabilise price at a reasonable level, making space for shale oil to grow until it peaked. Al Falih stated: "*until [US shale supply peaks], it is prudent for those of us who*

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

have a lot at stake ... to keep adjusting to it .... It increases the reasoning for us to stay vigilant, watchful and adjust slightly here - up and down as necessary to keep markets balanced".

The message from OPEC, and in particular from Saudi over the last 12 months, has been a desire to normalise global oil inventories, and stabilise 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. Monday's action is the latest milestone in OPEC's efforts to achieve a price around this level.

Looking beyond this year, the challenge OPEC faces comes in the form of non-OPEC supply, which is forecast (IEA) to grow in 2020 by a further 2m b/day, versus demand growth of 1.4m b/day. We believe OPEC has an expectation that the underinvestment in non-OPEC (ex US) regions since 2014, coupled with the 'decline curve' challenges of US shale, create significant challenges for non-OPEC supply to continue to grow in this fashion. But until that supply slowdown comes, tensions within the OPEC+ group are likely to remain.

Within the OPEC group, we continue to think that Saudi are managing the oil price in a rational fashion: trying to support the price as high as possible, whilst avoiding pushing it too far over-stimulate non-OPEC supply (in particular US shale production). The volatility in the spot price can give the impression that the game is more random than it really is. For all the price swings over the last 18 months, we expect Brent oil to average somewhere in the $60-70/bl range over 2018 & 2019, in -line with Saudi's plan. It is longer term oil price averages, and ultimately actual revenue from oil sales, that Saudi are interested in.

Overall, we believe that Saudi's long-term objective remains to maintain a 'good' oil price, a little higher than the current oil futures curve is indicating, and July 1st's action was another step on that journey.

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

1) PERFORMANCE Guinness Global Energy Fund

The main index of oil and gas equities, the MSCI World Energy Index (net return), was up by 7.0% in June, while the MSCI World Index (net return) rose by 6.6%. The Fund was up by 6.1% (class E) in the month, underperforming the MSCI World Energy index by 0.9% (all in US dollar terms).

Within the Fund, May's strongest performers were SunPower Corp, Reabold Resources PLC , Helix Energy Solutions Group Inc, Valero Energy Corp and Schlumberger Ltd while the weakest performers were Cliff Natural Resources PLC, JKX Oil & Gas PLC, Diversified Gas & Oil Company, Unit Corp and Encana Corp.

Performance (in USD) 30/06/2019

Annualised

% returns	1 year	3 years	5 years	10 years	1999 to date
Guinness Global Energy	-18.5	-0.7	-11.1	0.6	8.9
MSCI World Energy Index	-11.1	2.7	-5.5	3.2	5.9

Calendar year

% returns	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008	2007
Guinness Global Energy	12.0	-19.7	-1.3	27.9	-27.6	-19.1	24.4	3.0	-13.6	15.3	61.8	-48.2	37.6
MSCI World Energy Index	12.7	-15.8	5.0	26.6	-22.8	-11.6	18.1	1.9	0.2	11.9	26.2	-38.1	29.8

Source: Guinness Asset Management and Financial Express, bid to bid, gross income reinvested, in US dollars

Calculation by Guinness Asset Management Limited, simulated past performance prior to 31.3.08, launch date of Guinness Global Energy Fund. The Guinness Global Energy investment team has been running global energy funds in accordance with the same methodology continuously since November 1998. These returns are calculated using a composite of the Investec GSF Global Energy Fund class A to 29.2.08 (managed by the Guinness team until this date); the Guinness Atkinson Global Energy Fund (sister US mutual fund) from 1.3.08 to 31.3.08 (launch date of this Fund), the Guinness Global Energy Fund class A (1.49% OCF) from launch to 02.09.08, and class E (1.24% OCF) thereafter. Performance would be lower if an initial charge and/or redemption fee were included.

Past performance should not be taken as an indicator of future performance. The value of this investment and any income arising from it can fall as well as rise as a result of market and currency fluctuations as well as other factors. You may lose money in this investment.

Returns stated above are in US dollars; returns in other currencies may be higher or lower as a result of currency fluctuations. Investors may be subject to tax on distributions.

The Fund's Prospectus gives a full explanation of the characteristics of the Fund and is available at www.guinnessfunds.com.

2) PORTFOLIO Guinness Global Energy Fund

Buys/Sells

In June, there were no stock switches made. The portfolio was actively rebalanced during the month.

Sector Breakdown

The following table shows the asset allocation of the Fund at **June 30 2019**.

(%)	31 Dec 2011	31 Dec 2012	31 Dec 2013	31 Dec 2014	31 Dec 2015	31 Dec 2016	31 Dec 2017	31 Dec 2018	30 June 2019
Oil & Gas	***97.9***	***97.3***	***93.7***	***93.7***	***95.1***	***96.7***	***98.4***	***99.7***	***98.3***
Integrated	30.9	30.4	29.2	27.0	30.4	32.5	28.6	27.2	28.3
Integrated – Can & Em Mkts	8.8	8.4	9.4	10.3	11.1	14.3	14.2	15.3	15.7
Exploration & production	41.1	40.3	35.4	36.2	36.5	35.4	37.0	39.0	36.0
Oil & Gas Storage & Transportation	0.0	0.0	0.0	0.0	0.0	0.0	3.5	3.9	3.7
Drilling	5.9	7.1	6.4	3.3	1.5	2.2	1.9	1.4	1.1
Equipment & services	6.1	7.4	9.8	13.4	11.4	8.6	9.5	8.8	9.2
Refining and marketing	5.1	3.7	3.5	3.5	4.2	3.7	3.7	4.1	4.3
Solar	**1.3**	**1.2**	**2.6**	**3.7**	**4.7**	**0.9**	**1.4**	**0.4**	**0.7**
Coal & consumables	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Construction & engineering	**0.4**	**0.6**	**1.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Cash	**0.4**	**0.9**	**2.7**	**2.6**	**0.2**	**2.4**	**0.2**	**-0.1**	**1.0**
Total	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**

Source: Guinness Asset Management
Basis: Global Industry Classification Standard (GICS)

The Fund at June 30 2019 was on a price to earnings ratio (P/E) for 2019 of 12.2x versus the S&P 500 Index at 17.9x as set out in the following table:

	2012	2013	2014	2015	2016	2017	2018	2019
Guinness Global Energy Fund P/E	7.1	7.6	7.9	20.5	39.5	21.8	12.1	12.2
S&P 500 P/E	30.4	27.4	24.5	29.3	27.8	23.6	19.4	17.9
Premium (+) / Discount (-)	*-77%*	*-72%*	*-68%*	*-30%*	*42%*	*-8%*	*-38%*	*-32%*
Average oil price (WTI $/bbl)	94	98	93	49	43	51	66	

Source: Standard and Poor's; Guinness Asset Management Ltd

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

Portfolio holdings

Our integrated and similar stock exposure (c.48%) is comprised of a mix of mid cap, mid/large cap and large cap stocks. Our four large caps are Chevron, BP, Royal Dutch Shell and Total. Mid/large and mid-caps are ENI, Equinor and OMV. At June 30 2019 the median P/E ratios of this group were 11.6x/11.6x 2018/2019 earnings. We also have two Canadian integrated holdings, Suncor and Imperial Oil. Both companies have significant exposure to oil sands in addition to downstream assets.

Our exploration and production holdings (c.36%) give us exposure most directly to rising oil and natural gas prices. We include in this category non-integrated oil sands companies, as this is the GICS approach. The stock here with oil sands exposure is Canadian Natural Resources. The pure E&P stocks have a bias towards the US (EnCana, Devon and Oasis), with five other names (Apache, Occidental, ConocoPhillips, Noble Energy, Anadarko) having a mix of US and international production and one (Tullow) which is African focused. One of the key metrics behind a number of the E&P stocks held is low enterprise value / proven reserves. Almost all of the US E&P stocks held also provide exposure to North American natural gas.

We have exposure to four (pure) emerging market stocks in the main portfolio, though one is a half-position, and in total represent 12% of the portfolio. Two are classified as integrateds (Gazprom and PetroChina) and two as E&P companies (CNOOC and SOCO International). Gazprom is the Russian national oil and gas company which produces approximately a quarter of the European Union gas demand and trades on 3.9x 2019 earnings. PetroChina is one of the world's largest integrated oil and gas companies and has significant growth potential and, alongside CNOOC, enjoys advantages as a Chinese national champion. SOCO International is an E&P company with production in Vietnam.

The portfolio contains one midstream holding, Enbridge, North America's largest pipeline company. With the growth of onshore oil and gas production expected in the US and Canada over the next five years, we believe Enbridge is well placed to execute its pipeline expansion plans.

We have useful exposure to oil service stocks, which comprise around 10% of the portfolio. The stocks we own are split between those which focus their activities in North America (land driller Unit Corp) and those which operate in the US and internationally (Helix, Halliburton and Schlumberger).

Our independent refining exposure is currently in the US in Valero, the largest of the US refiners. Valero has a reasonably large presence on the US Gulf Coast and is benefitting from the rise in US exports of refined products seen in recent times.

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

Portfolio at June 30 2019 (for compliance reasons disclosed one month in arrears)

Guinness Global Energy Fund 31 May 2019														
Stock	Curr.	Country	% of NAV	2009 B'berg mean PER	2010 B'berg mean PER	2011 B'berg mean PER	2012 B'berg mean PER	2013 B'berg mean PER	2014 B'berg mean PER	2015 B'berg mean PER	2016 B'berg mean PER	2017 B'berg mean PER	2018 B'berg mean PER	2019 B'berg mean PER
Integrated Oil & Gas														
Chevron	USD	US	4.15	24.2	13.3	9.2	10.1	11.2	12.9	34.2	89.6	30.0	15.4	16.3
Royal Dutch Shell PLC	EUR	NL	4.34	15.4	10.9	8.1	8.0	10.6	9.3	19.8	32.5	17.6	13.0	12.1
BP PLC	GBP	GB	3.90	8.8	6.1	6.1	7.6	9.4	11.1	19.6	37.6	22.4	11.6	12.4
Total SA	EUR	FR	3.85	13.0	10.2	9.1	8.7	9.7	9.8	12.6	14.9	13.9	10.5	10.0
ENI SpA	EUR	IT	3.83	9.5	7.2	6.9	6.8	10.8	12.6	58.8	nm	23.7	11.2	10.8
Equinor ASA	NOK	NO	3.87	11.2	8.4	7.3	6.5	8.0	11.1	27.2	137.8	14.4	9.6	10.4
OMV AG	EUR	AT	3.82	16.9	10.5	13.2	9.2	11.3	13.9	12.5	12.7	8.6	8.8	8.0
			27.76											
Integrated / Oil & Gas E&P - Canada														
Suncor Energy Inc	CAD	CA	3.84	39.4	26.3	11.7	13.0	13.0	13.0	37.0	nm	22.3	14.9	12.6
Canadian Natural Resources Ltd	CAD	CA	4.01	15.2	15.0	15.8	23.0	16.3	10.6	262.7	nm	31.1	13.0	10.8
Imperial Oil	CAD	CA	3.84	18.2	15.8	9.8	8.7	11.3	9.5	20.3	60.0	28.2	13.2	13.6
			11.70											
Integrated Oil & Gas - Emerging market														
PetroChina Co Ltd	HKD	HK	3.86	6.5	5.2	5.2	5.9	6.6	6.5	20.2	79.0	30.7	12.5	11.7
Gazprom OAO	USD	RU	4.14	7.7	6.0	4.1	4.3	3.9	6.6	4.0	5.8	6.5	3.5	3.6
			8.00											
Oil & Gas E&P														
Occidental Petroleum Corp	USD	US	3.69	13.4	8.8	6.0	7.2	7.2	8.6	299.8	nm	55.4	10.1	12.7
ConocoPhillips	USD	US	3.90	16.3	9.9	6.9	10.3	10.5	11.1	nm	nm	94.6	13.3	13.2
Anadarko Petroleum Corp	USD	US	3.11	nm	40.6	22.3	21.0	16.9	15.4	nm	nm	nm	28.3	29.2
Apache Corp	USD	US	3.00	4.7	2.8	nm	2.7	3.2	4.7	nm	nm	245.9	15.6	24.8
Devon Energy Corp	USD	US	2.98	7.7	4.2	4.2	7.8	5.9	4.9	10.2	nm	13.7	16.7	15.1
Noble Energy Inc	USD	US	3.14	12.6	10.3	8.1	9.4	6.9	9.2	375.4	nm	1337.5	22.2	690.3
EnCana Corp	USD	US	2.82	1.3	4.3	7.1	3.1	4.1	2.6	nm	220.4	9.6	5.9	5.3
Oasis Petroleum Inc	USD	US	1.78	nm	31.0	6.3	3.5	1.9	2.1	6.5	nm	nm	18.4	26.1
			24.43											
International E&Ps														
CNOOC Ltd	HKD	HK	3.92	16.7	9.6	7.3	7.8	7.9	9.5	28.4	nm	16.4	9.2	9.1
Tullow Oil PLC	GBP	GB	1.68	39.2	19.0	4.3	3.9	29.3	nm	nm	nm	13.3	22.9	10.1
Soco International PLC	GBP	GB	0.53	4.9	6.8	4.4	1.2	1.3	2.0	nm	nm	nm	25.5	19.1
			6.13											
Midstream														
Enbridge Inc	USD	CA	3.28	45.0	38.9	35.0	32.3	29.7	27.3	24.6	22.8	27.7	20.1	20.4
			3.28											
Drilling														
Unit Corp	USD	US	1.27	3.7	3.2	2.4	2.3	2.6	2.3	nm	nm	18.1	9.7	12.7
			1.27											
Equipment & Services														
Halliburton Co	USD	US	3.31	16.3	10.6	6.4	7.2	6.9	5.4	14.4	nm	18.3	11.5	15.6
Helix Energy Solutions Group Inc	USD	US	1.67	11.7	12.8	4.5	3.6	6.3	3.5	40.0	nm	nm	30.7	23.0
Schlumberger Ltd	USD	US	3.35	12.8	12.6	9.6	8.3	7.3	6.3	10.4	30.0	23.7	21.3	22.4
			8.33											
Solar														
Sunpower Corp	USD	US	0.54	6.5	5.2	91.0	49.7	5.3	5.7	3.8	nm	nm	nm	nm
			0.54											
Oil & Gas Refining & Marketing														
Valero Energy Corp	USD	US	3.66	nm	44.4	17.7	14.4	17.2	11.6	8.0	19.2	14.4	11.4	10.7
			3.66											
Research Portfolio														
Cluff Natural Resources PLC	GBP	GB	0.28	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm
EnQuest PLC	GBP	GB	0.60	nm	3.3	3.9	1.2	1.3	2.4	23.1	1.5	nm	5.1	2.6
JKX Oil & Gas PLC	GBP	GB	0.14	1.3	1.4	1.7	2.3	4.4	12.1	nm	nm	nm	30.2	20.2
Diversified Gas & Oil PLC	GBP	GB	0.55	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm
Reabold Resources PLC	GBP	GB	0.39	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm	nm
Shandong Molong Petroleum Machiner	HKD	HK	0.06	6.9	2.7	3.7	nm	nm	nm	nm	nm	nm	nm	nm
			2.02											
		Cash	2.89											
		Total	100											
		PER		10.6	8.9	7.9	6.9	7.4	7.7	19.8	37.9	21.0	11.7	11.7
		Med. PER		12.6	9.9	7.0	7.7	7.6	9.3	20.2	31.3	22.3	13.0	12.7

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.

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

3) OUTLOOK

i) Oil market

The table below illustrates the difference between the growth in world oil demand and non-OPEC supply since 2015:

	2015	2016	2017	2018	2019E	2020E
					IEA	*IEA*
World Demand	***95.3***	***96.4***	***98.0***	***99.2***	***100.3***	***101.7***
Non-OPEC supply (inc NGLs)	*59.8*	*59.1*	*59.9*	*62.7*	*64.6*	*66.8*
OPEC NGLs	*5.2*	*5.4*	*5.5*	*5.5*	*5.6*	*5.6*
Non-OPEC supply plus OPEC NGLs	**65.0**	**64.5**	**65.4**	**68.2**	**70.2**	**72.4**
Call on OPEC (crude oil)	**30.3**	**31.9**	**32.6**	**31.0**	**30.1**	**29.3**
Congo supply adjustment	0.3	0.3	0.3	0.3	0.3	0.3
Gabon supply adjustment	0.2	0.2	0.2	0.2	0.2	0.2
Eq Guinea supply adjustment	0.1	0.1	0.1	0.1	0.1	0.1
Call on OPEC-11 (crude oil)	**29.7**	**31.3**	**32.0**	**30.4**	**29.5**	**28.7**

Source: 2006 - 2014: IEA oil market reports; 2015 - 19: June 2019 Oil market Report
OPEC-11 = Algeria; Angola; Ecuador; Iran; Iraq; Kuwait; Libya; Nigeria; Saudi Arabia; UAE; Venezuela

Global oil demand in 2018 was 12.1m b/day higher than the pre-financial crisis (2007) peak. This means the combined effect of the 2007/08 oil price spike and the 2008/09 recession was shrugged off remarkably quickly, thanks to growth in demand from emerging markets. The IEA forecast a further rise of 1.1m b/day in 2019, which would take oil demand to an all-time high of 100.3m b/day.

OPEC

The last five years have proved a testing time for OPEC. They have tried to keep prices strong enough that OPEC economies are not running excessive deficits, whilst not pushing the price too high and over-stimulating non-OPEC supply.

The effect of $100+ bbl oil, enjoyed for most of the 2011-2014 period, emerged in 2014 in the form of an acceleration in US shale oil production and an acceleration in the number of large non-OPEC (ex US onshore) projects reaching production. OPEC met in late 2014 and responded to rising non-OPEC supply with a significant change in strategy to one that prioritised market share over price. Post the November 2014 meeting, OPEC not only maintained their quota but also raised production significantly, up over 18 months by 2.5m b/day. This contributed to an oversupplied market in 2015 and 2016.

In November 2016, faced with sharply lower oil prices, OPEC stepped back from their market share stance, announcing plans for the first production cut since 2008, opting for a new production limit of 32.5m b/day. The announcement represented a cut of 1.2m b/day. There was also an understanding that non-OPEC, including Russia, would cut production by 0.6m b/day, taking the total reduction to 1.8m b/day. Compliance with the cuts was very strong and, after been delayed initially by a variety of temporary factors, inventories started to decline from mid 2017. Having originally been excluded from the cuts, Libya and Nigeria were subsequently included in the quota system.

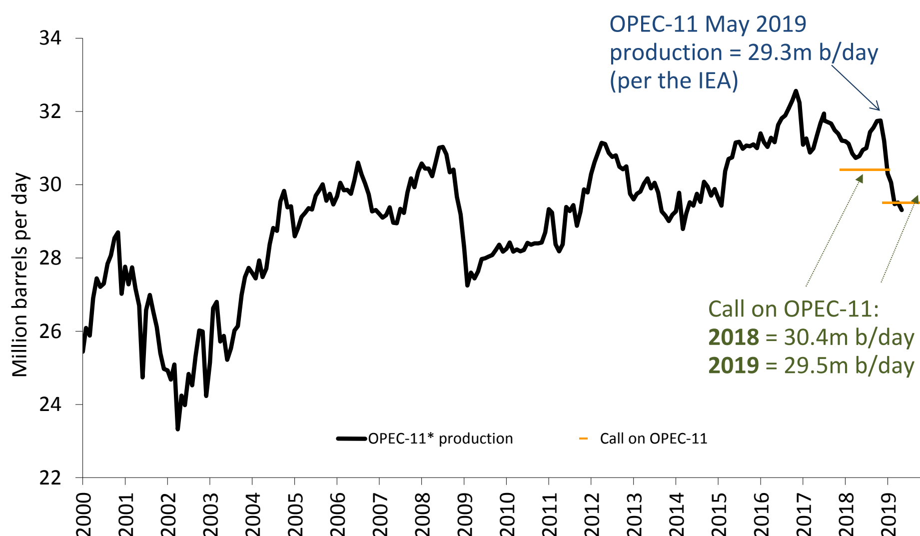
The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

('000 b/day)	30-Nov-14	31-Dec-16	30-Jun-19	Current vs Nov 2014 (OPEC hold mkt share)	Current vs Dec 2016 (OPEC cut production)
Saudi	9,650	10,480	**9,730**	80	-750
Iran	2,780	3,730	**2,280**	-500	-1,450
Iraq	3,370	4,630	**4,750**	1,380	120
UAE	2,800	3,070	**3,060**	260	-10
Kuwait	2,790	2,860	**2,730**	-60	-130
Nigeria	1,970	1,500	**1,890**	-80	390
Venezuela	2,350	2,080	**770**	-1,580	-1,310
Angola	1,640	1,670	**1,440**	-200	-230
Libya	580	630	**1,150**	570	520
Algeria	1,100	1,110	**1,010**	-90	-100
Ecuador	561	550	**530**	-31	-20
OPEC-11	**29,591**	**32,310**	**29,340**	**-251**	**-2,970**

Source: Bloomberg; Guinness Asset Management

The last eighteen months has continued to be a volatile time for OPEC. For the first half of 2018, a steep production decline from Venezuela and the promise of lower Iranian exports lead other OPEC members to raise supply, designed to prevent oil prices spiking too high. Towards the end of the year, it became apparent that OPEC had over-compensated and risked oversupplying the market in 2019. In December 2018, OPEC met in Vienna and, together with non-OPEC, announced a proposed cut of 1.2m b/day starting in January 2019 and lasting for an initial period of six months. It was proposed that OPEC (excluding Libya, Venezuela and Iran) cut total production by 0.8m b/day while non-OPEC (led predominantly by Russia) cut a total of 0.4m b/day. In July 2019, the existing quota cuts were extended to March 2020.

Figure 7: OPEC-12 apparent production vs call on OPEC 2000 – 2019



Source: IEA Oil Market Report (June 2019 and prior); Guinness estimates

OPEC's actions in recent years demonstrate a commitment to delivering a reasonable oil price to satisfy their own economies but also to incentivise investment in long term projects. Saudi's actions at the head of OPEC appear designed to achieve an oil price that to some extent closes their fiscal deficit ($75-80/bl is needed to close the gap fully), whilst not spiking the oil price too high and over-stimulating non-OPEC supply. Longer term, we believe that Saudi seek a 'good' oil price, in excess of current levels to balance their fiscal needs, but they realise that patience is required to achieve that goal.

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

Overall, we reiterate two important criteria for Saudi:

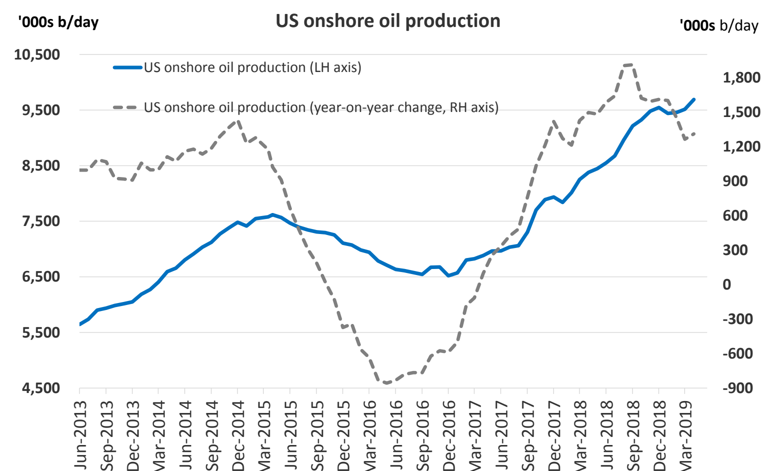
1. Saudi is interested in the average price of oil that they get, they have a longer investment horizon than most other market participants
2. Saudi wants to maintain a balance between global oil supply and demand to maintain a price that is acceptable to both producers and consumers

Nothing in the market in recent years has changed our view that OPEC can put a floor under the price – as they did in 2016, 2008, 2006, 2001, 1998 – and again in late 2018. Recent meetings and decisions indicate that OPEC have the resolve to continue in this manner.

Supply looking forward

The non-OPEC world has, since the 2008 financial crisis, grown its production more meaningfully than in the seven years before 2008. The growth was 0.9% p.a. from 2001-2008, increasing to 1.7% p.a. from 2008-2018.

Growth in the non-OPEC region since the start of the decade has been dominated by the successful development of shale oil and oil sands in North America (up around 7m b/day between since 2010), implying that the rest of non-OPEC region has barely grown over this period, despite the sustained high oil price until mid 2014.



The growth in US shale oil production, in particular from the Permian basin, raises the question of how much more there is to come and at what price. New oil production from these sources peaked in April 2015 at around 4m b/day, then declined by around 1.1m b/day, but is now well above the previous peak. Our assessment is that US shale oil is a capital intensive source of oil but one where real growth is viable, on average, at around $50 oil prices. In particular, there appears to be ample inventory in the Permian basin to allow growth well into the 2020s. In total, it could be comparable in size to the North Sea, i.e. it could grow by around a further 4m b/day over the next five years, but only if the price is sufficiently high to incentivise growth. The rate of development is heavily dependent on the cashflow available to producing companies, which tends to be recycled immediately into new wells, and the underlying cost of services to drill and fracture the wells. Naturally, cashflows available for reinvestment in a $50-60/bl world are far lower than in a $100/bl world, but with efficiency improvements, enough to see growth sustaining.

Offsetting US onshore shale oil growth, we expect to see non-OPEC supply growth outside the US slow, as the queue of large conventional project start-ups slows. Since 2014, the number of project start-ups in this region has been sustained at a high level, despite lower oil prices, since projects that were sanctioned before the 2014 (when oil was $100/bl+) have continued to come onstream. We believe 2020 marks a point, however, when the cancellation of projects that should have been sanctioned in 2015/16 starts to bite. A lack of supply response in the non-OPEC ex US region will increase the 'call' on US shale to balance the market.

Looking longer term, other opportunities to exploit unconventional oil likely exist internationally using techniques established in the US, notably in Argentina (Vaca Muerta), Russia (Bazhenov), China (Tarim and

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

Sichuan) and Australia (Cooper). However, the US is far better understood geologically; the infrastructure in the US is already in place; service capacity in the US is high; and the interests of the landowner are aligned in the US with the E&P company. In most of the rest of the world, the reverse of each of these points is true, and as a result we see international shale being 10+ years behind North America.

Demand looking forward

The IEA estimate that 2019 oil demand growth will be 1.1m b/day, taking demand to over 100m b/day. Generally speaking, we have seen demand forecasts revised consistently higher since 2014, with the positive effect of lower oil prices continuing to surprise.

The IEA's global demand estimate for 2019 comprises an increase in non-OECD demand of 1.0m b/day and OECD demand growth of 0.1m b/day. The components of this non-OECD demand growth can be summarised as follows:

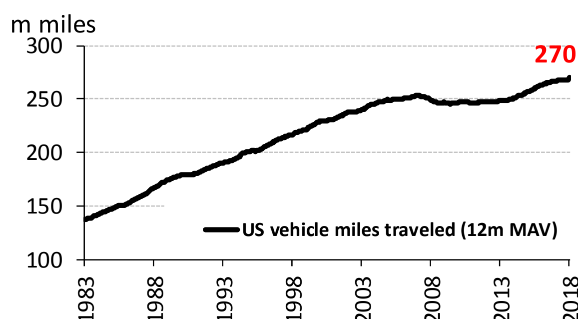
Figure 8: Non-OECD oil demand

m b/day	Demand								Growth							
	2013	2014	2015	2016	2017	2018	2019e	2020e	2013	2014	2015	2016	2017	2018	2019e	2020e
Asia	22.1	22.8	24.1	25.0	26.0	26.8	27.7	28.3	0.7	0.7	1.3	0.9	1.0	0.8	0.9	0.6
Middle East	7.9	8.4	8.5	8.5	8.5	8.4	8.5	8.5	0.1	0.5	0.1	0.0	0.0	-0.1	0.1	0.1
Latin America	6.7	6.8	6.7	6.4	6.5	6.4	6.4	6.4	0.3	0.1	-0.1	-0.3	0.1	-0.1	0.0	0.0
FSU	4.7	4.66	4.6	4.5	4.5	4.7	4.8	4.9	0.1	0.0	-0.1	0.0	0.0	0.2	0.1	0.1
Africa	3.9	3.8	4.2	4.3	4.3	4.3	4.4	4.4	0.1	-0.1	0.4	0.1	0.0	0.0	0.1	0.0
Europe	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total	**46.0**	**47.2**	**48.7**	**49.5**	**50.5**	**51.4**	**52.5**	**53.4**	**1.3**	**1.2**	**1.6**	**0.7**	**1.1**	**0.9**	**1.1**	**0.8**

Source: IEA Oil Market Report (June 2019)

Asia has settled down into a steady pattern of growth since 2010, and accounts for much of expected growth in 2018. Historically, China has been the most important component of this growth and continues to be a major component, although signs are emerging that India will also grow rapidly.

OECD demand in 2019 is forecast to be up by 0.1m b/day. In the US, the sharp fall in gasoline prices since 2014 has stimulated a reversal in improving fuel efficiency, as drivers switch back to purchasing larger vehicles, and a rise in total vehicle miles travelled, as shown in the chart opposite. Total vehicle miles travelled had stalled between 2007 and 2014, after two decades of growth, and are now growing again at a rate of around 1% per year.



The trajectory of global oil demand over the next few years will be a function of global GDP, pace of the 'consumerisation' of developing economies, the development of alternative fuels and price. At a $60/bl oil price, the world oil bill as a percentage of GDP is around 2.5% and this will still be a stimulant of multi-year demand growth. If oil prices move to a higher range (say around $75/bbl, representing 3%+ of GDP), we probably return to the pattern established over the past 5 years, with a flatter picture in the OECD more than offset by strong growth in the non-OECD area. Flatter OECD demand reflects improving oil efficiency over time, dampened by economic, population and vehicle growth. Within the non-OECD, population growth and rising oil use per capita will both play a significant part.

We keep a close eye on developments in the 'new energy' vehicle fleet (electric vehicles; hybrids etc), but see nothing that makes a significant dent on the consumption of gasoline and diesel in the next few years. Sales of electric vehicles (pure electric and plug-in hybrid electrics) globally were around 1.8m in 2018, up from 1.2m in

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

2017. We expect to see EV sales accelerate in 2019 to around 2.5m, or 3% of total global sales. Even applying an aggressive growth rate to EV sales, we see EVs comprising only around 0.7% of the global car fleet in 2020. Looking further ahead, we expect the penetration of EVs to accelerate, causing global gasoline demand to peak at some point in the second half of the 2020s. However, owing to the weight of oil demand that comes from sources other than passenger vehicles (around 70%), which we expect to continue growing linked to GDP, we expect total oil demand not to peak until the mid 2030s.

Conclusions about oil

The table below summarises our view by showing our oil price forecasts for WTI and Brent in 2019 against their historic levels, and rises/falls in percentage terms that we have seen in the period from 2002 to 2018.

Figure 9: Average WTI & Brent yearly prices, and changes

Oil price (inflation adjusted)																			*Est*
12 month MAV	1986-2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
WTI	30	33	38	49	66	75	82	104	68	84	99	94	98	93	49	45	51	65	58
Brent	30	32	35	46	64	75	82	103	67	84	115	112	108	99	52	45	54	72	60
Brent/WTI (12m MAV)	**30**	**33**	**37**	**48**	**65**	**75**	**82**	**104**	**68**	**84**	**107**	**103**	**103**	**96**	**51**	**45**	**53**	**68**	**59**
Brent/WTI y-on-y change (%)		8%	12%	30%	37%	15%	9%	26%	-35%	24%	27%	-4%	0%	-7%	-47%	-11%	17%	30%	-14%
Brent/WTI (5yr MAV)	30	25	32	37	42	51	61	75	79	82	89	93	93	99	92	80	69	63	55

We expect Brent oil to trade in a $60-70/bl range in the near term, supported at the lower end by OPEC. If this price range persists, we expect North American unconventional supply to sustain growth. We believe that the 'call' on unconventional supply, however, is likely to grow over the next few years as conventional non-OPEC supply declines.

The world oil bill at around $70/bl represents 3.0% of 2018 Global GDP, 12% under the average of the 1970 – 2015 period (3.4%). A return to oil representing 3.4% of GDP implies an oil price of around $80/bl.

We believe that Saudi's long-term objective remains to maintain a 'good' oil price, something around $70/bl.

Natural gas market

US gas demand

On the demand side for the US, industrial gas demand and power generation gas demand, each about a quarter of total US gas demand, are key. Commercial and residential demand, which make up a further quarter, have been fairly constant on average over the last decade – although yearly fluctuations due to the coldness of winter weather can be marked.

Industrial demand (of which around 35% comes from petrochemicals) tends to trend up and down depending on the strength of the economy, the level of the US dollar and the differential between US and international gas prices. Electricity gas demand (i.e. power generation) is affected by weather, in particular warm summers which drive demand for air conditioning, but the underlying trend depends on GDP growth and the proportion of incremental new power generation each year that goes to natural gas versus the alternatives of coal, nuclear and renewables. Gas has been taking market share in this sector: in 2018, 33% of electricity generation was powered by gas, up from 22% in 2007. The big loser here is coal which has consistently given up market share over the past 10 years.

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

Bcf/day	2007	2008	*2009*	2010	2011	2012	2013	2014	2015	2016	2017	2018	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**

Source: EIA; Simmons; Guinness estimates

Total gas demand in 2018 (including Canadian, Mexican and LNG exports) was around 90.6 Bcf/day, up by 7.5 Bcf/day (9.0%) versus 2017 and 10.8 Bcf/day (13.5%) higher than the 5 year average. The biggest contributors to the growth in demand in 2018 were be 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 LNGS exports (opening of new export terminals).

We expect US demand in 2019, assuming prices remain around $2.50/mcf, to exhibit further strong growth of around 4 Bcf/day. Normalised weather would keep a cap on power generation demand, but there should be a surge in LNG exports (c.3 Bcf/day), as a wave of new export terminals come into service. The table below shows the scheduled start-up of terminals, with 4.3 Bcf/day of capacity coming in 2019.

Terminal	Location	2015	2016	2017	2018E	2019E	2020E
Cameron 1-2	LA					1.4	
Cameron 3	LA						0.7
Corpus Christi 1-2	TX					1.3	
Cove Point 1	MD				0.8		
Elba Island 1-6	GA				0.2		
Elba Island 7-10	GA					0.2	
Sabine Pass 1-2	LA						
Sabine Pass 3-4	LA	0.1	1.0	1.3			
Sabine Pass 5	LA					0.7	
Freeport 1	TX					0.7	
Freeport 2-3	TX						1.4
Incremental exports		**0.1**	**1.0**	**1.3**	**1.0**	**4.3**	**2.1**
Total US LNG exports		**0.1**	**1.1**	**2.4**	**3.4**	**7.7**	**9.8**

Source: EIA; Simmons

Looking further ahead to 2025, we also believe that gas will continue to take the majority of incremental power generation growth in the US and continue to take market share from coal. Coal fired power generation closures have been a feature as new pollution standards have come into force in an effort to reduce mercury and acid gases emissions, which likely accelerates the switch to gas. Our working assumption is for gas fired power generation to grow 0.8-1.2 Bcf/day per year, although this will be affected by actual gas prices. Beyond the mid-2020s, we expect power generation from gas to face stronger competition from renewables.

US gas supply

Overall, whilst gas demand in the US has been strong over the past five years, it has been overshadowed by a rise in onshore supply, pulling the gas price lower.

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

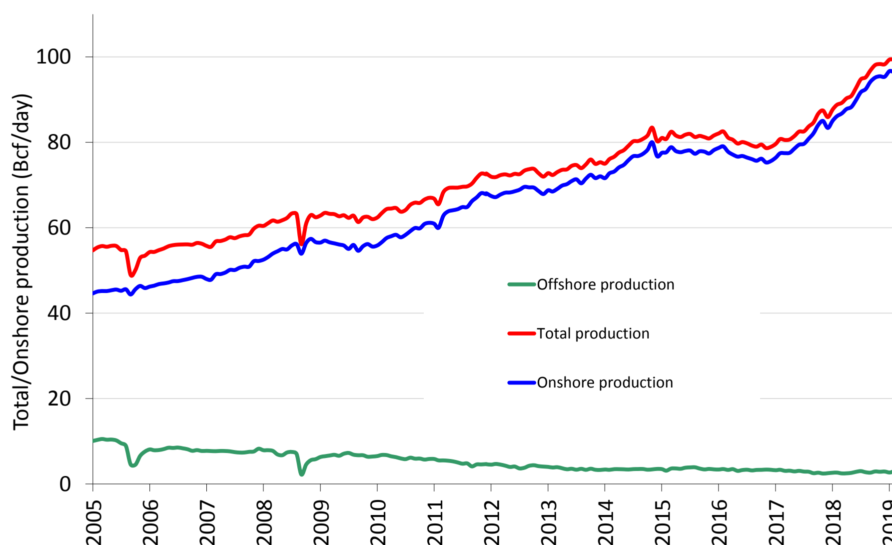
The supply side fundamentals for natural gas in the US are driven by 3 main moving parts: onshore and offshore domestic production, and pipeline imports of gas from Canada. Of these, onshore supply is the biggest component, making up over 85% of total supply.

Bcf/day	2007	2008	*2009*	2010	2011	2012	2013	2014	2015	2016	2017	2018	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**

Source: EIA; Simmons; Guinness estimates

Since the middle of 2008 the weaker gas price in the US reflects growing onshore US production driven by rising shale gas and associated gas production (a by-product of growing onshore US oil production). Interestingly, the overall rise in onshore production has come despite a collapse in the number of rigs drilling for gas, which has dropped from a 1,606 peak in September 2008 to only 81 in September 2016 and now 173 at the end of June 2019. However, offsetting the fall, the average productivity per rig has risen dramatically as producers focus their attention on the most prolific shale basins, whilst associated gas from oil production has grown handsomely. Onshore gas supply (gross, before processing) is now (April 2019) at 97.3 Bcf/day, far above the 57.4 Bcf/day peak in November 2008 before the rig count collapsed.

Figure 10: US natural gross gas production 2005 – 2019 (Lower 48 States)



Source: EIA 914 data (April 2019 published in June 2019)

The outlook for gas production in the US depends on three key factors: the rise of associated gas (gas produced from wells classified as oil wells); expansion of the newer shale basins, principally the Marcellus/Utica, and the decline profile of legacy gas fields.

Associated gas production declined in 2016 with the fall of shale oil production, but with US oil supply now growing well again, so associated gas production has picked up. Generally, we expect to see rates of around 2-3 Bcf/day of associated gas per 1m b/day of oil production growth.

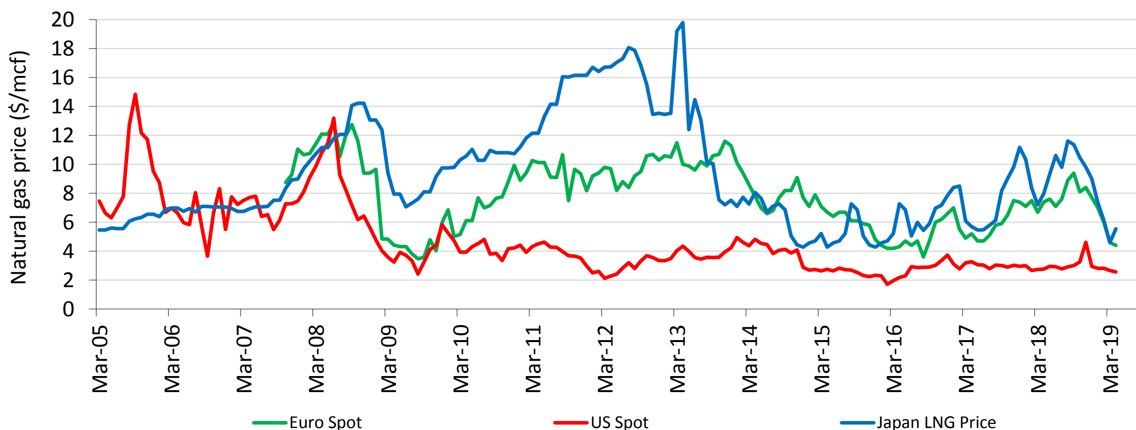
The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

The Marcellus/Utica region, which includes the largest producing gas field in the US and the surrounding region, reached production of around 29 Bcf/day in 2018, with growth accelerating further in 2019 as infrastructure capacity expands. Further growth in region is likely over the next couple of years, supported by a small increase from legacy gas fields, which have reversed the decline seen for much of the earlier part of this decade.

Overall, if the price remains in the $2.50-$3/mcf range, we expect a significant jump in onshore gas supply in 2019, up by around 5 Bcf/day versus 2018.

Outlook for US LNG exports – global gas arbitrage

The prospects for US LNG exports depend on the differentials to European and Asian gas prices, and whether the economic incentive exists to carry out the trade. The UK national balancing point (NBP) gas price – which serves as a proxy to the European traded gas price – remains at a small premium to the US gas price (c.$4/mcf versus c.$2.70/mcf). Asian spot LNG prices fell sharply down to around $4.50/mcf at the start of 2016 but have since averaged around $8/mcf (though currently around $5/mcf on seasonal weakness) as Chinese gas demand strengthens. The implied economics for US LNG exports into Europe and Asia are reasonably attractive assuming international prices are over $5/mcf.



Source: Bloomberg (July 2019)

Relationship with oil and coal

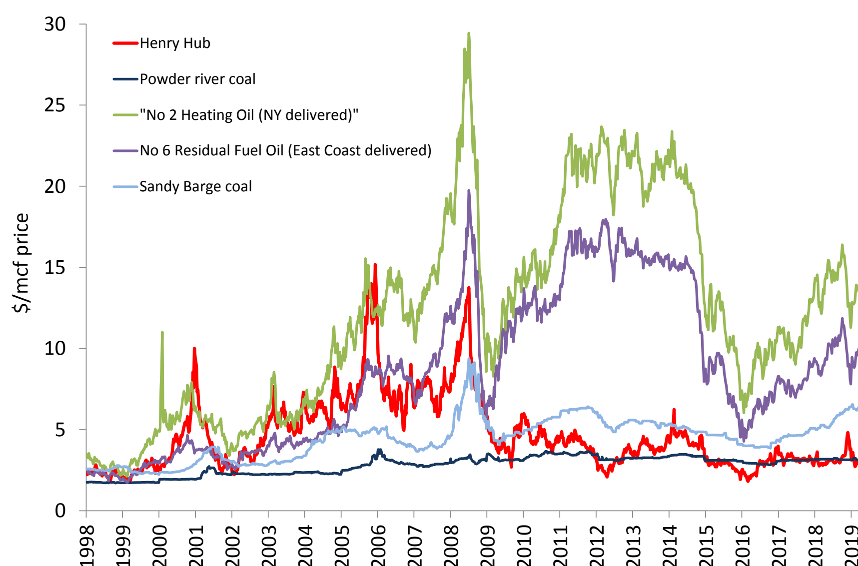
The oil/gas price ratio ($ per bbl WTI/$ per mcf Henry Hub) of around 24x at the end of June 2019 sits well above the long-term ratio of c.10x.

The following chart of the front month US natural gas price against heating oil (No 2), residual fuel oil (No 6) and coal (Sandy Barge adjusted for transport and environmental costs) seeks to illustrate how coal and residual fuel oil switching provide a floor and heating oil a ceiling to the natural gas price. When the gas price has traded below the coal price support level (2012 and 2016), resulting coal to gas switching for power generation was significant.

Figure 11: Natural gas versus substitutes (fuel oil and coal)

Henry Hub vs residual fuel oil, heating oil, Sandy Barge (adjusted) and Powder River coal (adjusted)

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.



Source: Bloomberg (June 2019)

Conclusions about US natural gas

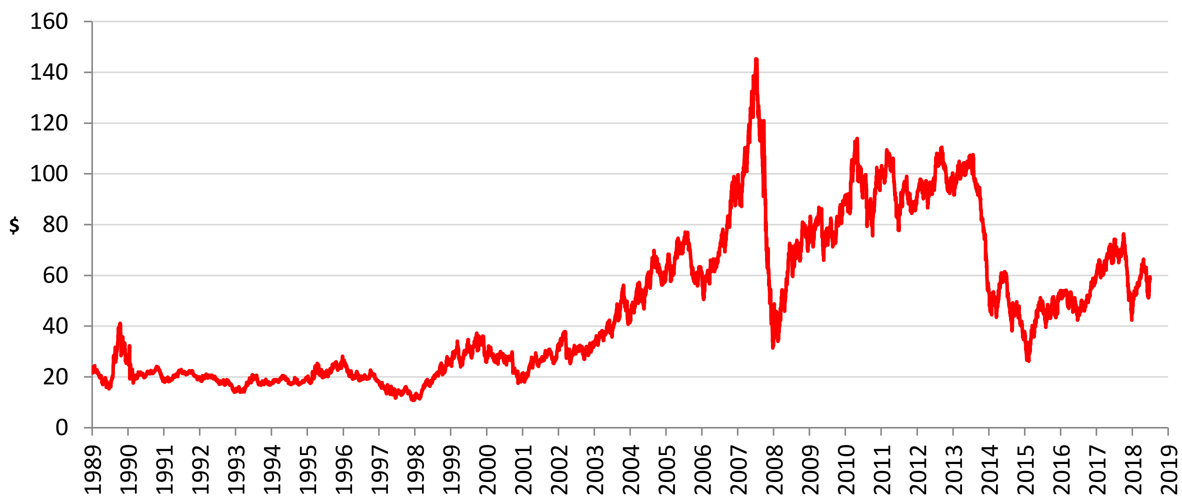
Bcf/day	2007	2008	*2009*	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019E
Total demand	65.4	66.2	65.6	68.8	71.3	74.3	76.1	77.0	80.0	82.6	83.1	90.6	94.5
Demand growth	4.0	0.8	- 0.6	3.2	2.5	3.0	1.8	0.9	3.0	2.6	0.5	7.5	3.9
Total supply	65.5	66.1	66.9	68.8	72.2	74.5	74.4	78.5	81.8	81.8	81.9	89.6	95.1
Supply 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 bottomed in 2012 and any recovery since then has been muted by continued strength in gas supply, particularly from the Marcellus/Utica and from gas produced as a by-product of shale oil. Average 2018 natural gas prices (at $3.07) were around 75% higher the April 2012 low, and we suspect that the (full cycle) marginal cost of supply is now around $3/mcf. However, the continued growth of associated gas (from shale oil) will probably pin the price closer to $2.50/mcf for the foreseeable future. Longer term we expect the price to normalise to nearer $3/mcf.

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

3. APPENDIX Oil and gas markets historical context

Figure 12: Oil price (WTI $) since 1989.



Source: Bloomberg LP

For the oil market, the period since the Iraq Kuwait war (1990/91) can be divided into two distinct periods: the first 9-year period was broadly characterized by decline. The oil price steadily weakened 1991 - 1993, rallied between 1994 –1996, and then sold off sharply, to test 20 year lows in late 1998. This latter decline was partly induced by a sharp contraction in demand growth from Asia, associated with the Asian crisis, partly by a rapid recovery in Iraq exports after the UN Oil for food deal, and partly by a perceived lack of discipline at OPEC in coping with these developments.

The last 13 years, by contrast, have seen a much stronger price and upward trend. There was a very strong rally between 1999 and 2000 as OPEC implemented 4m b/day of production cuts. It was followed by a period of weakness caused by the rollback of these cuts, coinciding with the world economic slowdown, which reduced demand growth and a recovery in Russian exports from depressed levels in the mid 90's that increased supply. OPEC responded rapidly to this during 2001 and reintroduced production cuts that stabilized the market relatively quickly by the end of 2001.

Then, in late 2002 early 2003, war in Iraq and a general strike in Venezuela caused the price to spike upward. This was quickly followed by a sharp sell-off due to the swift capture of Iraq's Southern oil fields by Allied Forces and expectation that they would win easily. Then higher prices were generated when the anticipated recovery in Iraq production was slow to materialise. This was in mid to end 2003 followed by a much more normal phase with positive factors (China demand; Venezuelan production difficulties; strong world economy) balanced against negative ones (Iraq back to 2.5 m b/day; 2Q seasonal demand weakness) with stock levels and speculative activity needing to be monitored closely. OPEC's management skills appeared likely to be the critical determinant in this environment.

By mid-2004 the market had become unsettled by the deteriorating security situation in Iraq and Saudi Arabia and increasingly impressed by the regular upgrades in IEA forecasts of near record world oil demand growth in 2004 caused by a triple demand shock from strong demand simultaneously from China; the developed world (esp. USA) and Asia ex China. Higher production by OPEC has been one response and there was for a period some worry that this, if not curbed, together with demand and supply responses to higher prices, would cause an oil price sell off. Offsetting this has been an opposite worry that non-OPEC production could be within a

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

decade of peaking; a growing view that OPEC would defend $50 oil vigorously; upwards pressure on inventory levels from a move from JIT (just in time) to JIC (just in case); and pressure on futures markets from commodity fund investors.

After 2005 we saw a further strong run-up in the oil price. Hurricanes Katrina and Rita, which devastated New Orleans, caused oil to spike up to $70 in August 2005, and it spiked up again in July 2006 to $78 after a three week conflict between Israel and Lebanon threatened supply from the Middle East. OPEC implemented cuts in late 2006 and early 2007 of 1.7 million barrels per day to defend $50 oil and with non-OPEC supply growth at best anaemic demonstrated that it could to act a price-setter in the market at least so far as putting a floor under it.

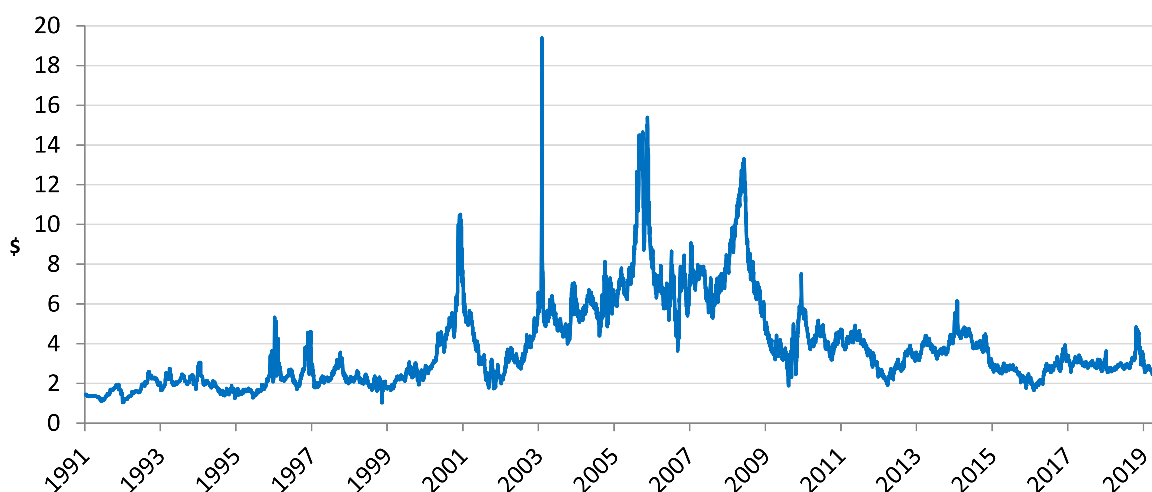
Continued expectations of a supply crunch by the end of the decade, coupled with increased speculative activity in oil markets, contributed to the oil price surging past $90 in the final months of 2007 and as high as $147 by the middle of 2008. This spike was brought to an abrupt end by the collapse of Lehman Brothers and the financial crisis and recession that followed, all of which contributed to the oil price falling back by early 2009 to just above $30. OPEC's responded decisively and reduced output, helping the price to recover in 2009 and stabilise in the $70-95 range where it remained for two years.

Prices during 2011-2014 moved higher, averaging around $100, though WTI generally traded lower than Brent oil benchmarks due to US domestic oversupply affecting WTI. During this period, US unconventional oil supply grew strongly, but was offset by the pressures of rising non-OECD demand and supply tensions in the Middle East/North Africa.

2014 marked the end of the oil cycle that started in the early 2000s. Ten years of high prices catalysed a wall of new non-OPEC supply, sufficient that OPEC saw no choice but to stop supporting price and re-set the investment cycle. Oil prices found a bottom in 2016 (as a result of OPEC cutting production again), but its recovery was capped by the volume of new supply still coming into the market from projects sanctioned pre the 2014 price crash.

Today, the new oil cycle is characterised by good demand growth but a reduced cost curve which has stimulated non-OPEC supply, pinning average prices in the $50-70/bl range once again.

Figure 13: North American gas price since 1991 (Henry Hub $/Mcf)



Source: Bloomberg LP

With regard to the US natural gas market, the price traded between $1.50 and $3/Mcf for the period 1991 - 1999. The 2000s were a more volatile period for the gas price, with several spikes over $8/mcf, but each lasting

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

less than 12 months. On each occasion, the price spike induced a spurt of drilling which brought the price back down. Excepting these spikes, from 2004 to 2008, the price generally traded in the $5-8 range. Since 2008, the price has averaged below $4 as progress achieved in 2007-8 in developing shale plays boosted supply while the 2008-09 recession cut demand. Demand has been recovering since 2009 but this has been outpaced by continued growth in onshore production, driven by the prolific Marcellus/Utica field and associated gas as a by-product of shale oil production.

North American gas prices are important to many E&P companies. In the short-term, they do not necessarily move in line with the oil price, as the gas market is essentially a local one. (In theory 6 Mcf of gas is equivalent to 1 barrel of oil so $60 per barrel equals $10/Mcf gas). It remains a regional market more than a global market, though the development of the LNG industry is creating a greater linkage.

The value of investments and the income from them can go down as well as up.
Guinness Asset Management is authorised and regulated by the Financial Conduct Authority.

IMPORTANT INFORMATION AND RISK FACTORS

Issued by Guinness Asset Management Limited, authorised and regulated by the Financial Conduct Authority.

This report is primarily designed to inform you about recent developments in the energy markets invested in by the Guinness Global Energy Fund. It may also provide information about the Fund's portfolio, including recent activity and performance. It contains facts relating to the energy market and our own interpretation. Any investment decision should take account of the subjectivity of the comments contained in the report.

This document is provided for information only and all the information contained in it is believed to be reliable but may be inaccurate or incomplete; any opinions stated are honestly held at the time of writing, but are not guaranteed. The contents of the document should not therefore be relied upon. It should not be taken as a recommendation to make an investment in the Fund or to buy or sell individual securities, nor does it constitute an offer for sale.

Risk
The Guinness Global Energy Fund is an equity fund. Investors should be willing and able to assume the risks of equity investing. The value of an investment and the income from it can fall as well as rise as a result of market and currency movement, and you may not get back the amount originally invested. The Fund invests only in companies involved in the energy sector; it is therefore susceptible to the performance of that one sector, and can be volatile. Details on the risk factors are included in the Fund's documentation, available on our website.

Documentation
The documentation needed to make an investment, including the Prospectus, the Key Investor Information Document (KIID) and the Application Form, is available from the website www.guinnessfunds.com , or free of charge from:

- the Manager: Link Fund Manager Solutions (Ireland) Ltd, 2 Grand Canal Square, Grand Canal Harbour, Dublin 2, Ireland; or,
- the Promoter and Investment Manager: Guinness Asset Management Ltd, 14 Queen Anne's Gate, London SW1H 9AA.

Residency
In countries where the Fund is not registered for sale or in any other circumstances where its distribution is not authorised or is unlawful, the Fund should not be distributed to resident Retail Clients. **NOTE: THIS INVESTMENT IS NOT FOR SALE TO U.S. PERSONS.**

Structure & regulation
The Fund is a sub-fund of Guinness Asset Management Funds PLC (the "Company"), an open-ended umbrella-type investment company, incorporated in Ireland and authorised and supervised by the Central Bank of Ireland, which operates under EU legislation. If you are in any doubt about the suitability of investing in this Fund, please consult your investment or other professional adviser.

Switzerland
The prospectus and KIID for Switzerland, the articles of association, and the annual and semi-annual reports can be obtained free of charge from the representative in Switzerland, Carnegie Fund Services S.A., 11, rue du Général-Dufour, 1204 Geneva, Switzerland, Tel. +41 22 705 11 77, www.carnegie-fund-services.ch. The paying agent is Banque Cantonale de Genève, 17 Quai de l'Ile, 1204 Geneva, Switzerland.

Singapore
The Fund is not authorised or recognised by the Monetary Authority of Singapore ("MAS") and shares are not allowed to be offered to the retail public. The Fund is registered with the MAS as a Restricted Foreign Scheme. Shares of the Fund may only be offered to institutional and accredited investors (as defined in the Securities and Futures Act (Cap.289)) ('SFA') and this material is limited to the investors in those categories

Telephone calls will be recorded and monitored.