

## Developments and trends for investors in the global energy sector

This is a marketing communication. Please refer to the prospectus and KIID for the Fund before making any final investment decisions. Past performance does not predict future returns.

April 2022

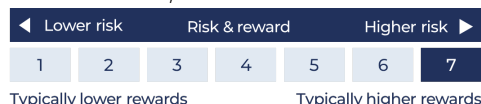
### Guinness Global Energy Fund

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 actively managed and uses the MSCI World Energy Index as a comparator benchmark only.

The Fund is run by co-managers Will Riley, Jonathan Waghorn and Tim Guinness, supported by Jamie Melrose (analyst). The investment philosophy, methodology and style which characterise the Guinness approach have been applied to the management of energy equity portfolios since 1998.

### 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.



The risk and reward indicator shows where the fund ranks in terms of its potential risk and return. The fund is ranked as higher risk as its price has shown high fluctuations historically. This is based on how investments have performed in the past and you should note that the fund may perform differently in the future and its rank may change. Historic data may not be a reliable indicator for the future.

### HIGHLIGHTS FOR MARCH

#### OIL

##### WTI/Brent up post Russian invasion of Ukraine

Brent and WTI oil prices rose in March, though closed the month significantly lower than the intra-month peak. Brent closed March at nearly \$107/bl (up from \$101/bl over the month), having traded up to \$133/bl, while WTI closed up \$4/bl at \$100/bl. Five-year forward prices rose, Brent closing at \$75/bl and WTI at \$68/bl. Price increases reflected the potential for a significant decline in Russian supply – perhaps 3m b/day – which looks only partially offset by lower global oil demand expectations. OECD inventories for oil and oil products already sit at the bottom of the ten year range.

#### NATURAL GAS

##### US, European and Asian gas prices all higher

Global gas prices maintained or exceeded their high levels. The European gas price (using UK NBP) averaged \$39/mcf in March, Asia (Japan LNG) averaged \$35/mcf, whilst the US spot price (Henry Hub) averaged \$5.6/mcf. Russian gas continued to flow into Europe, but debates about how to replace it in the short-term have highlighted the challenges, with limited scope to raise imports this year from elsewhere.

#### EQUITIES

##### Energy outperforms the broad market in March

The MSCI World Energy Index (net return) rose by 7.7% in March, outperforming the MSCI World Index (net return) which rose by 2.7% over the month (all in US dollar terms).

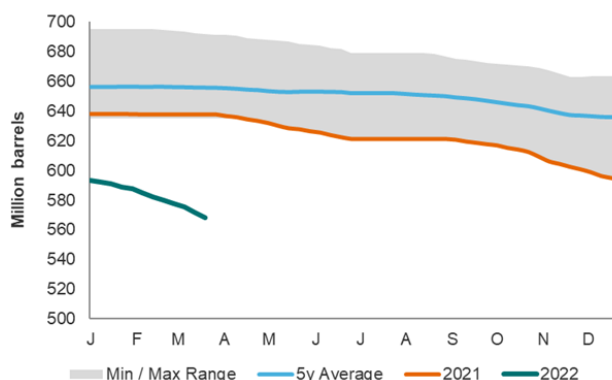
#### CHART OF THE MONTH

##### US SPR release announced by President Biden

On March 31, President Biden announced a 180m barrel sale from the US's Strategic Petroleum Reserve. The release, which is due to start in May and last for six months, is the largest in US oil market history. It will in theory reduce SPR inventories to less than 400m barrels, their lowest level since 1984.

US Strategic Petroleum Reserve inventories (m bls)

source: DNB



# The Guinness Global Energy Report

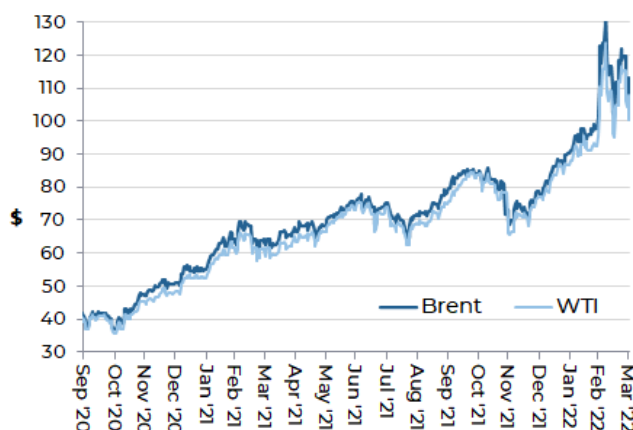
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## 1. MARCH IN REVIEW

### i) Oil market

Oil price (WTI and Brent \$/barrel): Oct 2020 to April 2022



Source: Bloomberg LP

The West Texas Intermediate (WTI) oil price started March at \$95.7/bl and moved sharply higher over the first week of the month, reaching a peak of \$123.7/bl on March 8. The spot price then moderated over the rest of March, closing at \$100.3/bl. WTI has averaged \$95/bl so far this year, having averaged \$68/bl in 2021, \$40/bl in 2020 and \$58/bl in 2019.

Brent oil traded in a similar shape, opening at \$100.8/bl, peaking at \$133.9/bl and closing the month at \$106.6/bl. Brent has averaged \$99/bl so far in 2022, having averaged \$70/bl in 2021, \$42/bl in 2020 and \$64/bl in 2019. The gap between the WTI and Brent benchmark oil prices widened over the month, ending March at just under \$6/bl. The Brent-WTI spread averaged \$2.4/bl in 2021.

#### Factors which strengthened WTI and Brent oil prices in April:

- **Decline in Russian oil supply**

The IEA estimate that Russian oil production declined by 1.5m b/day in April and are estimating a 3m b/day decline in Russian oil production from May. This is driven by a c.1.5m b/day reduction in oil exports due to a lack of buyers; a c.1m b/day reduction in oil product exports for the same reason; and 0.5m b/day reduction in domestic oil demand. For context, Russia is normally the world's largest oil exporter, shipping around 8m b/day of oil and refined products to customers globally. Of the 8m b/day, c.4m b/day is normally sent to Europe, c.1.5m b/day to China and 0.5m b/day to the US. The US formally stopped taking Russian product from April 22.

- **Prospects for European ban on imports of Russian oil and refined products**

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During April, the EU debated the merits of banning imports of Russian oil and refined products, in response to Russia's invasion of Ukraine. On May 4, the EU made a formal proposal to phase out Russian crude oil imports over six months and refined products by the end of 2022. "This will be a complete import ban on all Russian oil, seaborne and pipeline, crude and refined," EC President Ursula von der Leyen said in remarks to the European Parliament. "We will make sure that we phase out Russian oil in an orderly fashion, in a way that allows us and our partners to secure alternative supply routes and minimizes the impact on global markets." It is expected that Hungary and Slovakia, which had been opposed to a swift cut-off of Russian oil, will be granted a longer timeframe - until the end of 2023 - to enforce the sanctions. Longer term, we expected Russian oil and refined products to largely be recycled to other markets (e.g. China and India), but a full rerouting will take time.

- **OECD inventories close to bottom of 10 year range**

OECD total product and crude inventories at the end of March (latest data point) were estimated by the IEA to be 2,591m barrels, up by 9m barrels versus the level reported for February. The inventory level reported for March is around 6% below the 10 year average, and close to the bottom of the 10 year range. We believe low inventories were a key catalyst for the US and other IEA members last month to announce record releases from Strategic Petroleum Reserves.

### Factors which weakened WTI and Brent oil prices in April:

- **Announcement of record SPR releases**

Faced with the prospect of spiralling oil prices, US President Biden announced on March 31 a 180m barrel release of oil and oil products from the US's Strategic Petroleum Reserve (SPR). The SPR release is due to begin in May and run for six months (i.e. around 1m b/day), with the barrels to be bought back "in future years". In early April, it was confirmed that IEA will supplement the US SPR release with around a further 60m barrels (likely concentrated on oil products in Europe). Combined SPR releases by the US and other IEA members for 2022 now amount to 283 mb, or nearly 20% of the IEA's 1.45 bn barrel crude and product SPR inventories. As such, they represent the biggest planned release in oil market history. The releases will help the oil market to rebalance in 2022, increasing supply and commensurately reducing the amount of necessary price-induced demand destruction that would otherwise operate as the sole mechanism for rebalancing.

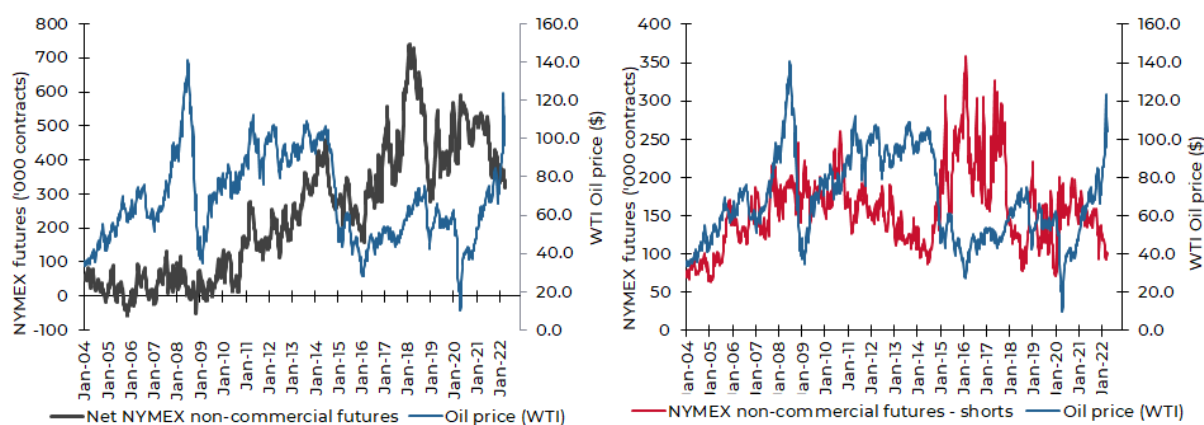
- **Current oil demand revised downwards by the IEA**

In April the IEA revised their global oil demand forecast for April-December 2022 lower by 1.3m b/day, resulting in 1.0m b/day slower oil demand growth for 2022 on average. Total demand is now projected at 99.7m b/day in 2022, an increase of 2.1m b/day from 2021. The downward revision to oil demand reflects lower expectations for world GDP growth as a result of the Russia/Ukraine crisis, lowered for the rest of the year by 0.9% to 3.4%. The largest downward move is expected in Russia, where annual GDP growth of 3.2% for 2022 has been revised to an 1% GDP contraction, resulting in a reduction in oil demand of 0.5m b/day.

### Speculative and investment flows

The New York Mercantile Exchange (NYMEX) net non-commercial crude oil futures open position was 318,000 contracts long at the end of March versus 339,000 contracts long at the end of February. 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 grew slightly to 104,000 contracts at the end of March versus 103,000 at the end of the previous month.

**NYMEX Non-commercial net and short futures contracts: WTI January 2004 – March 2022**



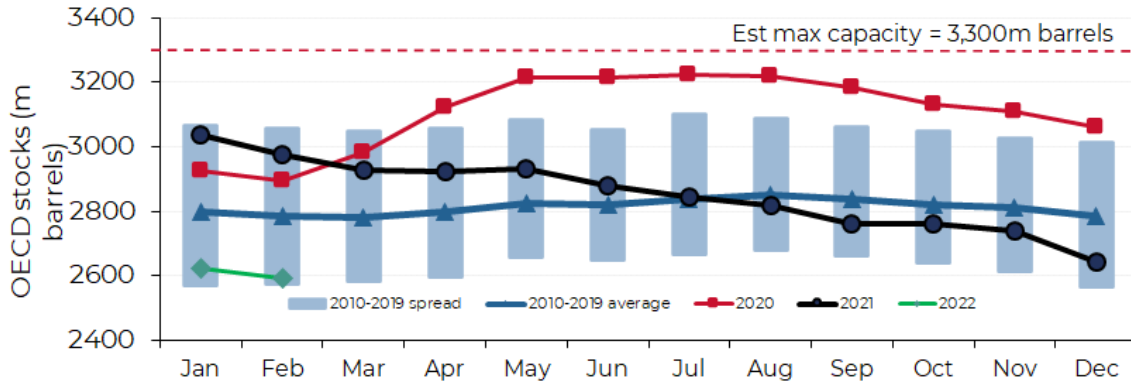
Source: Bloomberg LP/NYMEX/ICE (2022)

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## OECD stocks

OECD total product and crude inventories at the end of February (latest data point) were estimated by the IEA to be 2591m barrels, down by 30m barrels versus the level reported for January. This compares to a 10-year average draw for February of 15m barrels, implying that the OECD market was undersupplied by around 15m barrels. The significant oversupply situation in 2020 pushed OECD inventory levels close to maximum capacity in August 2020 (c3.3bn barrels), with persistent tightening thereafter taking inventories below normal levels.

**OECD total product and crude inventories, monthly, 2004 to 2022**



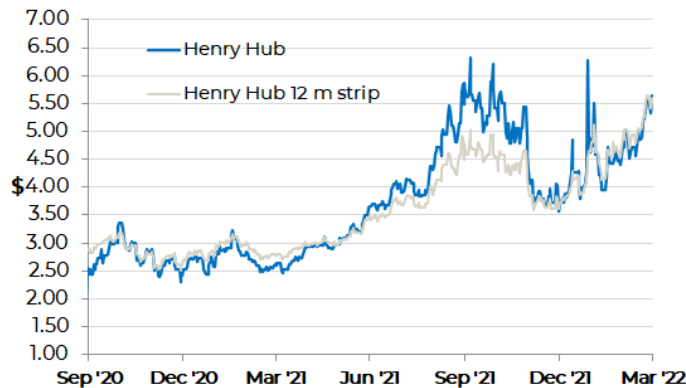
Source: IEA Oil Market Reports (Mar 2022 and older)

## ii) Natural gas market

The US natural gas price (Henry Hub front month) opened March at \$4.40/mcf (1,000 cubic feet), and rose steadily over the month to close at \$5.64/mcf. The spot gas price has averaged \$4.55/mcf so far in 2022, having averaged \$3.70/mcf in 2021, \$2.13/mcf in 2020 and \$2.53/mcf in 2019.

The 12-month gas strip price (a simple average of settlement prices for the next 12 months' futures prices) also rose over the month, rising from \$4.55/mcf to \$5.59/mcf. The strip price has averaged \$4.52/mcf so far in 2022, having averaged \$3.52 in 2021, \$2.54 in 2020 and \$2.60 in 2019.

**Henry Hub gas spot price and 12m strip (\$/Mcf): Sept 2020 to March 2022**



Source: Bloomberg LP

### Factors which strengthened the US gas price in March included:

- **Lower than normal international gas inventories and stronger international demand**

High gas demand and low inventories in Europe and Asia held international gas prices at around \$30-35/mcf during the month. This in turn is maximising demand for exports of LNG from the US. The EIA forecasts that US LNG exports will remain elevated, growing to 13 bcf/day at the end of the year.

- **Lower onshore supply**

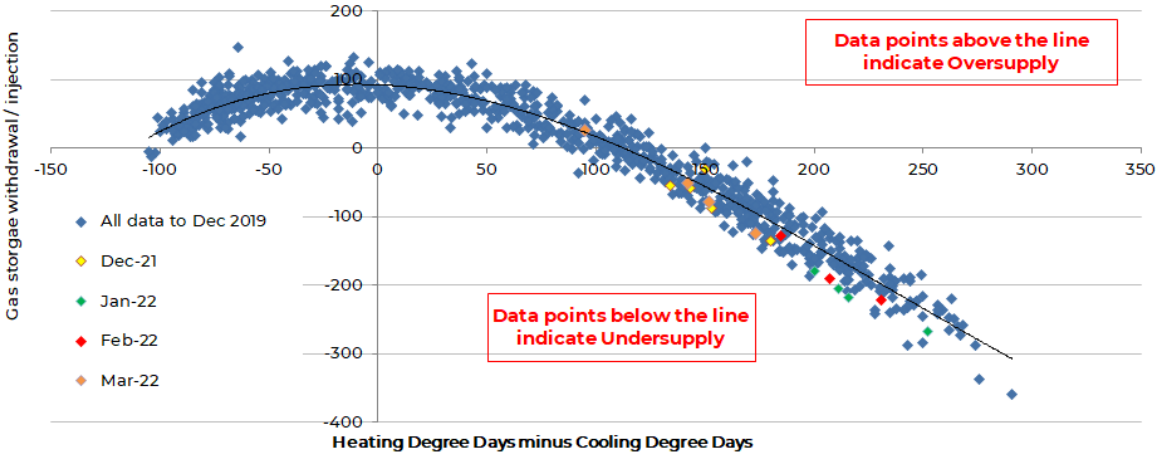
Latest supply data (for January) suggests that production dipped by 2.7 Bcf/day (-2.5%), thanks to short-term cold weather effects. Supply is up over twelve months by around 3 Bcf/day, and we expect continued growth this year.

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- Market undersupplied (ex-weather effects)**

Withdrawals from US natural gas inventories during March were higher than expected for the time of year. Adjusting for the impact of weather, the draws implied that the US gas market was, on average, nearly 4 Bcf/day undersupplied.

**Weather adjusted US natural gas inventory injections and withdrawals**

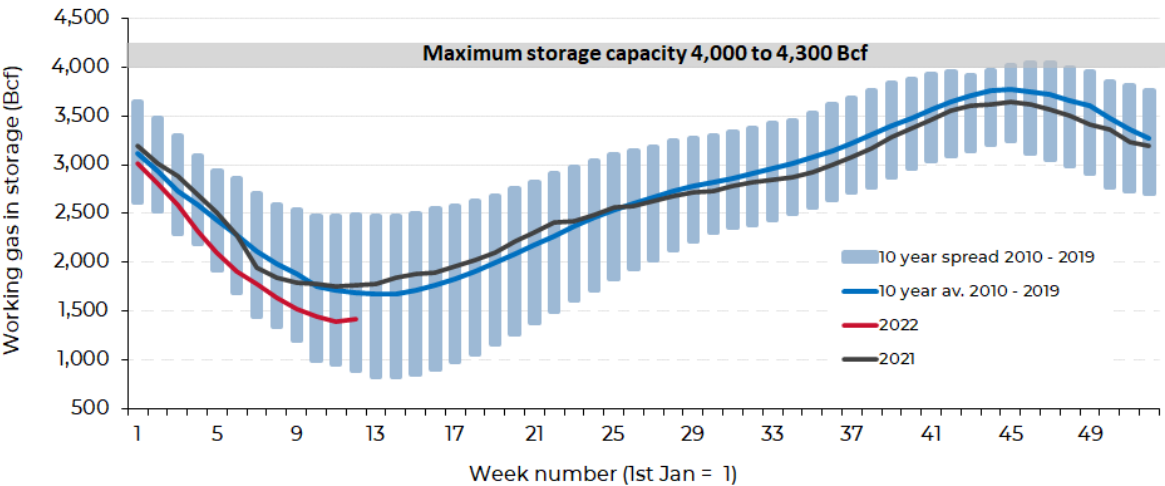


Source: Bloomberg LP; Guinness Global Investors

**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 March were reported by the EIA to be 1.4 Tcf. Current gas in storage is around 0.3 Tcf below the 10-year average.

**Deviation from 10yr gas storage norm**



Source: Bloomberg; EIA (April 2022)

## 2. MANAGER'S COMMENTS

The Russia/Ukraine crisis has contributed to surging energy and other commodity prices. Alongside financial and oil sanctions against Russia, these are expected to lower global economic growth and oil demand. In March, the International Energy Agency (IEA) revised their global oil demand forecast for April-December 2022 down by 1.3m b/day, resulting in 1.0m b/day slower oil demand growth for 2022 as a whole. Demand is still expected to increase by 2.1m b/day versus last year, as the post-COVID unwind continues, but the likelihood of exceeding 2019 global demand looks lower.

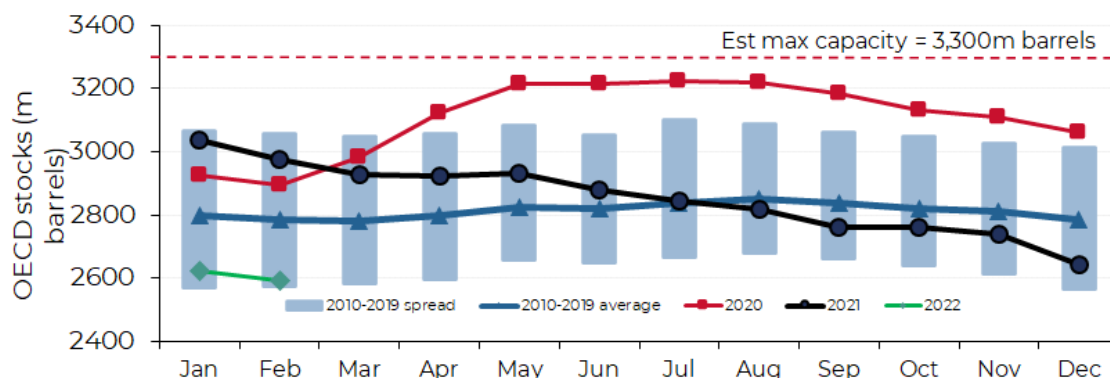
Whilst prospects for oil demand growth have been dampened, they look to be more than outweighed by a supply shock stemming from reduced Russian supply. Being precise about the path for Russian oil supply is challenging. At the time of writing, there are no legally binding restrictions on imports into Russia's most important markets, the EU and China. However, major oil companies have stepped away from Russian oil for reputational reasons and uncertainty over future sanctions.

Piecing together market data, and Russian oil production appears to have remained stable at around 11.1m b/day until March 23 but fell as low as 10.4m b/day late in the month as European refineries shunned Russian crude and Russian product exports dried up. At the time of writing, at least 1.3m b/day of refinery processing have been cut across 14 Russian refineries (according to Energy Aspects) as the struggle to find buyers escalates. This is being reflected in record discounts for Russia's flagship Urals crude, currently being offered for sale at around at \$35/bl discount to the Brent oil price. We note that China's state refiners are honouring existing Russian oil contracts but reportedly avoiding new ones despite deep discounts.

The IEA are estimating a 3m b/day decline in Russian oil production from April, driven by a c.1.5m b/day reduction in oil exports due to a lack of buyers; a c.1m b/day reduction in oil product exports for the same reason; and 0.5m b/day reduction in domestic oil demand. For context, Russia is normally the world's largest oil exporter, shipping around 8m b/day of oil and refined products to customers globally. Of the 8m b/day, c.4m b/day is normally sent to Europe, c.1.5m b/day to China and 0.5m b/day to the US. The US formally stop taking Russian product from April 22.

All of this comes against a backdrop of already low OECD commercial oil and product inventories. The latest data point, for February, suggests that inventories sit around 2.6bn barrels, the bottom of the ten-year range.

**OECD total product and crude inventories, monthly, 2004 to 2022**



Source: IEA Oil Market Reports (Mar 2022 and older)

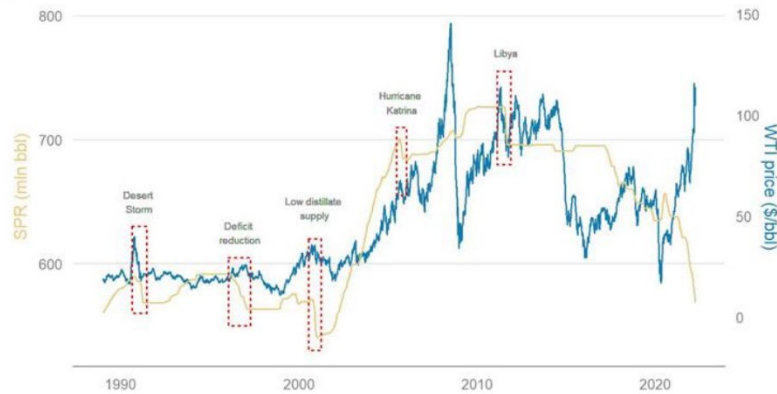
### SPR release: a large sticking plaster

Faced with the prospect of spiralling oil prices, US President Biden announced on March 31 a 180m barrel release of oil and oil products from the US's Strategic Petroleum Reserve (SPR). The SPR release is due to begin in May and run for six months (i.e. around 1m b/day), with the barrels to be bought back "in future years". There is currently around 570m barrels of US SPR remaining, and this sale will in theory bring stocks down below 400m barrels, which would be the lowest level since 1984. In early April, it was confirmed that IEA will supplement the US SPR release with around a further 60m barrels (likely concentrated on oil products in Europe). The plan by 31 US-allied IEA members represents their second announcement of a coordinated release within a month, and the fifth release in IEA history. The timing of the IEA release remains uncertain.



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## US Strategic Petroleum Reserve (m bls) vs WTI oil price (\$/bl)



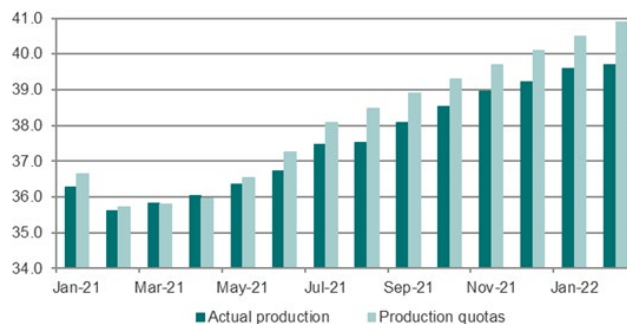
Source: Morgan Stanley; Guinness Global Investors

Combined SPR releases by the US and other IEA members for 2022 now amount to 283 mb, or nearly 20% of the IEA's 1.45 bn barrel crude and product SPR inventories. As such, they represent the biggest planned release in oil market history. The releases will help the oil market to rebalance in 2022, increasing supply and commensurately reducing the amount of necessary price-induced demand destruction that would otherwise operate as the sole mechanism for rebalancing. However, the sale of oil and products from SPR reserves is not a persistent source of supply in the coming years. And whilst the release is logical in the short-term, there is an element of 'kicking the can down the road' here, with an eventual need to refill the SPR creating an additional oil demand burden in the future.

### OPEC+ quotas: staying the course, but growth in question

The OPEC+ group met at the end of March to consider production quotas. The meetings concluded with OPEC+ members keeping to the plan of raising production by 0.4m b/day in May, in line with the group's stated aim of raising production monthly by this amount until September. The challenges for OPEC+ have been mounting, with mounting pressure from consuming nations to increase production more rapidly, questions around demand brought about by COVID escalation in China and slower global growth, the Iranian nuclear talks still not concluded, balanced against loyalty to fellow OPEC+ member Russia. Faced with these uncertainties, the path of least resistance for the group is to stick to their original plan. A major challenge for the oil market, however, is that OPEC+ is not delivering according to plan, even outside Russia.

### OPEC+ production versus quotas (m b/day)



Source: DNB; Guinness Global Investors

As the chart above shows, the gap between actual production and production quotas has been increasing consistently, with quotas for February 2022 at 40.9m b/day versus actual supply of 39.7m b/day. Several countries have struggled to keep up with quota increases, in particular African members of OPEC that are seeing the effects of years of underinvestment in new oil capacity. Preliminary data for production in March suggests a further widening of the production/quota gap. OPEC production looks to have increased by just 0.1m b/day in March, with increases from Saudi, Iran, UAE and Kuwait set against no growth or shallow decline in Nigeria, Angola and Iraq.

It is interesting to note that Saudi oil production has already recovered to 10.3m b/day, which is towards the top end of the 10 year production range (peak production for Saudi occurred in Dec 2018, at 10.6m b/day). This comes at a time when the drilling rig count in Saudi is close to trough levels. If there is a sharp increase in the call-on-OPEC caused by a shortage of Russian production, or any other outage, the low rig activity could pose a challenge to Saudi's ability to operate as swing producer to balance the market. Recent missile attacks on Saudi further

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exacerbate the issue, with the Saudi government stating that it would not bear responsibility for supply shortages in the global oil market unless the international community finds a way to stop Houthi aggression.

### Energy equities

Despite the rally in 2021 and so far in 2022, energy equity valuations remain relatively subdued. The MSCI World Energy Index now trades on a price to book ratio of 2.0x, versus the S&P500 at 4.6x. The relative P/B of energy versus the S&P500 sits at 0.43, versus the long-term average of around 0.85x. Oil and gas companies are demonstrating a meaningful shift towards capital discipline, manifested in lower levels of reinvestment, lower levels of debt and a return of free cash to shareholders. Our portfolio trades on 8.1x 2022 earnings (at 31 March 2022), with a dividend yield of around 3.7% and a free cashflow yield of over 10%. Energy equities offer attractive upside if our oil price, profitability and free cashflow scenarios play out. We believe energy equities currently discount an oil price of around \$61-62/bl. Adopting \$65/bl Brent as a long-term oil price (consistent with the bottom end of OPEC's desired range), we see 15-20% upside across our portfolio. At \$75 Brent as a long-term price (middle of OPEC's desired range), we see 50-60% upside.



## The Guinness Global Energy Report

### 3. PERFORMANCE Guinness Global Energy Fund

#### Past performance is not a guide to future returns

The main index of oil and gas equities, the MSCI World Energy Index (net return), rose by 7.7% in March, while the MSCI World Index (net return) rose by 2.7% in USD.

Within the Fund, March's strongest performers included Baker Hughes, Valero, Equinor, Chevron and Canadian Natural Resources while the weakest performers included Gazprom, Petrochina, Total, BP and ENI.

#### Performance (in USD) as at 31.03.2022

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.

Cumulative % returns	YTD	1 year	3 years ann.	5 years ann.	Launch of strategy* ann. (31.12.98)		
<b>Guinness Global Energy Fund (Class Y, 0.99% OCF)</b>	21.8%	44.7%	3.1%	1.6%	8.3%		
<b>MSCI World Energy NR Index</b>	30.6%	50.3%	6.9%	5.4%	6.2%		
<b>Calendar year % returns</b>							
	<b>2021</b>	<b>2020</b>	<b>2019</b>	<b>2018</b>	<b>2017</b>	<b>2016</b>	<b>2015</b>
<b>Strategy</b>	44.4%	-34.7%	9.8%	-19.7%	-1.3%	27.9%	-27.6%
<b>Index</b>	40.1%	-31.5%	11.4%	-15.8%	5.0%	26.6%	-22.8%
	<b>2014</b>	<b>2013</b>	<b>2012</b>	<b>2011</b>	<b>2010</b>	<b>2009</b>	<b>2008*</b>
<b>Strategy</b>	-19.1%	24.4%	3.0%	-13.7%	15.3%	61.8%	-44.8%
<b>Index</b>	-11.6%	18.1%	1.9%	0.2%	11.9%	26.2%	-32.8%
	<b>2007*</b>	<b>2006*</b>	<b>2005*</b>	<b>2004*</b>	<b>2003*</b>	<b>2002*</b>	<b>2001*</b>
<b>Strategy</b>	37.9%	10.1%	62.3%	41.0%	32.4%	6.7%	-4.1%
<b>Index</b>	31.1%	18.4%	29.4%	28.8%	26.8%	-5.9%	-6.6%
	<b>2000*</b>	<b>1999*</b>					
<b>Strategy</b>	39.6%	22.5%					
<b>Index</b>	6.6%	22.8%					

Source: FE fundinfo, Guinness Global Investors and Bloomberg, bid to bid, gross income reinvested, in US dollars

Calculation by Guinness Global Investors, \*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 December 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 Y (0.99% OCF) thereafter. Returns for share classes with a different OCF will vary accordingly.

Investors should note that fees and expenses are charged to the capital of the Fund. This reduces the return on your investment by an amount equivalent to the Ongoing Charges Figure (OCF). Performance returns do not reflect any initial charge; any such charge will also reduce the return.

#### TB Guinness Global Energy Fund

UK investors should be aware that the Guinness Global Energy Fund is now available as a UK domiciled fund denominated in GBP. The TB Guinness Global Energy Fund is available from 0.96% OCF. The historical performance of this fund will differ from the Guinness Global Energy Fund as the TB Guinness Global Energy fund has only been recently brought into line with the Guinness Global Energy Fund. 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.guinnessgi.com](http://www.guinnessgi.com) Please contact [info@guinnessgi.com](mailto:info@guinnessgi.com) or +44 (0) 20 7222 5703 for more details.

**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.guinnessgi.com](http://www.guinnessgi.com).**

## The Guinness Global Energy Report

### 4. PORTFOLIO Guinness Global Energy Fund

#### Buys/Sells

In March we exited our positions in Gazprom and CNOOC, and established new positions in Diamondback Energy, Halliburton and Baker Hughes.

#### Sector Breakdown

The following table shows the asset allocation of the Fund at **March 31 2022**.

Asset allocation as %NAV	Current	Change	Last year end	Previous year ends				
	Mar-22		Dec-21	Dec-20	Dec-19	Dec-18	Dec-17	Dec-16
<b>Oil &amp; Gas</b>	<b>97.2%</b>	<b>0.3%</b>	<b>96.9%</b>	<b>94.8%</b>	<b>98.3%</b>	<b>96.7%</b>	<b>98.4%</b>	<b>96.7%</b>
Integrated	53.3%	-4.4%	57.7%	56.3%	51.1%	46.4%	42.9%	46.4%
Exploration & Productio	25.5%	1.8%	23.7%	22.2%	29.6%	35.8%	36.9%	35.8%
Drilling	0.0%	0.0%	0.0%	0.0%	0.1%	2.2%	1.9%	2.2%
Equipment & Services	8.0%	4.0%	4.0%	4.6%	9.6%	8.6%	9.5%	8.6%
Storage & Transportatio	4.4%	0.1%	4.3%	4.4%	4.0%	0.0%	3.5%	0.0%
Refining & Marketing	5.9%	-1.2%	7.2%	7.3%	3.8%	3.7%	3.7%	3.7%
Solar	0.9%	-0.1%	1.0%	1.8%	0.7%	0.9%	1.4%	0.9%
Coal & Consumable Fue	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Construction & Enginee	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Cash	1.9%	-0.2%	2.1%	3.3%	1.1%	2.4%	0.2%	2.4%

Source: Guinness Global Investors. Basis: Global Industry Classification Standard (GICS)

The Fund at end of March 2022 was on a price to earnings ratio (P/E) for 2021/2022 of 13.7x/8.1x versus the MSCI World Index at 20.2x/17.9x as set out in the following table:

As at 31 March 2022	P/E		
	2020	2021E	2022E
Guinness Global Energy Fund	84.8x	13.7x	8.1x
MSCI World Index	37.3x	20.2x	17.9x
Fund Premium/(Discount)	127%	-32%	-55%

Source: Bloomberg; Guinness Global Investors

#### Portfolio holdings

Our integrated and similar stock exposure (c.53%) is comprised of a mix of mid cap, mid/large cap and large cap stocks. Our five large caps are Chevron, BP, ExxonMobil, Royal Dutch Shell and Total. Mid/large and mid-caps are ENI, Equinor, GALP, Repsol and OMV. At March 31 2021 the median P/E ratio of this group was 11.3x 2021 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.26%) 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 (EOG, Pioneer and Devon), with one other name (ConocoPhillips) having a mix of US and international production. One of the key metrics behind a number of the E&P stocks held is low enterprise value / proven reserves.

We have exposure to two emerging market stocks, Petrochina and Sinopec, in the portfolio and in total represent around 3% of the portfolio.

The portfolio contains one midstream holding, Enbridge, North America's largest pipeline company. With the growth of hydrocarbon demand 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 modest exposure to oil service stocks, which comprise around 8% of the portfolio. The stocks we own are mainly diversified internationally (Helix and Schlumberger).

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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 a recovery in refining margins.

### Portfolio at February 28 2022 (for compliance reasons disclosed one month in arrears)

Guinness Global Energy Fund (28 February 2022)			P/E			EV/EBITDA			Price/Book		
Stock	ISIN	% of NAV	2020	2021E	2022E	2020	2021E	2022E	2020	2021E	2022E
<b>Integrated Oil &amp; Gas</b>											
Exxon Mobil Corp	US30231G1022	5.0%	n/a	15.0x	11.4x	19.1x	7.1x	6.0x	2.0x	2.0x	1.9x
Chevron Corp	US1667641005	5.0%	n/a	16.8x	13.3x	17.5x	7.2x	6.2x	2.0x	2.0x	1.9x
Shell PLC	GB00BP6MXD	4.5%	38.7x	10.6x	7.5x	7.0x	4.6x	4.2x	1.5x	1.2x	1.0x
Total SA	FR0000120271	4.1%	35.4x	7.8x	6.5x	8.8x	4.2x	3.5x	1.2x	1.2x	1.1x
BP PLC	GB000798059	4.2%	n/a	7.8x	6.4x	11.4x	4.1x	3.6x	1.4x	1.3x	1.2x
Equinor ASA	NO001009698	4.1%	56.5x	10.2x	8.7x	5.7x	2.4x	2.0x	2.9x	2.6x	2.3x
ENI SpA	IT0003132476	4.1%	n/a	11.4x	7.8x	6.3x	3.8x	3.2x	1.1x	1.2x	1.1x
Repsol SA	ES0173516115	3.6%	51.5x	7.6x	5.8x	6.2x	3.8x	3.4x	0.7x	0.8x	0.7x
Galp Energia SGPS SA	PTGALOAM001	3.0%	n/a	17.1x	11.5x	6.5x	4.7x	3.9x	2.1x	2.4x	2.5x
OMV AG	AT0000743055	2.8%	18.8x	5.0x	4.5x	6.7x	3.3x	3.0x	1.0x	0.9x	0.8x
		<b>40.3%</b>									
<b>Integrated / Oil &amp; Gas E&amp;P - Canada</b>											
Suncor Energy Inc	CA8672241079	4.7%	n/a	14.8x	7.9x	15.3x	5.5x	4.7x	1.7x	1.6x	1.5x
Canadian Natural Resources Ltd	CA1363851017	4.6%	n/a	11.8x	9.9x	17.0x	6.3x	5.7x	2.6x	2.3x	2.1x
Imperial Oil Ltd	CA4530384081	4.7%	n/a	15.3x	8.5x	44.7x	7.7x	5.7x	1.9x	1.8x	1.7x
		<b>13.9%</b>									
<b>Integrated Oil &amp; Gas - Emerging market</b>											
PetroChina Co Ltd	CNE1000003W	3.7%	33.4x	6.7x	6.9x	5.1x	3.8x	3.7x	0.5x	0.5x	0.5x
Gazprom PJSC	US3682872078	1.0%	61.6x	1.1x	0.9x	9.1x	3.7x	3.1x	0.2x	0.1x	0.2x
		<b>4.7%</b>									
<b>Oil &amp; Gas E&amp;P</b>											
ConocoPhillips	US20825C1045	4.6%	n/a	15.7x	10.7x	24.7x	6.6x	5.0x	3.4x	2.8x	2.4x
EOG Resources Inc	US26875P1012	4.7%	105x	13.3x	10.5x	13.8x	6.2x	5.4x	3.3x	3.0x	2.6x
Pioneer Natural Resources Co	US7237871071	4.8%	153x	18.7x	11.2x	27.0x	9.0x	6.2x	3.4x	2.5x	2.2x
Devon Energy Corp	US25179M1036	5.1%	n/a	17.6x	10.2x	27.7x	7.8x	5.7x	7.1x	4.2x	3.1x
		<b>19.2%</b>									
<b>International E&amp;Ps</b>											
CNOOC Ltd	HK0883013259	1.3%	15.0x	4.9x	4.4x	3.9x	2.2x	1.9x	0.8x	0.8x	0.7x
Pharos Energy PLC	GB00B572ZV9	0.1%	n/a	n/a	9.3x	2.7x	2.9x	1.7x	n/a	n/a	n/a
		<b>1.4%</b>									
<b>Midstream</b>											
Enbridge Inc	CA29250N105C	4.2%	22.3x	19.6x	18.2x	13.9x	13.3x	12.2x	1.9x	2.0x	2.1x
		<b>4.2%</b>									
<b>Equipment &amp; Services</b>											
Schlumberger Ltd	AN8068571086	4.0%	61.0x	30.9x	19.9x	15.9x	13.6x	10.9x	4.6x	4.0x	3.3x
Helix Energy Solutions Group Inc	US42330P1075	0.6%	n/a	n/a	n/a	4.6x	7.1x	8.2x	0.4x	0.4x	0.4x
		<b>4.6%</b>									
<b>Oil &amp; Gas Refining &amp; Marketing</b>											
China Petroleum & Chemical Corp	CNE1000002Q	2.9%	11.0x	5.0x	5.6x	5.6x	3.5x	3.5x	0.5x	0.5x	0.5x
Valero Energy Corp	US91913Y1001	4.0%	n/a	47.6x	11.8x	43.8x	10.8x	6.3x	2.0x	1.9x	1.8x
		<b>6.9%</b>									
<b>Research Portfolio</b>											
Deltic Energy PLC	GB00B6SYKFC	0.3%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
EnQuest PLC	GB00B635TG2	0.3%	n/a	3.8x	1.6x	3.6x	2.5x	2.1x	2.1x	14.7x	2.0x
Reabold Resources PLC	GB00B95L0551	0.1%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sunpower Corp	US8676524064	0.7%	n/a	102x	56x	102x	46.5x	33.7x	256.1x	8.0x	5.5x
Maxeon Solar Technologies Ltd	SGXZ25336314	0.0%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	1.3x	1.9x
Diversified Energy Company	GB00BYX7JT7	0.5%	6.6x	6.6x	6.3x	7.8x	6.8x	4.8x	1.2x	1.2x	1.2x
		<b>1.9%</b>									
<b>Cash</b>	Cash	<b>2.8%</b>									

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 Guinness Global Energy Report

### 5. 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	2019	2020	2021	2022E
							IEA	IEA
<b>World Demand</b>	<b>95.3</b>	<b>96.4</b>	<b>98.2</b>	<b>99.5</b>	<b>100.4</b>	<b>91.9</b>	<b>97.5</b>	<b>99.6</b>
Non-OPEC supply (inc NGLs)	60.3	59.8	60.8	63.5	65.6	63.0	63.7	64.5
OPEC NGLs	5.2	5.3	5.4	5.5	5.4	5.1	5.2	5.4
<b>Non-OPEC supply plus OPEC NGLs</b>	<b>65.5</b>	<b>65.1</b>	<b>66.2</b>	<b>69.0</b>	<b>71.0</b>	<b>68.1</b>	<b>68.9</b>	<b>69.9</b>
<b>Call on OPEC (crude oil)</b>	<b>29.8</b>	<b>31.3</b>	<b>32.0</b>	<b>30.5</b>	<b>29.4</b>	<b>23.8</b>	<b>28.6</b>	<b>29.7</b>
Congo supply adjustment	0.3	0.3	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	0.2	0.2
Eq Guinea supply adjustment	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
<b>Call on OPEC-10 (crude oil)</b>	<b>29.2</b>	<b>30.7</b>	<b>31.4</b>	<b>29.9</b>	<b>28.8</b>	<b>23.2</b>	<b>28.0</b>	<b>29.1</b>

Source: Bloomberg; IEA; Guinness Global Investors

Global oil demand in 2019 was 13m b/day higher than the pre-financial crisis (2007) peak. The demand picture for 2020, down by nearly 9m b/day, was heavily clouded by the impact of the COVID-19 virus and efforts to mitigate its spread. The IEA's best estimate is that demand recovered in 2021 by around 5.6m b/day, leaving overall consumption still around 2.9m b/day below the 2019 peak.

#### 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 late 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.

#### OPEC-10 oil production to 31 March 2022

('000 b/day)	31-Dec-19	28-Feb-22	31-Mar-22	Current vs Dec 2019	Current vs last month
<b>Saudi</b>	9,730	10,170	<b>10,270</b>	540	100
Iran	2,080	2,550	<b>2,590</b>	510	40
Iraq	4,610	4,280	<b>4,260</b>	-350	-20
UAE	3,040	2,960	<b>2,980</b>	-60	20
Kuwait	2,710	2,620	<b>2,640</b>	-70	20
Nigeria	1,820	1,500	<b>1,480</b>	-340	-20
Venezuela	730	620	<b>620</b>	-110	0
Angola	1,390	1,170	<b>1,170</b>	-220	0
Libya	1,110	1,120	<b>1,050</b>	-60	-70
Algeria	1,010	980	<b>990</b>	-20	10
<b>OPEC-10</b>	<b>28,230</b>	<b>27,970</b>	<b>28,050</b>	<b>-180</b>	<b>80</b>

Source: Bloomberg; Guinness Global Investors

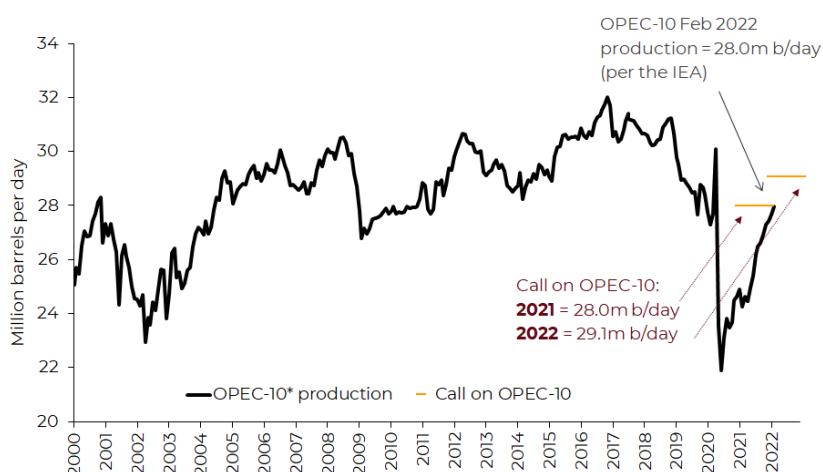
## The Guinness Global Energy Report

The 2017-19 period continued to see a volatile time for OPEC with further production cuts necessary to balance ongoing non-OPEC supply growth.

The challenge for OPEC then ballooned in 2020 with the onset of COVID around the world. Initially, OPEC and their non-OPEC partners failed to reach agreement around their response to demand from the spread of the virus, precipitating a fall-out between participants and a short-lived price war. In light of extreme oil market oversupply, OPEC and non-OPEC partners reconvened in April 2020 and confirmed a deal to cut their production by 9.7m b/day, relative to their 'baseline' production level of October 2018.

In July 2021, the OPEC+ group agreed to taper their quota cuts at 0.4m b/day until September 2022, whilst still meeting monthly to ratify each production increase in light of the prevailing conditions. The agreement gives us confidence that OPEC is looking to do 'what it takes' to keep the market in balance, despite extreme challenges in the shorter term.

### OPEC-10 apparent production vs call on OPEC 2000 – 2022



Source: IEA Oil Market Report (March 2022 and prior); Guinness estimates

OPEC's actions in recent years have generally demonstrated 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 have been designed to achieve an oil price that to some extent closes their fiscal deficit (c.\$75/bl is needed to close the gap fully), whilst not spiking the oil price too high and over-stimulating non-OPEC supply.

In the shorter term, the COVID-19 and Russia crises have created particularly challenging conditions, adding to oil price volatility. Longer term, we believe that Saudi seek a 'good' oil price, one that satisfies their fiscal needs. 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 2020, 2018, 2016, 2008, 2006, 2001 and 1998.

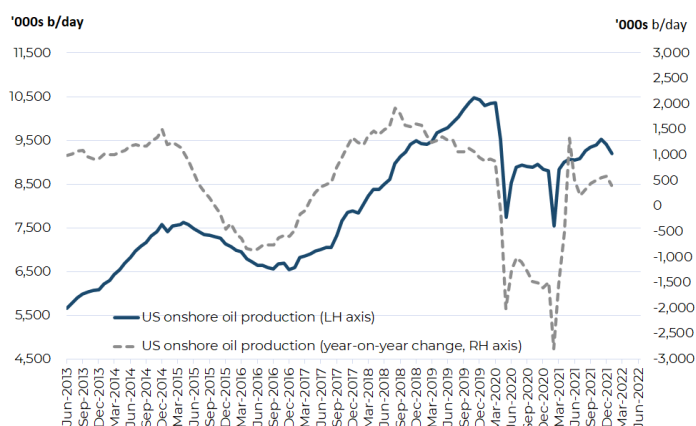
### Supply looking forward

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 1.8% p.a. from 2008-2019.

Growth in the non-OPEC region since the start of the last decade has been dominated by the 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 Guinness Global Energy Report

## US onshore oil production



Source: EIA; Guinness Global Investors

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. Our assessment is that US shale oil is a capital intensive source of oil but one where some 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. 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. During 2019 and 2020, we started to see increased pressure on US E&P companies to improve their capital discipline and to cut their reinvestment rates, and this is evidenced by higher costs of capital being charged to the US E&P companies.

The collapse in oil prices at the start of 2020 to a level well below \$50/bbl changed the landscape, with US E&P companies significantly reducing capital spending as they attempt to live within their cashflows. Despite a stronger oil price since then, the overall reduction in activity caused average US shale supply to decline in 2021. Production growth will return in 2022, albeit slower than the previous cycle, as the Russia/Ukraine crisis creates greater space again for US shale barrels in the world market.

Non-OPEC supply growth outside the US has been sustained in recent years, despite lower oil prices, with projects that were sanctioned before 2014 (when oil was \$100/bbl+) continuing to come onstream. However, with a lack of major project additions post 2020, new supply is only strong enough to offset the decline profiles of existing production, causing overall supply to stagnate.

### Demand looking forward

The IEA estimate that 2022 oil demand will rise by around 2.1m b/day to 99.7m b/day, still around 1m b/day below the 2019 pre-COVID peak. The spread of the COVID virus globally caused major restrictions to the movement of people, which has now largely reversed.

Port the COVID demand recovery, we expect the world to settle back into oil demand growth of plus or minus 1m b/day, led by increased use in Asia. 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.

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. Total vehicle miles travelled had stalled between 2007 and 2014, after two decades of growth, and are now growing again (ex-COVID effects) 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 \$50/bbl oil price, the world oil bill as a percentage of GDP is around 2.0% and this will still be a stimulant of further demand growth. If oil prices persist in 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 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 little that makes a significant dent on the consumption of gasoline and diesel in the next few years. Sales of electric



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vehicles (pure electric and plug-in hybrid electrics) globally were around 6.1m in 2021, up from 3.1m in 2020. We expect to see strong EV sales growth again in 2022, up to around 9m, or 10% of total global sales. Even applying an aggressive growth rate to EV sales, we see EVs comprising only around 2% of the global car fleet by the end of 2022. Looking further ahead, we expect the penetration of EVs to accelerate, causing global gasoline demand to peak at some point in the middle 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 around 2030.

### Conclusions about oil

The table below summarises our view by showing our oil price forecasts for WTI and Brent in 2022 versus recent history.

#### Average WTI & Brent yearly prices, and changes

Oil price (inflation adjusted)																Est
12 month MAV	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
WTI	82	104	68	84	99	94	98	93	49	45	51	65	57	40	68	87
Brent	82	103	67	84	115	112	108	99	52	45	54	72	60	42	70	90
<b>Brent/WTI (12m MAV)</b>	<b>82</b>	<b>104</b>	<b>68</b>	<b>84</b>	<b>107</b>	<b>103</b>	<b>103</b>	<b>96</b>	<b>51</b>	<b>45</b>	<b>53</b>	<b>68</b>	<b>59</b>	<b>41</b>	<b>69</b>	<b>89</b>
<b>Brent/WTI y-on-y change</b>	9%	26%	-35%	24%	27%	-4%	0%	-7%	-47%	-11%	17%	30%	-14%	-30%	68%	28%
Brent/WTI (5yr MAV)	61	75	79	82	89	93	93	99	92	80	69	63	55	53	58	65

Source: Guinness Global Investors, Bloomberg

We believe that Saudi's long-term objective remains to maintain a 'good' oil price, something north of \$70/bl. The world oil bill at around \$70/bl represents 2.8% of 2021 Global GDP, under the average of the 1970 – 2015 period (3.4%).

## ii) Natural gas market

### US gas demand

On the demand side for the US, industrial gas demand and power generation gas demand, each about 25-30% 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.

#### US natural gas demand

Bcf/day	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022E
<b>US natural gas demand:</b>											
Residential/commercial	19.2	22.4	23.4	21.4	20.5	20.9	23.4	23.5	21.3	22.2	21.9
Power generation	24.9	22.3	22.3	26.5	27.3	25.3	29.0	30.9	31.7	30.3	30.5
Industrial	19.7	20.3	20.9	20.6	21.1	21.6	23.0	23.0	22.6	23.0	23.1
Pipeline exports (Mexico)	1.8	1.9	1.9	2.7	3.8	4.0	4.6	5.1	5.4	6.1	6.3
LNG exports	-	-	-	0.1	1.0	2.6	3.4	5.7	7.3	10.3	12.6
Pipeline/plant/other	6.1	6.7	6.3	6.5	6.4	6.5	7.1	7.6	7.7	7.8	8.1
<b>Total demand</b>	<b>71.7</b>	<b>73.6</b>	<b>74.8</b>	<b>77.8</b>	<b>80.1</b>	<b>80.9</b>	<b>90.5</b>	<b>95.8</b>	<b>96.0</b>	<b>99.7</b>	<b>102.5</b>
<b>Demand growth</b>	<b>3.1</b>	<b>1.9</b>	<b>1.2</b>	<b>3.0</b>	<b>2.3</b>	<b>0.8</b>	<b>9.6</b>	<b>5.3</b>	<b>0.2</b>	<b>3.7</b>	<b>2.8</b>

Source: Guinness estimates; GS (April 2022)

Industrial demand (of which around 35% comes from petrochemicals) tends to trend up and down depending on the strength of the economy 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 2021, 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.

Total gas demand in 2021 (including Mexican and LNG exports) was around 99.7 Bcf/day, up by 3.7 Bcf/day versus 2020 and 11 Bcf/day (12%) higher than the 5-year average. The biggest contributors to the growth in demand in



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2020 were residential/commercial and LNG exports (opening of new export terminals). Power generation for gas was lower, however.

We expect US demand in 2022, assuming prices remain around \$4-5/mcf, to be up by around 3 Bcf/day. Looking further ahead to 2025, we believe that gas will take a good share of incremental power generation growth in the US and continue to take market share from coal. 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, holding the gas price lower.

The supply side fundamentals for natural gas in the US are driven by three main moving parts: onshore and offshore domestic production, pipeline imports of gas from Canada and LNG imports. Of these, onshore supply is the biggest component, making up over 90% of total supply.

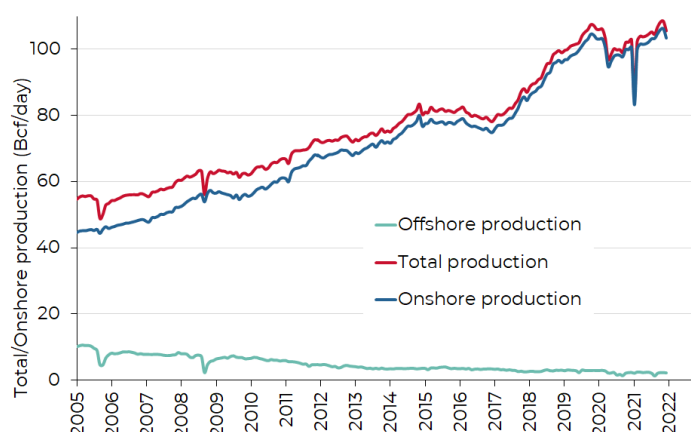
#### US natural gas supply

Bcf/day	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022E
<b>US natural gas supply:</b>											
US (onshore & offshore)	65.7	66.3	70.9	74.2	73.4	73.6	84.0	92.3	92.1	93.0	95.8
Net imports (Canada)	5.4	5.0	4.9	4.9	5.5	5.8	5.4	4.7	4.4	5.3	5.6
LNG imports & other	0.8	0.6	0.5	0.5	0.4	0.3	0.1	0.1	-	-	0.1
<b>Total supply</b>	<b>71.9</b>	<b>71.9</b>	<b>76.3</b>	<b>79.6</b>	<b>79.3</b>	<b>79.7</b>	<b>89.5</b>	<b>97.1</b>	<b>96.5</b>	<b>98.3</b>	<b>101.5</b>
<b>Supply growth</b>	<b>2.4</b>	<b>-</b>	<b>4.4</b>	<b>3.3</b>	<b>- 0.3</b>	<b>0.4</b>	<b>9.8</b>	<b>7.6</b>	<b>- 0.6</b>	<b>1.8</b>	<b>3.2</b>
<b>(Supply)/demand balance</b>	<b>- 0.2</b>	<b>1.7</b>	<b>- 1.5</b>	<b>- 1.8</b>	<b>0.8</b>	<b>1.2</b>	<b>1.0</b>	<b>- 1.3</b>	<b>- 0.5</b>	<b>1.4</b>	<b>1.0</b>

Source: EIA; GS; Guinness estimates

Over the last 10 years, 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 138 at the end of March 2022. 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.

#### US natural gross gas production 2005 – 2022 (Lower 48 States)



Source: EIA 914 data (Mar 2022 data)

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 2021 with the fall of shale oil production, but will rise again in 2022 as shale oil grows again. Generally, we expect to see rates of around 2-3 Bcf/day of associated gas per 1m b/day of oil production growth. The Marcellus/Utica region, which includes the largest producing gas field in the US and the surrounding region, reached production of around 32 Bcf/day in 2021. Moderate growth is likely in 2022.

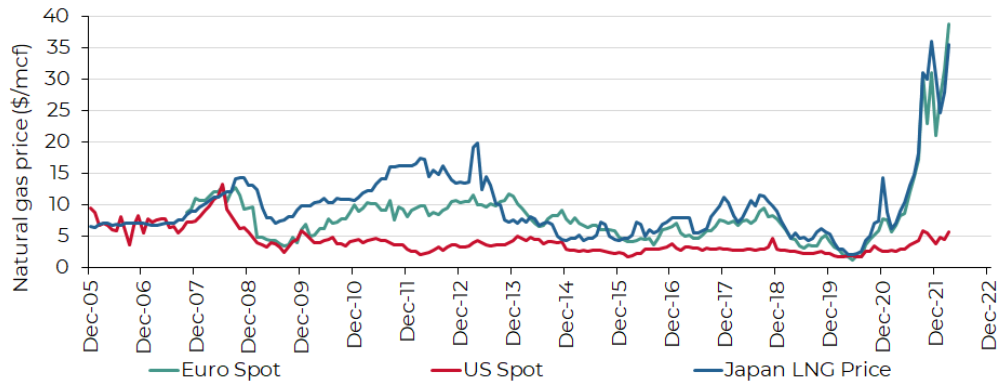
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Overall, if the price averages in the \$4-\$5/mcf range, we expect a rise in average onshore gas supply in 2022, up by around 2-3 Bcf/day versus 2021.

### 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 – has moved to a significant premium to the US gas price (c.\$30/mcf versus c.\$4-5/mcf). Asian spot LNG prices have also been extraordinarily strong, averaging over \$10/mcf in 2021 and up over \$30/mcf on a spot basis at the end of March. There have been many factors at play, in particular the strong economic recovery which is driving demand, and a shortage of Russian imports into Europe. The implied economics for US LNG exports into Europe and Asia are attractive assuming international prices are over \$7/mcf.

### International gas prices to March 2022

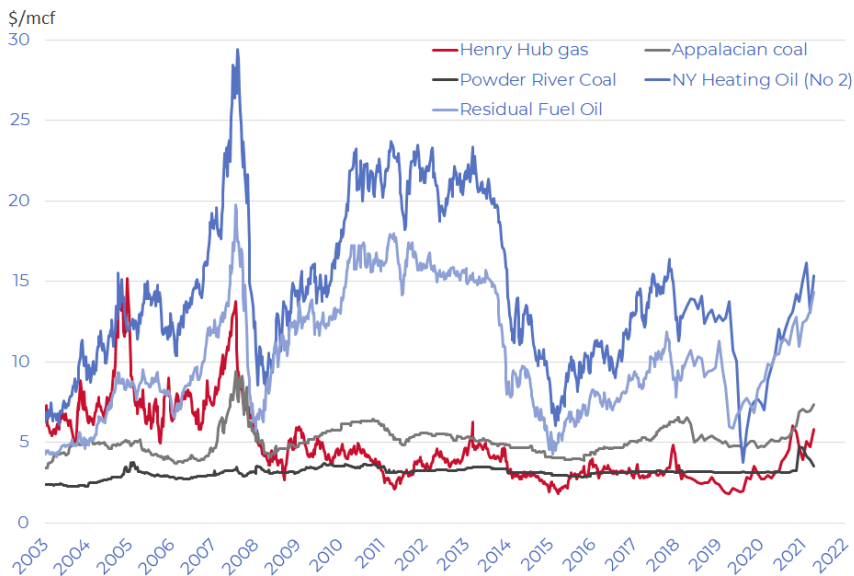


Source: Bloomberg; Guinness Global Investors (Mar 2022)

### Relationship with oil and coal

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.

### Natural gas versus substitutes (fuel oil and coal) - Henry Hub vs residual fuel oil, heating oil, Sandy Barge (adjusted) and Powder River coal (adjusted)



Source: Bloomberg; Guinness Global Investors (March 2022)

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## Conclusions about US natural gas

The US natural gas price was held back in the 2010s by continued strength in gas supply, particularly from the Marcellus/Utica and from gas produced as a by-product of shale oil. Natural gas prices averaged \$3.71/mcf in 2021, up from \$2.13/mcf in 2020, and we suspect that the (full cycle) marginal cost of supply is now around \$4/mcf. More controlled growth in associated gas supply over the next couple of years should allow gas prices to stay closer to the full cycle cost level.

## 6. APPENDIX Oil and gas markets historical context

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 three distinct periods:

- 1) **1990-1998:** 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.
- 2) **1998-2014:** 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 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.

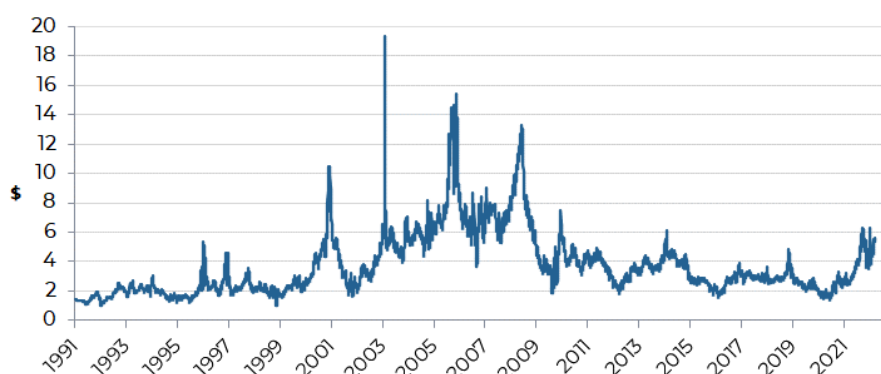
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Continued expectations of a supply crunch by the end of the decade, coupled with increased speculative activity in oil markets, contributed to the oil price surging past \$90 in the final months of 2007 and as high as \$147 by the middle of 2008. This 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.

- 3) **2014-2021:** a further downcycle in oil. Ten years of high prices leading up to 2014 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 and non-OPEC partners 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. Average prices were pinned 2017-19 in the \$50-70/bl range, with prices at the top end of this range stimulating oversupply from US shale.
- 4) The alliance between OPEC and non-OPEC partners fell apart briefly in March 2020 and, coupled with an unprecedented collapse in demand owing to the COVID-19 crisis, oil prices dropped back below \$30/bl, before recovering to around \$50/bl by the end of 2020 thanks to renewed OPEC+ action.

**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 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 Guinness Global Energy Report

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**Telephone calls** will be recorded and monitored.