

THE GUINNESS GLOBAL ENERGY REPORT

Developments and trends for investors in the global energy sector

November 2021

GUINNESS GLOBAL ENERGY FUND

*This is a marketing communication.
Please refer to the prospectus and KIID
for the Fund before making any final
investment decisions.*

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 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.

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.

HIGHLIGHTS FOR OCTOBER

OIL

WTI/Brent up on tighter market

Brent and WTI oil prices were both up in October, as a tight oil market saw oil and refined product inventories decline again. WTI closed the month up nearly \$9/bl at \$84/bl, whilst Brent rose by \$5/bl to \$84/bl. OPEC production was up in October by only 0.1m b/day, as declines in Nigeria and Angola offset planned increases elsewhere.

NATURAL GAS

US, European and Asian gas prices down but still elevated

Another month of strong demand, limited supply and low inventories have caused tight gas markets to persist and prices to remain high, albeit falling vs Sept. The European gas price (using UK NBP) fell from \$30.0/mcf to around \$20/mcf, whilst the US spot price (Henry Hub) fell \$0.5/mcf to \$5.4/mcf.

EQUITIES

Energy outperforms the broad market in October

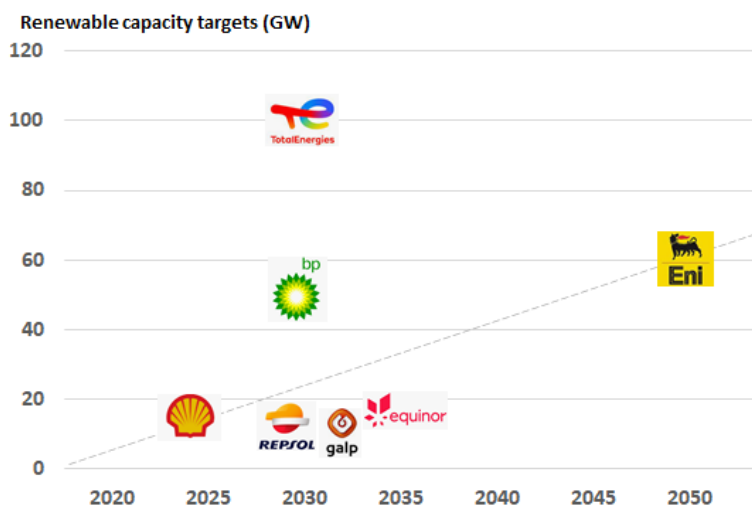
The MSCI World Energy Index (net return) rose by 8.0% in October, outperforming the MSCI World Index (net return) which rose by 5.7% over the month (all in US dollar terms).

CHART OF THE MONTH

Energy transition for the big oils

With the COP26 underway, the conference puts a spotlight on the transition of large oil & gas companies to lower carbon technologies. Large European oil & gas companies are generally putting more emphasis on renewable power, with TotalEnergies and BP leading the way. Exxon and Chevron, by contrast, are focusing more on petrochemicals (a non-combustion use for hydrocarbons) and carbon capture, exploiting the US's geological advantages in this area.

European large-cap oils: renewable energy capacity targets



Source: Morgan Stanley; Guinness Asset Management

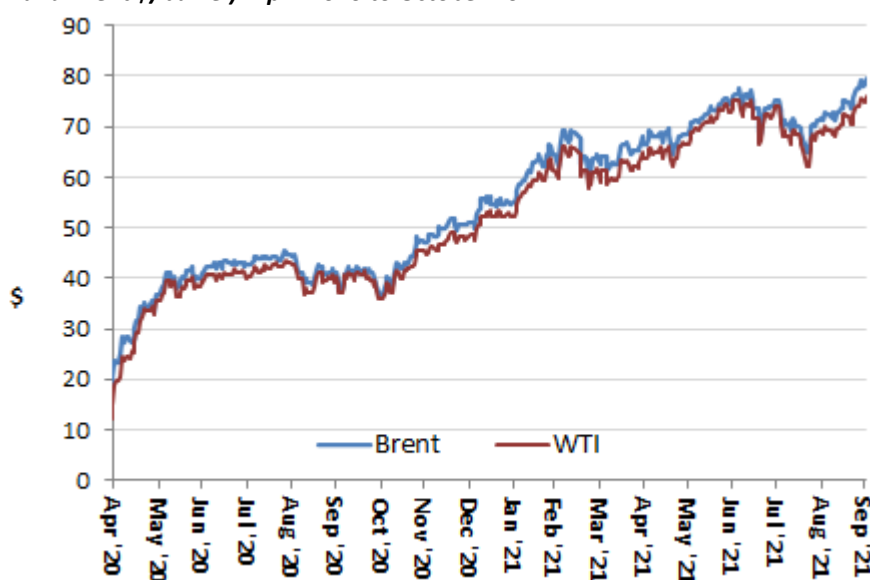
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1. OCTOBER IN REVIEW

i) Oil market

Oil price (WTI and Brent \$/barrel): April 2020 to October 2021



Source: Bloomberg LP

The West Texas Intermediate (WTI) oil price started October at \$75.0/bl and moved steadily higher over the month to reach a peak of \$84.7/bl on October 26, before slipping a little to close at \$83.6/bl. WTI has averaged \$67/bl so far in 2021, having averaged \$40/bl in 2020 and \$58/bl in 2019.

Brent oil traded in a similar shape, opening at \$78.8/bl and closing the month at \$83.9/bl. Brent has averaged \$69/bl so far in 2021, having averaged \$42/bl in 2020 and \$64/bl in 2019. The gap between the WTI and Brent benchmark oil prices narrowed sharply over the month, ending October at just \$0.35/bl. The Brent-WTI spread averaged \$3/bl in 2020.

Factors which strengthened WTI and Brent oil prices in October:

- **Oil demand stronger than expected**
 Global oil demand in October is estimated to have reached close to 100m b/day, back to the level before COVID. This is ahead of expectation, and has been driven partly by continuing economic recovery, and partly by a high level of gas-to-oil switching (c.1m b/day). These estimates imply that the oil market has sustained a deficit in recent weeks of around 2m b/day.

- **OPEC production rising more slowly than expected**

Initial estimates from Bloomberg suggest that OPEC oil production rose by around 0.12m b/day, versus stated monthly OPEC quota increases of 0.4m b/day which run from July 2021 to September 2022. Whilst the Middle Eastern members of the group increased production as expected, this was offset by declines from Nigeria, Angola and Libya. A lack of new investment in African oil over past few years is now showing up in a lack of spare capacity.

Factors which weakened WTI and Brent oil prices in October:

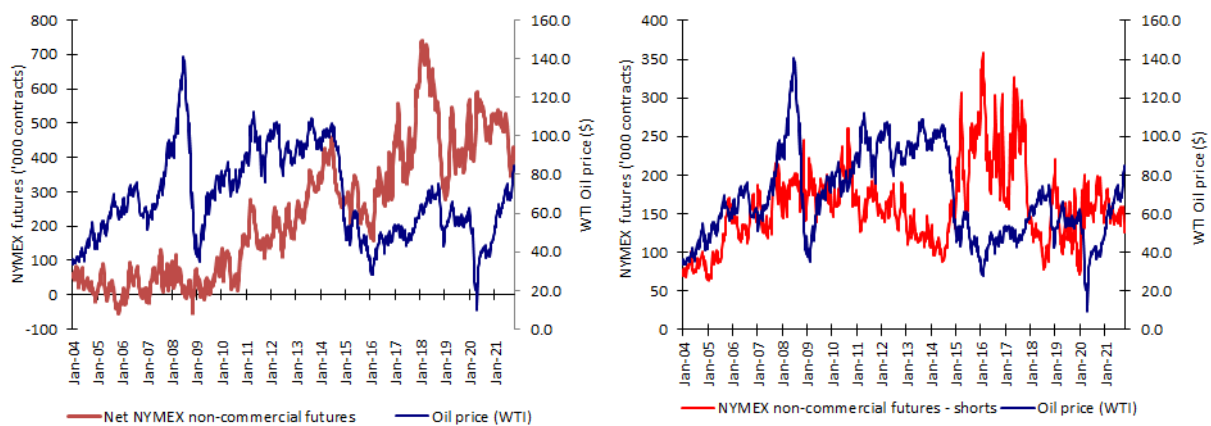
- **Rising US shale oil rig count**

The number of rigs drilling for oil in the US rose to 444 rigs in October, up from 428 at the start of the month. This implies greater US supply, albeit with a lag. We observe that the recovery in the rig count is lagging the recovery in the previous cycle (2016), by around 150 rigs. It is also notable that the rigs are mainly being added by the smaller private participants in the US market, with little change from companies in the listed sector.

Speculative and investment flows

The New York Mercantile Exchange (NYMEX) net non-commercial crude oil futures open position was 424,000 contracts long at the end of October versus 374,000 contracts long at the end of September. 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 decreased to 126,000 contracts at the end of October versus 154,000 at the end of the previous month.

NYMEX Non-commercial net and short futures contracts: WTI January 2004 – October 2021

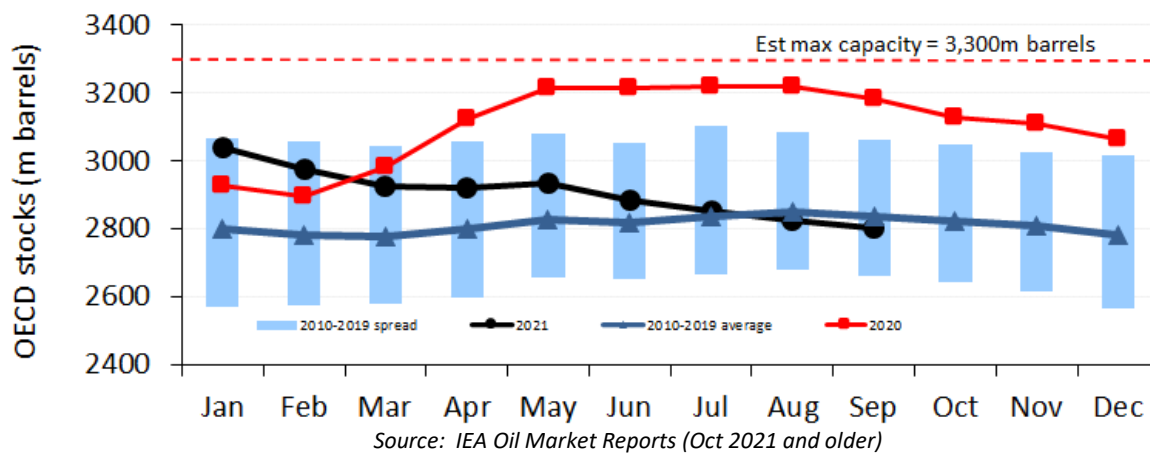


Source: Bloomberg LP/NYMEX/ICE (2021)

OECD stocks

OECD total product and crude inventories at the end of September (latest data point) were estimated by the IEA to be 2,801m barrels, down by 23 barrels versus the level reported for August. This compares to a 10-year average decrease for September of 14m barrels, implying that the OECD market was undersupplied. 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 2021

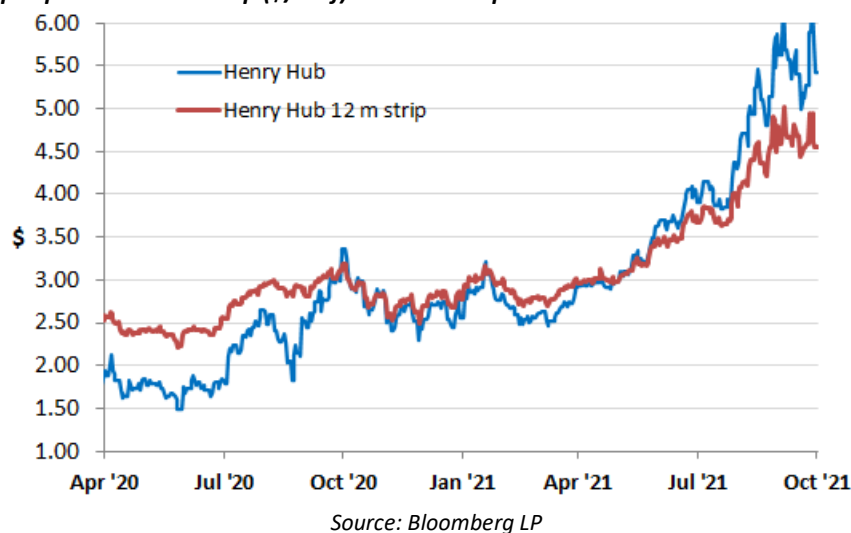


ii) Natural gas market

The US natural gas price (Henry Hub front month) opened October at \$5.87/mcf (1,000 cubic feet), dipped to \$4.99/mcf on October 18, then rallied somewhat to close at \$5.43/mcf. The spot gas price has averaged \$3.56/mcf so far in 2021, having averaged \$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 declined over the month, opening at \$4.79/mcf and closing at \$4.55/mcf. The strip price averaged \$2.54 in 2020 and \$2.60 in 2019.

Henry Hub gas spot price and 12m strip (\$/Mcf) 18 months April 2020 to Oct 2021



Factors which strengthened the US gas price in October included:

- **Lower than normal international gas inventories and stronger international demand**
High gas demand and low inventories in Europe and Asia sent international gas prices over \$30/mcf during the month. This in turn is maximising demand for exports of LNG from the US. In addition, exports of US natural gas to Mexico are strong. US inventories also sit below the 10 year average.

Factors which strengthened the US gas price in October included:

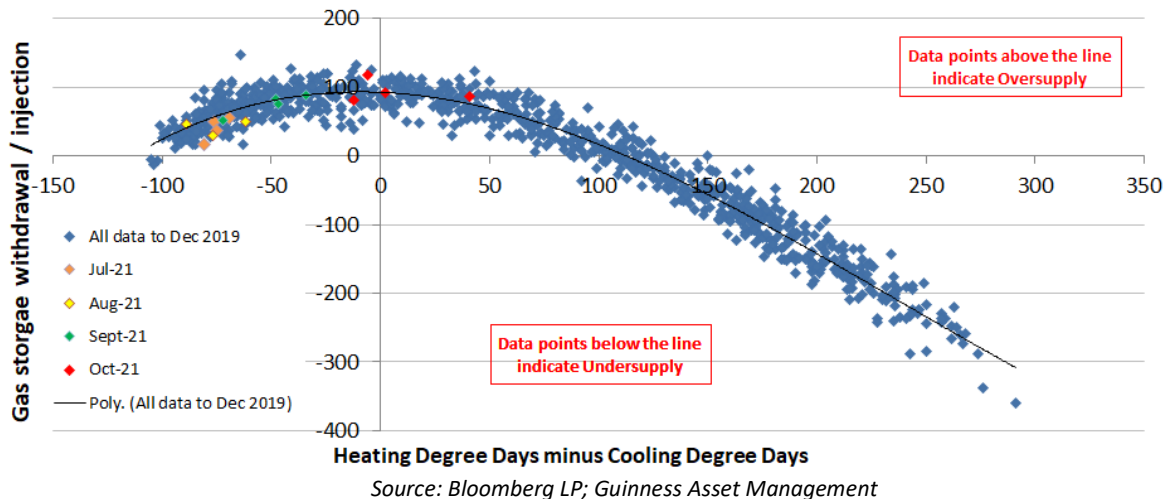
- **Market oversupplied (ex-weather effects)**

Injections into US natural gas inventories during October were higher than expected for the time of year. Adjusting for the impact of weather, the builds implied that the US gas market was, on average, around 1 Bcf/day oversupplied.

- **US onshore supply up**

The latest US natural gas production data published by the EIA (for August) indicates that onshore supply of gas has risen since the start of the year by 4.1 Bcf/day, to 104.0 Bcf/day. Despite the increase in supply so far in 2021, it has been more than outweighed by the rise in demand, coming from improving economic activity, warm summer weather and rising LNG exports.

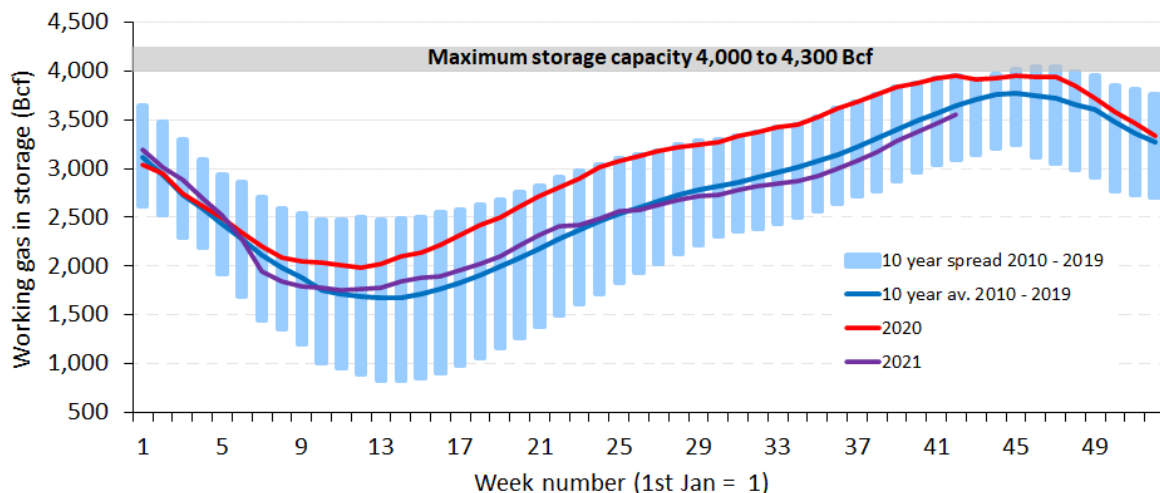
Weather adjusted US natural gas inventory injections and withdrawals



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 October were reported by the EIA to be 3.5 Tcf. Current gas in storage is around 0.1 Tcf below the 10-year average.

Deviation from 10yr gas storage norm



Source: Bloomberg; EIA (November 2021)

2. MANAGER'S COMMENTS

Energy transition for 'big oil'

With the COP26 climate conference underway, one of the main aims of the conference is to secure global net zero by mid-century and keep 1.5 degrees warming within reach. Countries are also being asked to come forward with ambitious 2030 emissions reductions targets that align with reaching net zero by 2050. Whatever the outcome, the conference puts a spotlight on the transition of large oil & gas companies to lower carbon technologies. Here, we focus on the transition plans of the large oils, and how material these plans are in the context of their existing business.

The pace of change in the oil and gas industry towards energy transition targets is accelerating. At the end of 2019, just one of the largest 15 oil and gas majors, Repsol, had announced net-zero emissions pledges by 2050. By the end of 2020, the number of companies pledging net zero by 2050 had increased to 10, including all of the European majors and, in the US, Chevron and Conocophillips. The main outlier amongst the European and US majors, then, is Exxon, who are continuing to assess the pledge.

The route to net zero for these companies will take many forms, but the key transition activities are likely to be:

- **Significant expansion of low carbon electricity divisions.** This is likely to be a combination of renewable power capacity (solar; onshore & offshore wind) and growing power retail and trading capabilities.
- **Expansion in petrochemicals.** The petrochemicals industry is relevant to the net zero route in that it forms a non-combustion market for hydrocarbons.
- **Scaling up in biofuels.** This will be a combination of renewable natural gas and renewable liquids, with various end markets particularly in power and transportation.
- **Carbon sequestration.** As carbon capture activities ramp up, these should achieve better economies of scale.
- **Green hydrogen.** Cleaner hydrogen is emerging as a key technology to decarbonise at the higher end of the cost curve, especially in power and gas-intensive industrial processes.

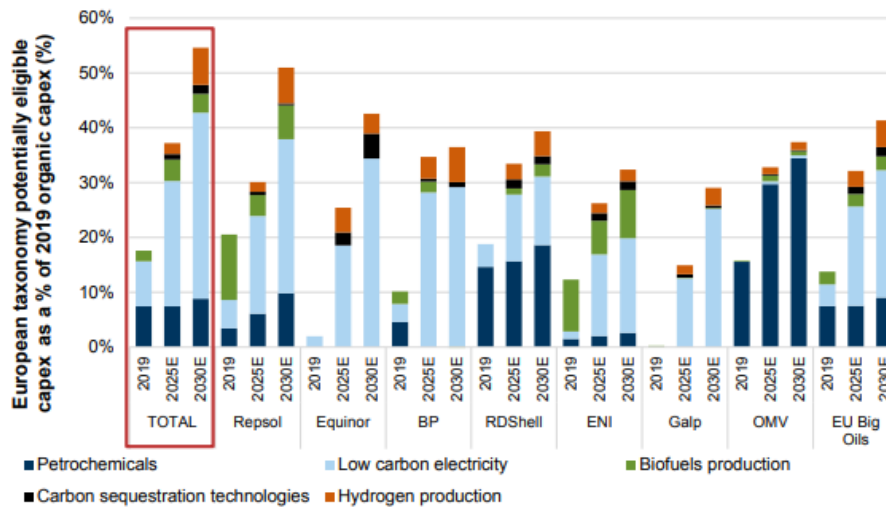
Review of the super major's transition strategies

The pace and ambition of large cap oil companies in their pursuit of renewable generation capacity varies considerably.

TotalEnergies started its transition several years ago, and in September 2021 highlighted its commitment to lead the way, becoming a net-zero corporate across all scopes by 2050. On this journey to net-zero, TotalEnergies is aiming to reduce scope 1&2 emissions by 40% by 2030, and a reduction of scope 1,2&3 emissions by 2030 (vs a 2015 baseline). The company is building out a portfolio of low-carbon technologies, including renewables (targeting 35GW gross capacity by 2025, 100GW by 2030), bioenergy (production of 2-3 mtpa by 2025), and early positions in hydrogen and CCUS.

When assessing the proportion of capex currently allocated to low carbon or energy transition projects, TotalEnergies currently sits in the middle of the pack at around 15%. However, by 2025, the company is expected to up its 'green' spending around 35% of CAPEX, rising further to over 50% in 2050, ahead of its European peers.

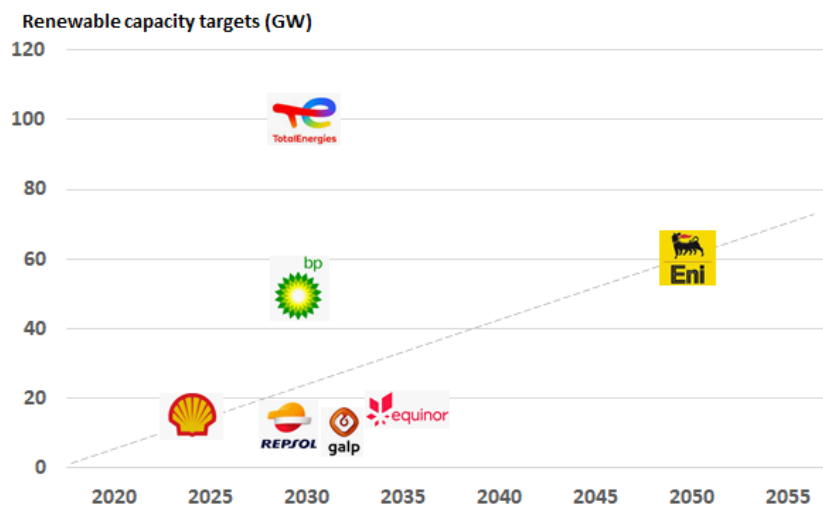
European big oils: EU taxonomy 'green' capex as a % of total capex



Source: Goldman Sachs; Guinness Asset Management

BP plans to increase its annual low-carbon investment by ten times to around \$5bn per annum in 2030, representing over 20% of their capital employed over this period. The portfolio of low carbon assets which BP develops will include renewables, bioenergy, hydrogen and carbon capture and storage (CCS). BP is also looking to expand its electricity trading arm, doubling from 250TWh in 2019 to 500TWh by 2030.

European large-cap oils: renewable energy capacity targets



Source: Morgan Stanley; Guinness Asset Management

Royal Dutch Shell is progressing on a different path to BP and Total, with less focus on a renewable power capacity target. Instead, Shell’s new energies division (formed in 2016) that is looking energetically at various options for low carbon growth, including renewable power (560TWh by 2030), EV charging (500,000 charge points by 2025) and biofuels. The company is also pursuing carbon capture (25 Mtpa of CCUS capacity by 2035), and is likely to expand more aggressively than peers into petrochemicals. By 2030 then, it is estimated that over 40% of Shell’s capex will be allocated to ‘green’ revenue aligned activities, up from around 20% today.

The European majors are significantly more progressed in their development of renewable power generation than the US majors, **ExxonMobil** and Chevron. Despite being the US's largest integrated oil & gas company, Exxon has shown little interest in investing in renewable energy technologies, and currently has no meaningful renewable generation assets. Total cumulative low carbon investment for the company in 2025 is expected to be around \$3bn, representing just 3% of CAPEX at that time. Instead, any diversification strategy that the company has is focused on reducing relative intensity of GHG emissions, advancing biofuels and developing carbon capture and storage (CCS). Notably, Exxon holds interests in around one third of the world's CCS capacity.

Similar to ExxonMobil, **Chevron**, the second US supermajor, has largely not followed the recent moves of its European peers into renewable energy capacity. Chevron did develop solar, wind and geothermal projects in the 2000s, but sold most of those positions in the mid 2010s. Whilst the company retains a small renewable portfolio consisting of legacy wind and solar projects, Chevron's New Energies business focuses instead on renewable fuels. Renewable fuel volumes are expected to treble by 2025, with the ambition of producing 100k b/day of renewable diesel and sustainable aviation fuel by 2030. The company is also investing in two of the world's largest carbon dioxide injection projects: the Quest CCS project in the Canadian oil sands and the Gorgon Project in Australia.

Exxon and Chevron's leadership in carbon sequestration makes sense given the geological advantages that North America has over parts over the world. The US and Canada both have robust sequestration capacity near CO₂ supply sources, limiting the need for expensive pipelines. In addition, around 50% of US CO₂ emissions are tied to large stationary sources (e.g. refining; industry), many of which are well suited for CCUS.

Methane reduction a key topic at COP26

Across the oil & gas industry, there will also be shorter-term 'wins' in the effort to decarbonise relating to oil and production. At COP26, for example, President Biden is outlining new measures to reduce methane emissions. In the US, the oil and gas industry is the largest industrial source of methane, responsible for around 30% of total emissions of the gas. Under the Methane Emissions Reduction Plan, the Environmental Protection Agency is proposing new regulations to intensify methane emissions reduction for new oil and gas facilities. In addition, the EPA is looking to reduce methane from existing sites, including the plugging of 'orphan' oil and gas wells and the banning of the burning of methane waste on public land.

The elimination of routine flaring, one of the key sources of methane emissions in the oil and gas industry, is already a main part of many oil companies' ESG strategies. Chevron recently noted that the company has reduced flaring by 60% since 2016, and upstream methane emissions by 50%. Some upstream companies have gone further, with large E&P company, EOG Resources, claiming that the company is now nearing the end of routine flaring. The new Methane Emissions Reduction Plan will be relevant to big oil companies, but with the progress already being made, focus may be more on the private oil & production sector, where flaring remains more prevalent.

Conclusion

For all the interest around big oils and their potential transition to renewable and other low carbon technologies, we must recognise that it will be a long journey. Even with the scale of Total's plans, for example, we estimate that only around 20-25% of the company's enterprise value in 2030 will be represented by its low-carbon business. Repsol and BP will see around 20% of their EV represented by transition activities, whilst for Exxon, Chevron and other European large cap oils, the equivalent figure is estimated to be between 5% and 15%.

A key message from the big energy integrators is that the decarbonisation process is evolving from being one dimensional (renewable power) to a multi-dimensional energy ecosystem (renewable power; biofuels; carbon capture; hydrogen) with significant interconnectivity. However, in the shorter term, we must be realistic that for this group of companies, the trajectory for oil and gas prices, plus refining and petrochemical margins, remain more important drivers of return on capital.

3. PERFORMANCE Guinness Global Energy Fund

The main index of oil and gas equities, the MSCI World Energy Index (net return), rose by 8.0% in October, while the MSCI World Index (net return) rose by 5.7%. The Fund was up by 6.5% (class Y*) in the month, underperforming the MSCI World Energy index by 1.5% (all in US dollar terms).

Within the Fund, October's strongest performers were Suncor, Imperial Oil, EOG Resources, Pioneer Resources and Chevron while the weakest performers were Galp, Helix, Repsol, Gazprom and Equinor.

*Class Y formerly named the E class. OCF remains at 0.99%.

Performance (in USD) Past performance does not predict future returns													31/10/2021	
Cumulative	YTD	1 month	3 months	6 months	1 year	3 years	5 years						From Launch (31/03/08)	
% returns														
Guinness Global Energy Fund (Class Y, 0.99% OCF)	49.1%	6.5%	20.3%	22.5%	106.5%	-11.3%	-8.1%						-27.9%	
MSCI World Energy NR Index	44.9%	8.0%	16.7%	18.5%	93.9%	-3.6%	7.0%						-3.5%	
MSCI World Small Cap Energy Index	67.2%	7.7%	24.2%	27.7%	141.2%	-16.4%	-18.7%						-54.2%	
50/50 Mix of World Energy and Small Cap Index	56.0%	7.9%	20.5%	23.1%	117.6%	-10.0%	-5.8%						-28.8%	
Calendar year	YTD	2020	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010	2009	2008**
Guinness Global Energy Fund (Class Y, 0.99% OCF)	49.1%	-34.7%	9.8%	-19.7%	-1.3%	27.9%	-27.6%	-19.1%	24.4%	3.0%	-13.7%	15.3%	61.8%	-44.8%
MSCI World Energy NR Index	44.9%	-31.5%	11.4%	-15.8%	5.0%	26.6%	-22.8%	-11.6%	18.1%	1.9%	0.2%	11.9%	26.2%	-32.8%
MSCI World Small Cap Energy Index	67.2%	-30.5%	-2.3%	-31.3%	-12.0%	37.0%	-37.3%	-33.1%	16.4%	1.4%	-9.2%	34.8%	77.5%	-54.7%
50/50 Mix of World Energy and Small Cap Index	56.0%	-31.0%	4.6%	-23.6%	-3.5%	31.8%	-30.1%	-22.3%	17.3%	1.6%	-4.5%	23.3%	51.9%	-43.8%

Source: Guinness Asset Management and Bloomberg, 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 Y (0.99% OCF) thereafter. Performance would be lower if an initial charge and/or redemption fee were included. Returns for share classes with a different OCF will vary accordingly

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 0.95% 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.guinnessfunds.com

Please contact info@guinnessfunds.com or +44 (0) 20 7222 5703 for more details

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.

4. PORTFOLIO Guinness Global Energy Fund

Buys/Sells

There were no buys and sells during the month, but the portfolio was actively rebalanced.

Sector Breakdown

The following table shows the asset allocation of the Fund at **October 31 2021**.

Asset allocation as %NAV	Current	Change	Last year end		Previous year ends						
	Oct-21		Dec-20	Dec-19	Dec-18	Dec-17	Dec-16	Dec-15	Dec-14	Dec-13	Dec-12
Oil & Gas	98.6%	3.8%	94.8%	98.3%	96.7%	98.4%	96.7%	95.1%	93.7%	93.6%	98.6%
Integrated	58.3%	2.1%	56.3%	51.1%	46.4%	42.9%	46.4%	41.5%	37.3%	38.4%	39.1%
Exploration & Production	24.3%	2.1%	22.2%	29.6%	35.8%	36.9%	35.8%	36.5%	36.2%	35.2%	41.6%
Drilling	0.0%	0.0%	0.0%	0.1%	2.2%	1.9%	2.2%	1.5%	3.3%	7.0%	7.4%
Equipment & Services	4.4%	-0.2%	4.6%	9.6%	8.6%	9.5%	8.6%	11.4%	13.4%	9.8%	7.1%
Storage & Transportation	4.5%	0.0%	4.4%	4.0%	0.0%	3.5%	0.0%	0.0%	0.0%	0.0%	0.0%
Refining & Marketing	7.2%	-0.1%	7.3%	3.8%	3.7%	3.7%	3.7%	4.2%	3.5%	3.1%	3.4%
Solar	1.7%	-0.2%	1.8%	0.7%	0.9%	1.4%	0.9%	4.7%	3.7%	2.6%	1.2%
Coal & Consumable Fuels	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Construction & Engineering	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.2%	0.6%
Cash	-0.3%	-3.7%	3.3%	1.1%	2.4%	0.2%	2.4%	0.2%	2.6%	2.6%	-0.4%

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

The Fund at end of October 2021 was on a price to earnings ratio (P/E) for 2021/2022 of 9.9x/8.2x versus the MSCI World Index at 20.2x/18.9x as set out in the following table:

As at 31 October 2021	P/E		
	2020	2021E	2022E
Guinness Global Energy Fund	62.8x	9.9x	8.2x
MSCI World Index	38.8x	20.2x	18.9x
Fund Premium/(Discount)	62%	-51%	-57%

Source: Bloomberg; Guinness Asset Management Ltd

Portfolio holdings

Our integrated and similar stock exposure (c.58%) 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 October 31 2021 the median P/E ratio of this group was 8.5x 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.24%) 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 five (pure) emerging market stocks in the main portfolio, though one is a half-position, and in total represent 13% of the portfolio. Two are classified as integrations (Gazprom and PetroChina), one as refining (Sinopec) and two as E&P companies (CNOOC and Pharos Energy). Gazprom is the Russian national oil and gas company which produces approximately a quarter of the European Union gas demand and trades on 3.8x 2021 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.

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 5% of the portfolio. The stocks we own are mainly diversified internationally (Helix 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 a recovery in refining margins.

Portfolio at September 30 2021 (for compliance reasons disclosed one month in arrears)

Guinness Global Energy Fund (30 September 2021)			P/E			EV/EBITDA			Price/Book		
Stock	ISIN	% of NAV	2020	2021E	2022E	2020	2021E	2022E	2020	2021E	2022E
Integrated Oil & Gas											
Exxon Mobil Corp	US30231G1022	4.3%	n/a	13.1x	11.6x	15.6x	6.3x	5.8x	1.5x	1.5x	1.4x
Chevron Corp	US1667641005	3.9%	n/a	14.9x	13.1x	13.2x	6.0x	5.7x	1.4x	1.4x	1.4x
Royal Dutch Shell PLC	GB00B03MLX29	4.3%	35.9x	9.0x	7.5x	7.2x	4.3x	4.1x	1.1x	1.0x	0.9x
Total SA	FR000120271	4.2%	33.2x	8.8x	8.1x	8.6x	4.5x	4.2x	1.2x	1.2x	1.1x
BP PLC	GB0007980591	4.3%	n/a	8.3x	7.5x	11.3x	4.5x	4.3x	1.3x	1.2x	1.1x
Equinor ASA	NO0010096985	4.2%	45.6x	10.0x	11.3x	5.1x	2.7x	2.8x	2.4x	2.1x	1.9x
ENI SpA	IT0003132476	3.8%	n/a	13.3x	10.5x	5.8x	3.8x	3.4x	1.0x	1.0x	1.0x
Repsol SA	ES0173516115	3.8%	51.7x	8.0x	7.2x	6.4x	4.1x	3.9x	0.7x	0.8x	0.8x
Galp Energia SGPS SA	PTGALOAM0009	3.0%	n/a	17.0x	13.2x	6.4x	4.6x	4.2x	2.2x	2.3x	2.4x
OMV AG	AT0000743059	3.9%	23.9x	7.4x	7.7x	8.6x	4.7x	4.8x	1.2x	1.1x	1.0x
		39.8%									
Integrated / Oil & Gas E&P - Canada											
Suncor Energy Inc	CA8672241079	3.5%	n/a	9.0x	7.3x	11.9x	4.3x	3.7x	1.2x	1.1x	1.0x
Canadian Natural Resources Ltd	CA1363851017	3.5%	n/a	9.1x	8.9x	12.4x	4.8x	4.4x	1.7x	1.5x	1.5x
Imperial Oil Ltd	CA4530384086	4.0%	n/a	10.0x	8.4x	34.6x	5.7x	4.9x	1.3x	1.3x	1.2x
		10.9%									
Integrated Oil & Gas - Emerging market											
PetroChina Co Ltd	CNE1000003W8	3.5%	29.6x	6.8x	7.6x	5.2x	4.0x	4.1x	0.5x	0.4x	0.4x
Gazprom PJSC	US3682872078	4.5%	232.2x	4.3x	4.4x	7.6x	3.1x	3.1x	0.6x	0.5x	0.5x
		8.0%									
Oil & Gas E&P											
ConocoPhillips	US20825C1045	4.0%	n/a	14.0x	12.2x	18.4x	5.4x	5.0x	2.4x	2.0x	1.9x
EOG Resources Inc	US26875P1012	3.9%	73.2x	10.4x	9.6x	9.9x	4.8x	4.4x	2.3x	2.0x	1.7x
Pioneer Natural Resources Co	US7237871071	3.9%	106.6x	13.5x	8.7x	20.9x	6.9x	4.8x	2.4x	1.6x	1.5x
Devon Energy Corp	US25179M1036	4.6%	n/a	12.5x	8.9x	18.4x	5.7x	4.6x	4.2x	3.8x	2.4x
		16.4%									
International E&Ps											
CNOOC Ltd	HK0883013259	2.1%	13.1x	4.7x	4.5x	3.4x	2.0x	1.8x	0.7x	0.7x	0.6x
Pharos Energy PLC	GB00B572ZV91	0.2%	n/a	n/a	8.0x	1.9x	2.4x	1.2x	n/a	n/a	n/a
		2.2%									
Midstream											
Enbridge Inc	CA29250N1050	4.1%	20.6x	18.0x	16.1x	13.6x	13.0x	11.8x	1.7x	1.9x	1.9x
		4.1%									
Equipment & Services											
Schlumberger Ltd	AN8068571086	3.5%	46.1x	23.9x	16.7x	12.9x	11.1x	9.3x	3.4x	3.1x	2.7x
Helix Energy Solutions Group Inc	US42330P1075	0.6%	n/a	n/a	n/a	4.4x	7.1x	6.3x	0.3x	n/a	n/a
		4.1%									
Oil & Gas Refining & Marketing											
China Petroleum & Chemical Corp	CNE1000002Q2	2.9%	11.0x	5.6x	5.8x	5.6x	3.7x	3.6x	0.5x	0.5x	0.5x
Valero Energy Corp	US91913Y1001	3.6%	n/a	n/a	14.6x	40.3x	12.0x	6.7x	1.7x	1.7x	1.6x
		6.5%									
Research Portfolio											
Deltic Energy PLC	GB00B65YKF01	0.3%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
EnQuest PLC	GB00B635TG28	0.6%	n/a	3.4x	1.7x	3.4x	2.1x	1.9x	2.3x	n/a	n/a
JKX Oil & Gas PLC	GB0004697420	0.2%	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
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	1.0%	n/a	69.1x	39.4x	140.6x	38.1x	26.3x	324.0x	8.1x	6.6x
Maxeon Solar Technologies Ltd	SGXZ25336314	0.1%	n/a	n/a	n/a	n/a	n/a	163.4x	n/a	1.5x	2.1x
Diversified Energy Company	GB00BYX7JT74	0.5%	6.7x	14.9x	9.7x	7.3x	6.6x	5.6x	1.2x	1.4x	1.4x
		2.9%									
Cash											
Cash	Cash	5.1%									
Portfolio											
		100.0%	63.4x	10.4x	9.1x	9.4x	4.9x	4.5x	1.3x	1.3x	1.2x

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.

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	2021E	2022E
							IEA	IEA
World Demand	95.3	96.4	98.2	98.8	99.5	90.8	96.3	99.6
Non-OPEC supply (inc NGLs)	60.3	59.8	60.8	63.5	65.6	63.0	63.6	66.6
OPEC NGLs	5.2	5.3	5.4	5.5	5.4	5.2	5.3	5.5
Non-OPEC supply plus OPEC NGLs	65.5	65.1	66.2	69.0	71.0	68.2	68.9	72.1
Call on OPEC (crude oil)	29.8	31.3	32.0	29.8	28.5	22.6	27.4	27.5
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
Call on OPEC-10 (crude oil)	29.2	30.7	31.4	29.2	27.9	22.0	26.8	26.9

Source: Bloomberg; IEA; Guinness Asset Management

Global oil demand in 2019 was 13m 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 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 will recover this year by around 5.5m b/day, leaving overall consumption on a par with 2016 but still around 3.2m 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 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.

OPEC-10 oil production to 31 Oct 2021

('000 b/day)	31-Dec-19	30-Sep-21	31-Oct-21	Current vs Dec 2019	Current vs last month
Saudi	9,730	9,690	9,810	80	120
Iran	2,080	2,500	2,530	450	30
Iraq	4,610	4,130	4,180	-430	50
UAE	3,040	2,800	2,840	-200	40
Kuwait	2,710	2,480	2,500	-210	20
Nigeria	1,820	1,500	1,440	-380	-60
Venezuela	730	540	540	-190	0
Angola	1,390	1,170	1,100	-290	-70
Libya	1,110	1,140	1,120	10	-20
Algeria	1,010	930	940	-70	10
OPEC-10	28,230	26,880	27,000	-1,230	120

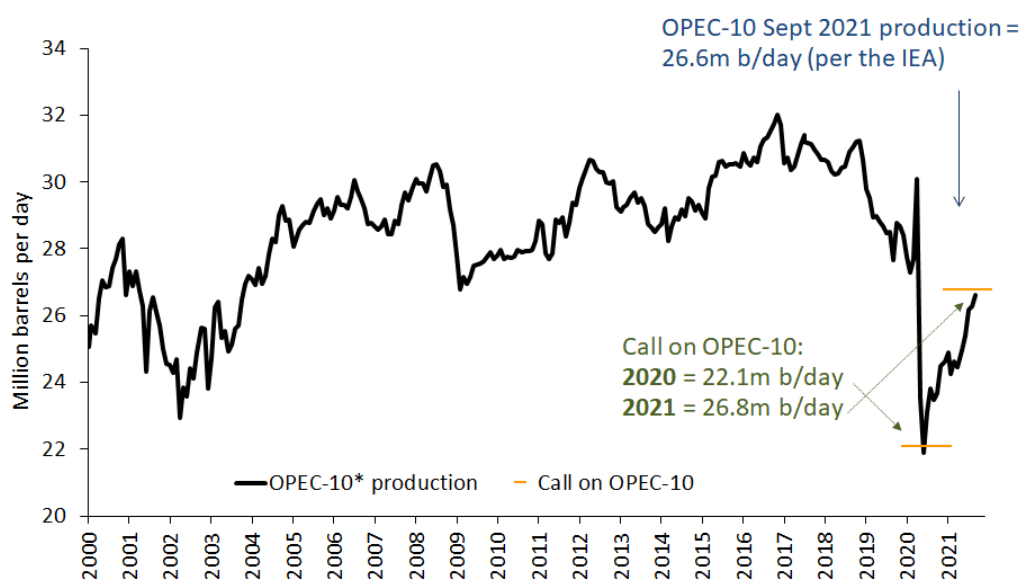
Source: Bloomberg; Guinness Asset Management

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 – 2021



Source: IEA Oil Market Report (Sept 2021 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.\$70/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 crisis has created particularly challenging conditions. Longer term, however, we believe that Saudi seek a ‘good’ oil price, well in excess of current levels to balance their fiscal needs, but they realise that patience is required to achieve that goal.

Overall, we reiterate two important criteria for Saudi:

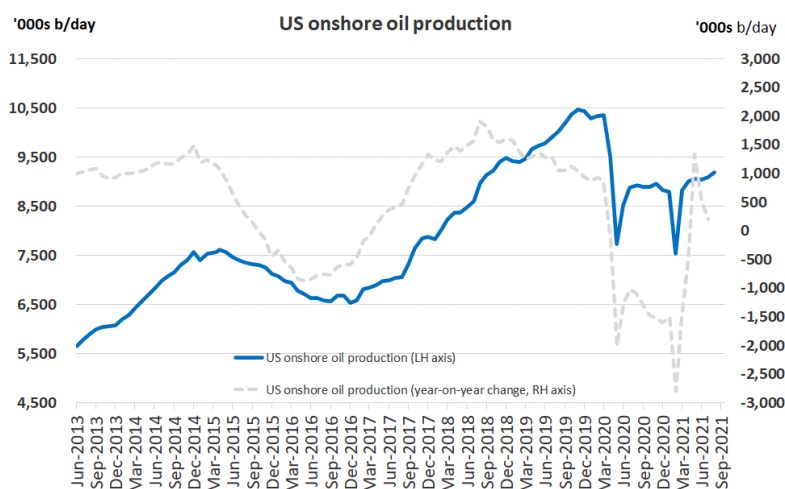
1. Saudi is interested in the average price of oil that they get, they have a longer investment horizon than most other market participants
2. Saudi wants to maintain a balance between global oil supply and demand to maintain a price that is acceptable to both producers and consumers

Nothing in the market in recent years has changed our view that OPEC can put a floor under the price – as they did in 2018, 2016, 2008, 2006, 2001 and 1998. Saudi’s desire for a \$60 oil price floor is not dimmed.

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.



Source: EIA; Guinness Asset Management

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/bl 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 will cause US shale supply to decline in 2021.

Non-OPEC supply growth outside the US has been sustained in recent years, despite lower oil prices, since projects that were sanctioned before 2014 (when oil was \$100/bl+) have continued to come onstream. However, the slowdown in investment post 2014 creates the likelihood that non-OPEC (ex-US) production will struggle to grow into the start of the 2020s. On a ten-year view, it is interesting to note that non-OPEC (ex-US) has essentially been flat (excluding the fall in early 2020 as a result of voluntary curtailments amid the COVID-19 demand shock), as new investment has simply offset the decline profiles of existing production.

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 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 as only being viable at high oil prices.

Demand looking forward

The IEA estimate that 2022 oil demand will rise by around 3.3m b/day to 99.6m b/day, back just above the 2019 pre-COVID peak. The spread of the COVID virus globally caused major restrictions to the movement of people, which are now lifting.

After a sharp demand recovery in 2021 and 2022, we then 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/bl 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 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 little 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 3.1m in 2020, up from 2.3m in 2019. We expect to see strong EV sales growth again in 2021, up to around 4.4m, or 5% 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 2021 versus recent history.

Average WTI & Brent yearly prices, and changes

Oil price (inflation adjusted)																		Est
12 month MAV	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
WTI	49	66	75	82	104	68	84	99	94	98	93	49	45	51	65	57	40	67
Brent	46	64	75	82	103	67	84	115	112	108	99	52	45	54	72	60	42	70
Brent/WTI (12m MAV)	48	65	75	82	104	68	84	107	103	103	96	51	45	53	68	59	41	69
Brent/WTI y-on-y change (%)	30%	37%	15%	9%	26%	-35%	24%	27%	-4%	0%	-7%	-47%	-11%	17%	30%	-14%	-30%	67%
Brent/WTI (5yr MAV)	37	42	51	61	75	79	82	89	93	93	99	92	80	69	63	55	53	58

Source: Guinness Asset Management, Bloomberg

We believe that Saudi's long-term objective remains to maintain a 'good' oil price, something north of \$60/bl. The world oil bill at around \$60/bl represents 2.5% of 2021 Global GDP, 26% under the average of the 1970 – 2015 period (3.4%).

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	2021E	2022E
US natural gas demand:											
Residential/commercial	19.2	22.4	23.4	21.4	20.5	20.9	23.4	23.5	21.3	22.2	22.0
Power generation	24.9	22.3	22.3	26.5	27.3	25.3	29.0	30.9	31.7	30.3	31.2
Industrial	19.7	20.3	20.9	20.6	21.1	21.6	23.0	23.0	22.6	23.0	23.6
Pipeline exports (Mexico)	1.8	1.9	1.9	2.7	3.8	4.0	4.6	5.1	5.4	6.1	6.4
LNG exports	-	-	-	0.1	1.0	2.6	3.4	5.7	7.3	10.3	10.9
Pipeline/plant/other	6.1	6.7	6.3	6.5	6.4	6.5	7.1	7.6	7.7	7.8	8.0
Total demand	71.7	73.6	74.8	77.8	80.1	80.9	90.5	95.8	96.0	99.7	102.1
Demand growth	3.1	1.9	1.2	3.0	2.3	0.8	9.6	5.3	0.2	3.7	2.4

Source: Guinness estimates; GS (Nov 2021)

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 2020, 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 2020 (including Mexican and LNG exports) was around 96.5 Bcf/day, down by 0.6 Bcf/day versus 2019 but 11 Bcf/day (13%) higher than the 5 year average. The biggest contributors to the growth in demand in 2020 were power generation (numerous gas plants increasing gas' share over coal) and LNG exports (opening of new export terminals). Commercial demand for gas was lower, however.

We expect US demand in 2021, assuming prices remain around \$2.75/mcf, to be up by around 4 Bcf/day. The key change is a ramp up of LNG exports (+3 Bcf/day vs 2020, thanks to new terminals coming into full operation and arbitrage between US and European gas prices looking better).

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.

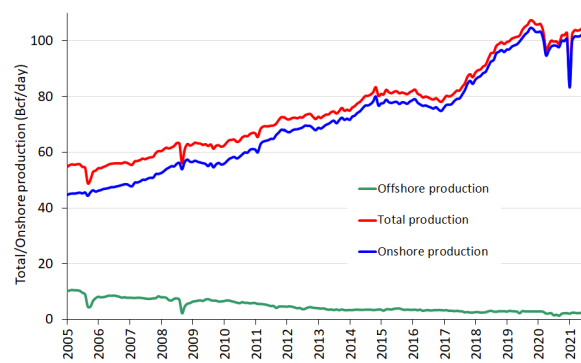
US natural gas supply

Bcf/day	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021E	2022E
US natural gas supply:											
US (onshore & offshore)	65.7	66.3	70.9	74.2	73.4	73.6	84.0	92.3	92.1	93.0	96.7
Net imports (Canada)	5.4	5.0	4.9	4.9	5.5	5.8	5.4	4.7	4.4	5.3	5.3
LNG imports & other	0.8	0.6	0.5	0.5	0.4	0.3	0.1	0.1	-	-	0.1
Total supply	71.9	71.9	76.3	79.6	79.3	79.7	89.5	97.1	96.5	98.3	102.1
Supply growth	2.4	-	4.4	3.3	- 0.3	0.4	9.8	7.6	- 0.6	1.8	3.8
(Supply)/demand balance	- 0.2	1.7	- 1.5	- 1.8	0.8	1.2	1.0	- 1.3	- 0.5	1.4	-

Source: EIA; Simmons; 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 97 at the end of August 2021. 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 – 2021 (Lower 48 States)



Source: EIA 914 data (November 2021 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 2020 with the fall of shale oil production, and with US oil supply now flattening, so associated gas production has also moderated. Generally, we expect to see rates of around 2-3 Bcf/day of associated gas per 1m b/day of oil production growth.

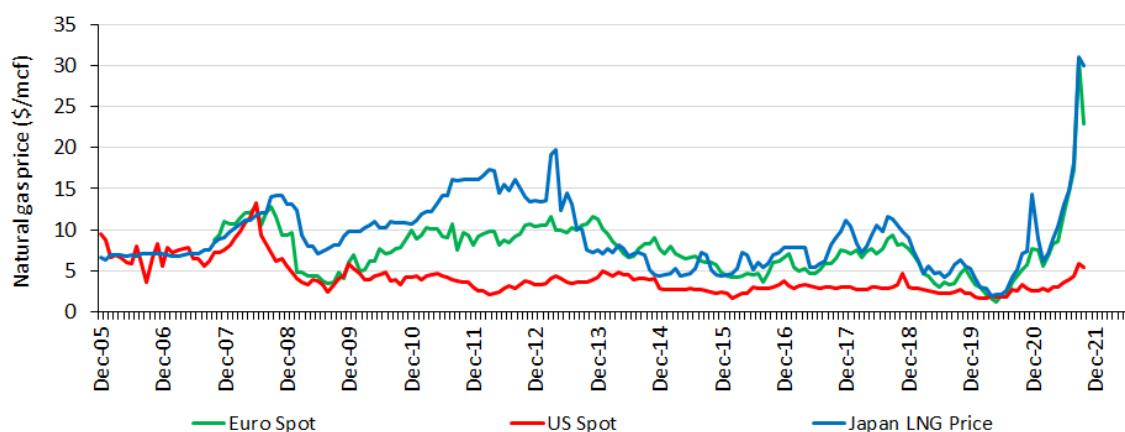
The Marcellus/Utica region, which includes the largest producing gas field in the US and the surrounding region, reached production of around 32 Bcf/day in 2020. Moderate growth is likely in 2021.

Overall, if the price averages in the \$3-\$4/mcf range, we expect a small rise in average onshore gas supply in 2021, up by around 1 Bcf/day versus 2020.

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.\$20/mcf versus c.\$6/mcf). Asian spot LNG prices have also been extraordinarily strong, averaging over \$10/mcf in 2021 and also up over \$30/mcf on a spot basis at the end of October. There have been many factors at play, in particular the strong economic recovery which is driving demand, and a shortage of coal supply in China which is causing China to pull in additional LNG. The implied economics for US LNG exports into Europe and Asia are attractive assuming international prices are over \$7/mcf.

International gas prices to Oct 2021



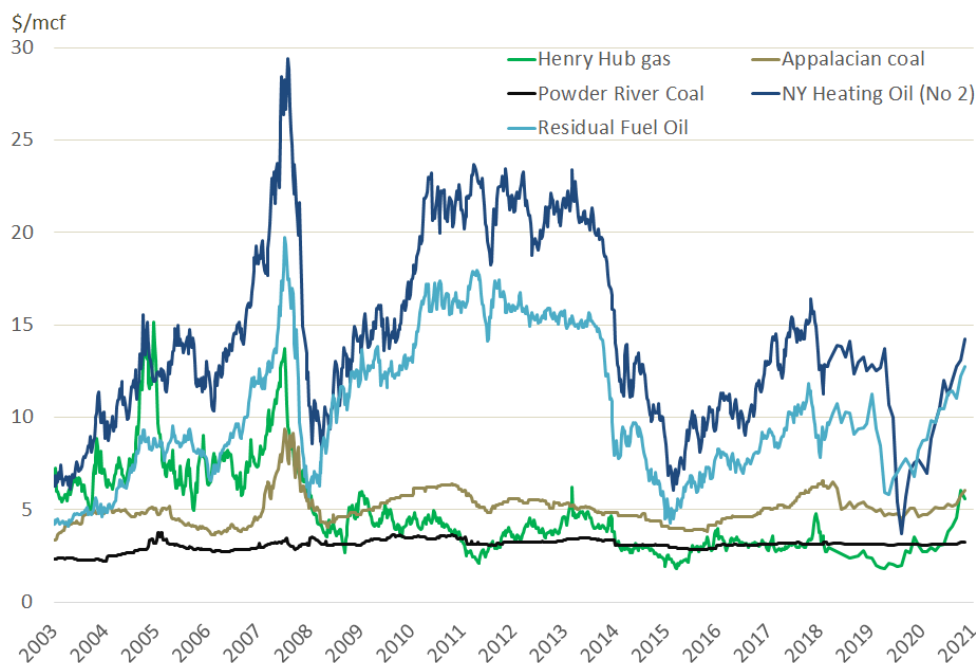
Source: Bloomberg (Nov 2021)

Relationship with oil and coal

The oil/gas price ratio (\$ per bbl WTI/\$ per mcf Henry Hub) of around 19x at the end of October 2021 sits 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.

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



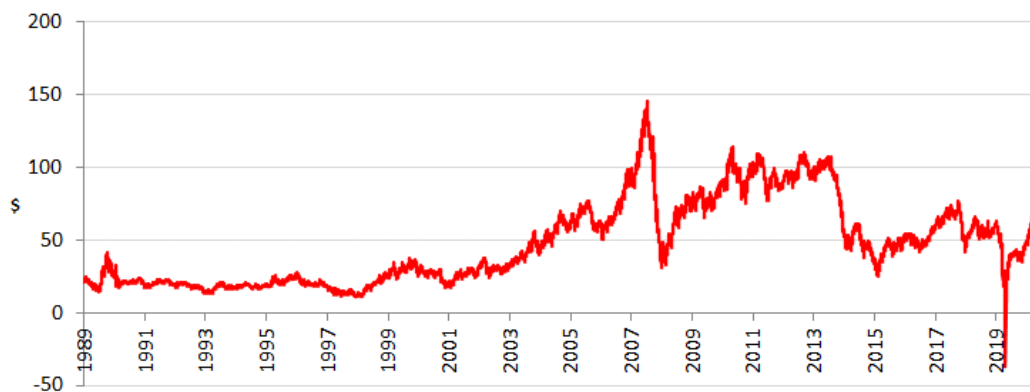
Source: Bloomberg; Guinness Asset Management (Nov 2021)

Conclusions about US natural gas

The US natural gas price was held back over the last decade 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 \$2.13/mcf in 2020, but we suspect that the (full cycle) marginal cost of supply is now around \$4/mcf. A drop in associated gas supply over the next couple of years, thanks to lower oil prices, should allow gas prices to normalise closer to the full cycle cost level, though a tight market in the short term has pushed the price higher.

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.

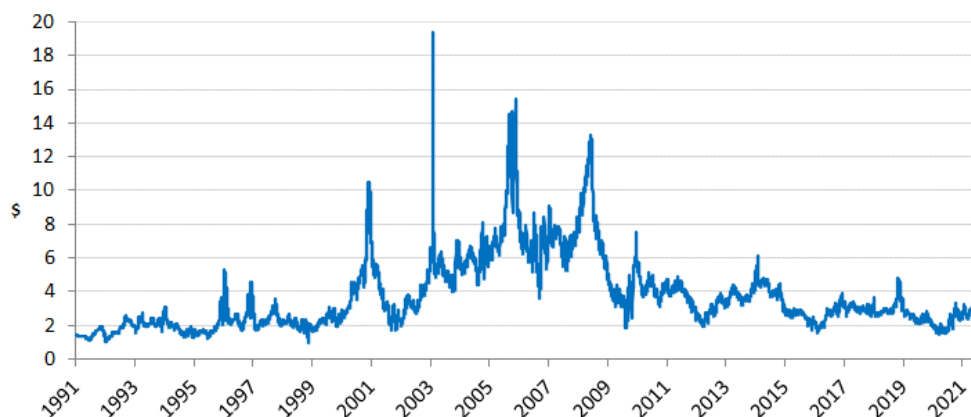
Continued expectations of a supply crunch by the end of the decade, coupled with increased speculative activity in oil markets, contributed to the oil price surging past \$90 in the final months of 2007 and as high as \$147 by the middle of 2008. This spike was brought to an abrupt end by the collapse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

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.

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