# The Guinness Global Energy Report

GUINNESS GLOBAL INVESTORS

**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.*

**December 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 analysts Jamie Melrose and Dan Hobster. 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 NOVEMBER

### OIL

**Brent/WTI fall as demand destruction concerns build**

Brent and WTI spot oil prices declined in November, driven by another COVID spike in China and a lower-than-expected price cap announcement on Russian oil. Brent and WTI closed the month at $87/bl and $81/bl, down by $11/bl and $6/bl respectively. Five-year forward prices rose modestly by around $1/bl, Brent closing at $72/bl and WTI at $65/bl.

### NATURAL GAS

**US, European and Asian gas prices decline**

The Asian and European gas prices (using UK NBP) closed November at $39/$43/mcf, whilst the US spot price (Henry Hub) rose to $6.9/mcf. European gas inventories have filled well over the past few weeks and have returned to the five-year average. Against this, sabotage on the Nordstream gas pipelines in late September has reduced the prospect of Russian gas flows recovering to previous levels.

### EQUITIES

**Energy underperforms the broad market in November**

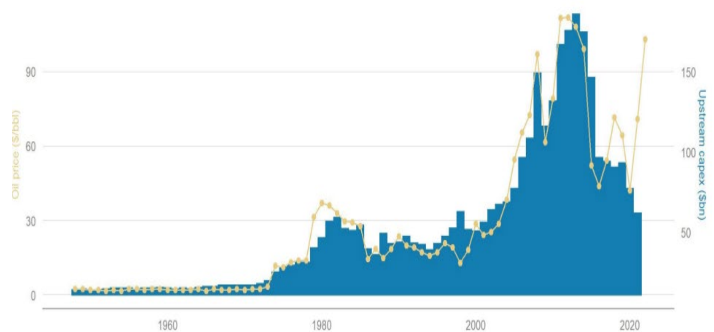
The MSCI World Energy Index (net return) rose by 3.1% in November, underperforming the MSCI World Index (net return) which rose 7.2% over the month (all in US dollar terms).

### CHART OF THE MONTH

**Upstream capex**

Historically there has been a strong correlation between oil prices and the capex spend of the oil majors. As the chart below shows, this has materially disconnected in the last few years, suggesting underinvestment (positive for oil prices) as well as, possibly, a brighter outlook for our oil service holdings.

Upstream capex vs oil price




*Source: Morgan Stanley*

## The Guinness Global Energy Report

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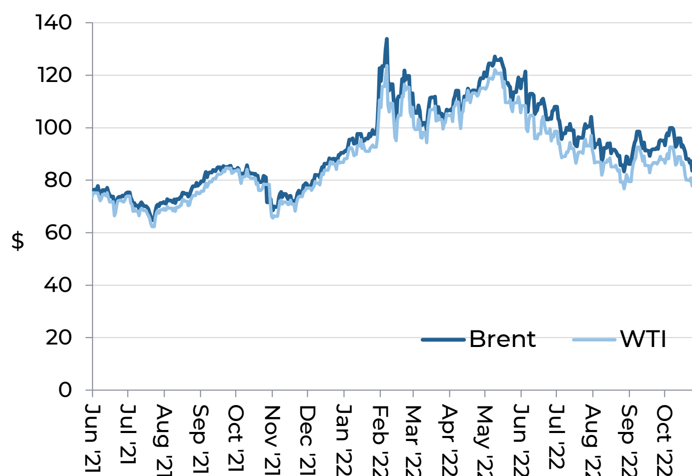
## 1. NOVEMBER IN REVIEW

### i) Oil market

***Oil price (WTI and Brent $/barrel): June 2021 to November 2022***




*Source: Bloomberg; Guinness Global Investors*

The West Texas Intermediate (WTI) oil price started November at $87/bl, declining over the month to reach a low of $78/bl on November 23, before closing slightly higher at $81/bl. WTI has averaged $96/bl so far this year, having averaged $68/bl in 2021, $40/bl in 2020 and $57/bl in 2019.

Brent oil traded in a similar shape, opening at $98/bl, troughing at $82/bl and closing the month at $87/bl. Brent has averaged $102/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 compressed slightly over the month, ending November at just $6/bl. The Brent-WTI spread averaged $2.4/bl in 2021.

**Factors which strengthened WTI and Brent oil prices in November:**

- **OPEC+ output well behind quotas**

  In theory, OPEC+ production should have grown by around 3.7m b/day so far this year, representing quota increases of 0.4m b/day per month up to June, then 0.6m b/day in July and August. In reality, the group's production is up by around 1.8m b/day, with a decline from Russia and anaemic growth from many OPEC members contributing to the result. OPEC+ met on October 5 and agreed a headline 2m b/day quota cut, which translated into an actual production cut of around 1m b/day in November. OPEC provided two reasons for the cut: first, a micromanagement of short-term demand weakness, and second, a push for higher prices to incentivise new investment. At its meeting on December 4, OPEC+ decided to maintain current production quotas.

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

OECD total product and crude inventories at the end of October (latest data point) were estimated by the IEA to be 2,718m barrels, up by 8m barrels versus the level reported for September. The inventory level reported for October is around 4% below the 10-year average, and close to the bottom of the 10-year range. Low inventories were a key catalyst for the US and other IEA members in March to announce record releases from Strategic Petroleum Reserves.

- **Nordstream pipeline sabotage likely to increase gas-to-oil switching**

On September 26, pressure on the Nordstream 1 and 2 natural gas pipelines dropped significantly. It became clear that the pressure drop was caused by explosions on both pipelines, occurring in international waters. Neither pipeline was actively supplying gas, but we see this activity by Russia as i) a warning shot that Europe's offshore pipeline system is vulnerable, and ii) Russia's effort to maintain a high price for its gas flowing via other routes. Sabotage of the Nordstream pipelines will also boost gas-to-oil switching, which is currently running globally at around 1.3m b/day.

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

- **Global GDP slowdown**

Global economic forecasts deteriorated further during the month; following the IMF GDP cuts earlier in the year, the latest round of PMI releases (a key lead indicator for GDP) showed a broad deterioration in the Global economy. On the November data, geographies which had formerly been weak (Emerging Markets and the Eurozone) largely stayed weak, while countries which had thus far been faring reasonably (namely the US) dipped into recessionary territory, leading to negative sentiment on oil demand.

- **COVID surge in China**

After stop/start lockdowns in China throughout the course of 2022, hopes of a near-term re-opening were dashed during the month as COVID cases spiked to more than 30,000/day (the second highest level of the year) suggesting further demand weakness in the short term. The IEA are currently forecasting Chinese demand for 2022 to average 15.0m b/day, the first annual drop in consumption of oil in the last thirty years, with a 1m b/day positive inflection forecast for 2023.

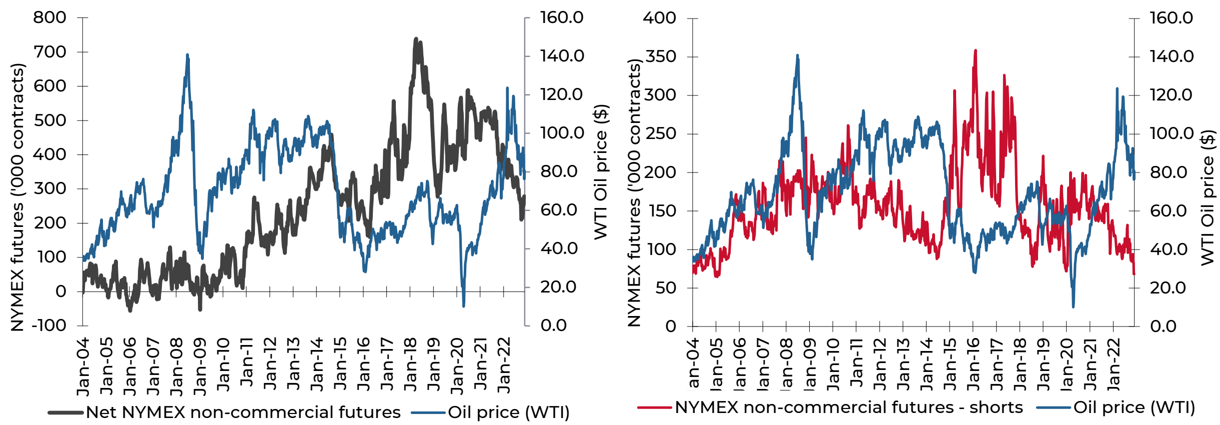
- **Russia price caps**

Following months of speculation, the G-7 finally announced a price cap on Russian crude at $60 per barrel. This came in somewhat higher than market expectations of around $40-50/bl, leading to concerns that there would be more Russian crude supply than initially anticipated. As we discuss later in our Managers Comments, while we expect some of these barrels to make their way to end markets such as China, India and Turkey, ultimately Russian crude already accounts for a large percentage of imports in such end markets. Increasing it further runs the risk of processing issues within the local refining complex.

### Speculative and investment flows

The New York Mercantile Exchange (NYMEX) net non-commercial crude oil futures open position was 252,500 contracts long at the end of November versus 249,000 contracts long at the end of October. 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 declined to 68,000 contracts at the end of November versus 83,000 at the end of the previous month.

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

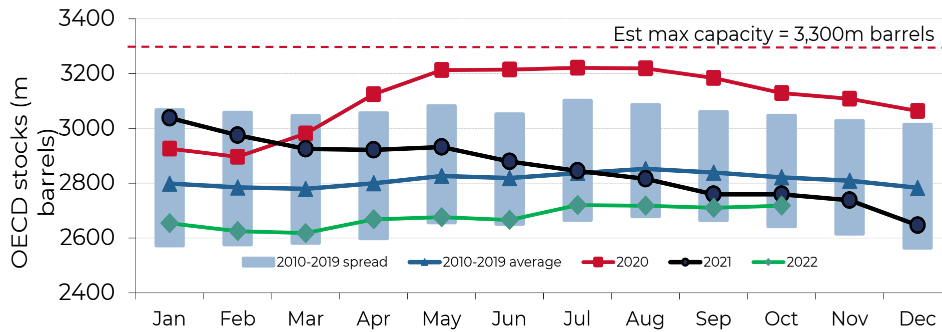



*Source: Bloomberg LP/NYMEX/ICE (2022)*

### OECD stocks

OECD total product and crude inventories at the end of October (latest data point) were estimated by the IEA to be 2,718m barrels, up by 8m barrels versus the level reported for September. This compares to a 10-year average draw for October of 17m barrels, implying that the OECD market was oversupplied. 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 (November 2022 and older)*

## ii) Natural gas market

The US natural gas price (Henry Hub front month) opened November at $5.71/mcf (1,000 cubic feet) and increased over the month to a peak of $7.31/mcf before closing at $6.93/mcf. The spot gas price has averaged $6.59/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, increasing from $5.13/mcf to $5.72/mcf. The strip price has averaged $5.98/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): February 2021 to November 2022***

*Source: Bloomberg LP*

**Factors which strengthened the US gas price in November included:**

- **Higher thermal coal prices**

Thermal coal prices in the north-east of the US rose again in November, as coal supply is pulled into a strong export market. This in turn has raised the switching price for US utilities between natural gas and coal.

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

High gas demand in Europe and Asia held international gas prices above $25/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 (assuming Freeport LNG returns to service).

- **Slight decline in onshore gas supply**

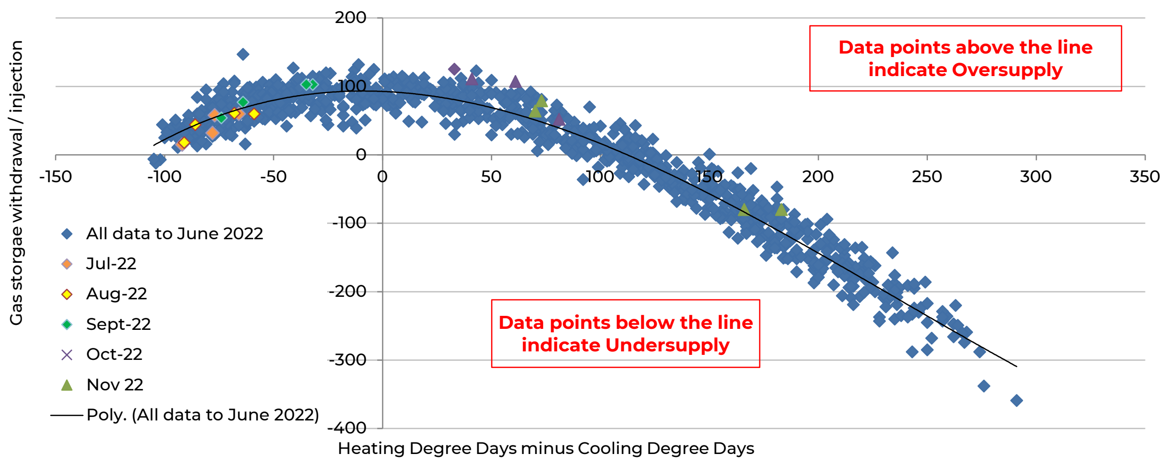
EIA 914 data released at the start of November indicates that September 2022 onshore gas production in the US fell by around 2.5 Bcf/day, to 105.4 Bcf/day. This takes year-on-year growth in US onshore supply up by around 1.8 Bcf/day (+1.7%).

**Factors which weakened the US gas price in November included:**

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

Draws from US natural gas inventories during November were lower than expected for the time of year. However, adjusting for the impact of weather, the draws implied that the US gas market was, on average, nearly 4 Bcf/day oversupplied.

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

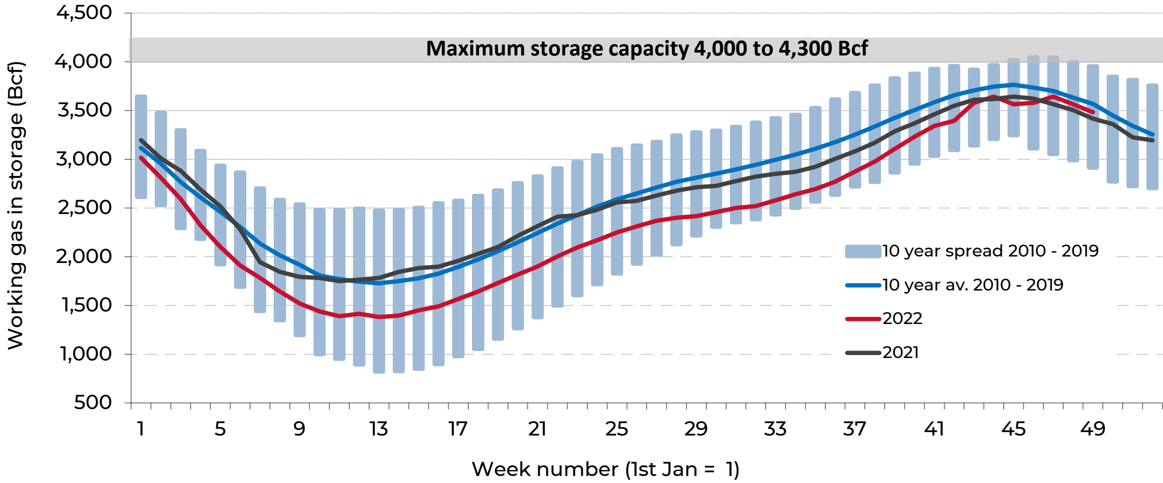



*Source: Bloomberg LP; Guinness Global Investors*

### 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 November were reported by the EIA to be 3.5 Tcf. Current gas in storage is around 0.2 Tcf below the 10-year average.

***Deviation from 10yr gas storage norm***




*Source: Bloomberg; EIA (Nov 2022)*

## 2. MANAGER'S COMMENTS

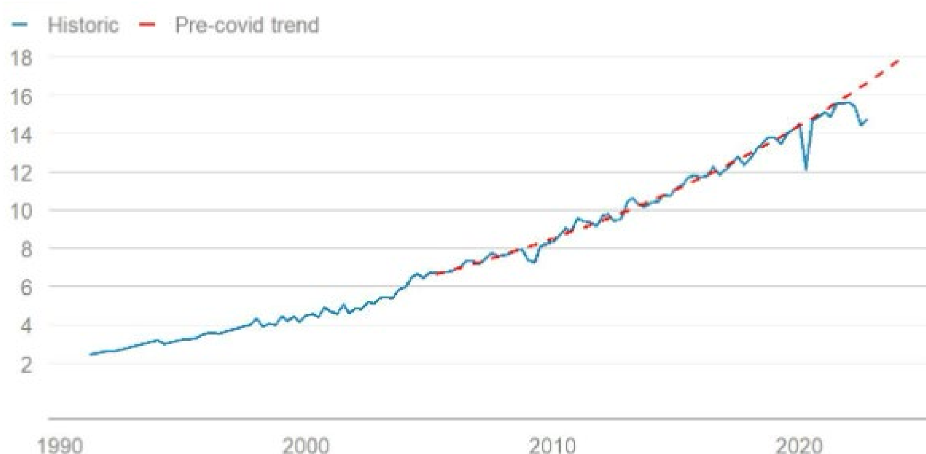
### Four near-term oil supply and demand catalysts

**This month, we consider the likelihood and effect of four potential oil supply and demand catalysts. The events are i) the potential for China to re-open post COVID ii) the EU embargo on Russian oil and the G-7 price cap iii) the end of releases from the US strategic petroleum reserve and iv) the potential for recovery in aviation demand. Although the Brent spot oil price is now $10/bl lower than it was pre the Russian invasion of Ukraine, we note that the five year forward oil price is up 13% this year and is starting to reflect these oil supply/demand constraints that may well outweigh broader global recessionary concerns.**

**1. The potential for China to re-open post COVID**

The zero COVID policy in China continues to limit economic activity and transportation and will result in Chinese oil demand being down in 2022 for the first time in over 30 years. While there remains uncertainty around the timing of China's re-opening, we note that there is as much as 2m b/day of oil demand recovery to come should the country return to its pre-COVID trend level of activity. We see a strong likelihood that this demand recovery does appear and view it as a significant tailwind for global oil demand over the next year or two.

**Chinese oil demand (m b/day) and pre-COVID trend oil demand**
*source: Morgan Stanley*




**2. The EU embargo on Russian oil and the G-7 price cap**

Two steps towards limiting Russia's ability to profit from exporting crude oil and oil products became effective in the early part of December and both are likely to cause supply/demand disruption in the coming months:

- First, an **EU embargo** against Russian oil started on 5 December and this will be followed by a similar embargo against Russian oil products on 5 February 2023. The embargoes are designed to stop EU countries from importing Russian crude oil and oil products and also include a ban on the provision by companies in EU jurisdictions of insurance, trading, brokering and other services related to the export of cargoes of Russian oil. As recently as October 2022, the EU was still importing around 2.4m b/day of Russian oil and oil products (split 1.4m b/day oil and 1.0m b/day oil products), although this was down from around 3.8m b/day one year ago.

- Secondly, the **G-7 price cap** on seaborne Russian oil volumes also came into effect on 5 December. The price cap is designed to mitigate the effect of the EU insurance ban by allowing a group of G-7 and EU countries plus Australia to ship and import Russian Urals oil cargoes as long as the price is below $60 per barrel. The price cap, which will be adjusted regularly to ensure it is 5% below the IEA's determined average Russian crude price, is effective on 5 December but includes a grace period for its implementation until 19 January 2023. Historically, Urals has traded at a small discount to Brent but that discount has widened sharply since the invasion leaving Urals currently at around $65/bl, a $20/bl discount to Brent. Adding to the volume risk, Russia has repeatedly stated that it will not sell its oil to any country that imposes the price cap even if it has to cut its own production. In the words of Deputy PM Alexander Novak "*We will sell oil and petroleum products only to those countries that will work with us under market conditions, even if we have to reduce production by a certain margin.*"

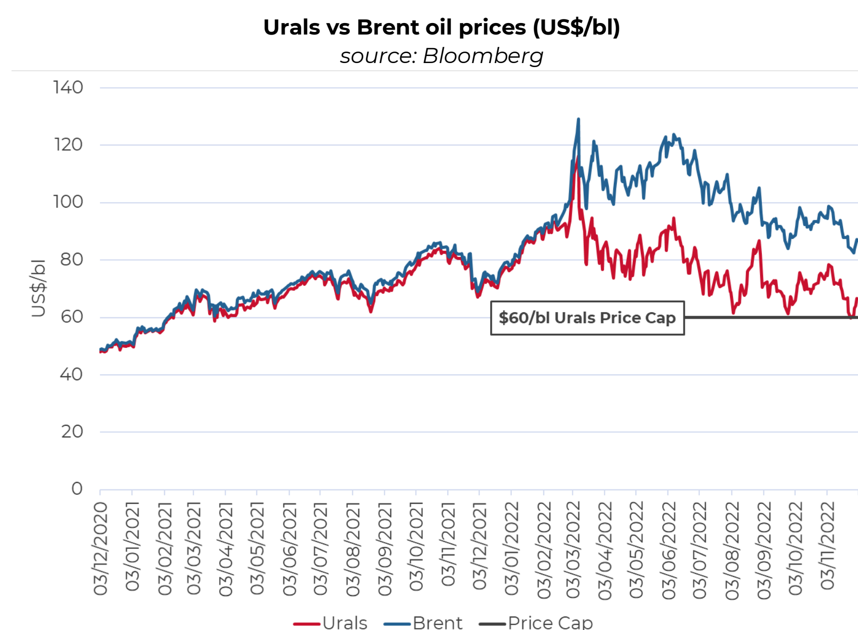
We expect that Russia will attempt to re-route its oil and oil products to other markets such as China, India and Turkey. All three have all taken greater levels of discounted Russian oil this year but China and India may be less likely to want to rely even more on Russia oil since it already represents 18% and 25% of their respective crude oil imports. An increase in Russian imports would displace imported Middle Eastern barrels, increasing security of supply risks for both countries, and may cause processing issues for domestic refineries.

Redirecting Russian oil from the EU to these more distant markets is estimated to require as many as 100 extra oil tankers. While some tankers will operate under the G-7 price cap, Russia will also likely rely on its growing fleet of 'dark' tankers that will not operate within the price cap restrictions. Early indications are that many tanker owners are wary of being involved (because of the price cap) and we note that the price for transporting oil from the Baltic Sea to India is 50% higher (an extra $10/bl) for December transit than it was for November (pre-the embargo and price cap).

The embargo and price cap have been just recently initiated, and the price cap has a grace period until 19 January 2023, so it may take some time for the market to absorb the full effects. In terms of impact, we note that the Russian government budget assumes a 0.5m b/day fall while the IEA estimates a fall of 1.4m b/day through to 1Q22. The range of outcomes here is very wide indeed and we see good chance that around 1m b/day of Russian oil exports are lost as a result.

**Urals vs Brent oil prices (US$/bl)**

*source: Bloomberg*



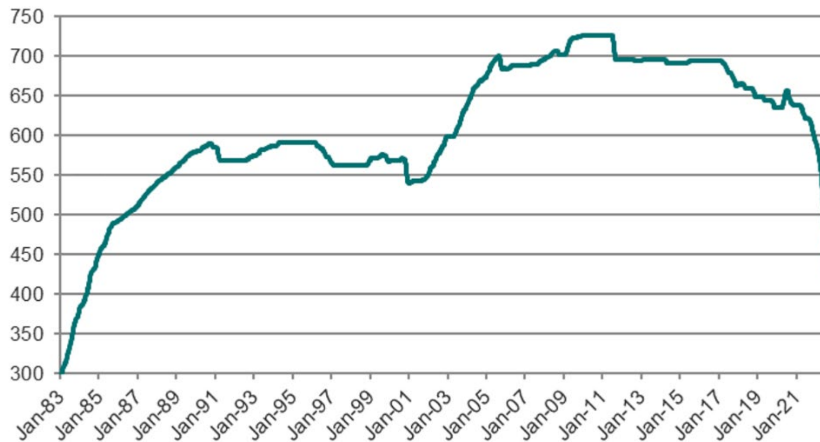

**3. The end of releases from the US strategic petroleum reserve**

In response to the Russian invasion, the US government authorised 180m barrels to be released from its Strategic Petroleum Reserve (SPR) over the remainder of 2022. Oil has been steadily released, leaving around 15m bls still to be released this month. By the end of 2022, the SPR will have drawn at a rate of around 0.8 m b/day since March 2022. Beyond this unprecedented release in 2022, further releases of around 147m bls of crude over the 2023-2027 period are currently mandated by the US Congress.

The 2022 release has effectively added 0.8m b/day to global oil supply since March, helping to loosen the oil market and limit domestic oil and gasoline prices in the United States. Once this phase of SPR release ends in December, we expect the global market to effectively tighten by this amount and for it to become more constructive for oil prices.

Moreover, an announcement from the US administration in early December indicates that Congress will now seek to stop the future 147mn bl mandated release from the SPR and allow a new proposed refilling programme to come into effect. This is consistent with President Biden's recent proposal to start refilling the SPR once oil prices fall to a range of around $70/bl. If passed, this will further tighten the market and effectively place a floor under US WTI oil prices at around $70/bl.

**US Strategic Petroleum Reserve (mn bls)**
*source: DNB Markets*




**4. Potential recovery in aviation demand**

The global economic outlook remains unclear and the actual path for oil demand will be driven by the balance of i) continuing post COVID recovery of underlying global transportation and ii) a growing global economic recessionary environment. The weakest aspect of transportation, relative to pre-COVID trends, remains aviation where global jet fuel consumption, at 6.3m b/day, is still approximately 2m b/day below 2019 levels. According to Morgan Stanley, current schedules for commercial flights suggest that jet fuel demand increases to around 7m b/day by 2Q 2023. Beyond that, a recovery to pre-COVID trends would suggest a further 1-1.5m b/day of demand recovery, although we note that this would be contingent on China unlocking and sentiment towards global air travel returning to pre-pandemic levels. Longer-term, we see good reason to expect that a large share of this pent-up aviation demand reappears in the coming years.

**Global jet fuel demand and demand implied by flight schedules**
*Source: Morgan Stanley, S&P Global Platts, Bloomberg*

In conclusion, near-term supply and demand dynamics for the global oil market are rarely clear and the current situation is no different. However, on balance, we believe that these four potential catalysts could bring tighter oil supply/demand balances in 2023 and could therefore be constructive towards oil prices. Although the Brent spot oil price is now $10/bl lower than it was pre the Russian invasion of Ukraine, we note that the five year forward oil price is up 13% this year and is starting to reflect the oil supply/demand constraints discussed above, that may well outweigh broader global recessionary concerns.

## 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 3.1% in November, while the MSCI World Index (net return) rose by 7.2% in USD.

Within the Fund, November's strongest performers included Galp, Sinopec, PetroChina and ENI while the weakest performers included Devon, Pioneer and Suncor.

**Performance (in USD) as at 30.11.2022**

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) |
|---|---|---|---|---|---|
| **Guinness Global Energy Fund[1] (Class Y, 0.99% OCF)** | 36.1% | 42.6% | 11.1% | 3.4% | 8.6% |
| **MSCI World Energy NR Index** | 51.2% | 57.1% | 15.2% | 7.4% | 6.6% |

| **Calendar year returns** | **2021** | **2020** | **2019** | **2018** | **2017** | **2016** | **2015** |
|---|---|---|---|---|---|---|---|
| **Guinness Global Energy Fund[1] (Class Y, 0.99% OCF)** | 44.5% | -34.7% | 9.8% | -19.7% | -1.3% | 27.9% | -27.6% |
| **MSCI World Energy NR Index** | 40.1% | -31.5% | 11.4% | -15.8% | 5.0% | 26.6% | -22.8% |
| | **2014** | **2013** | **2012** | **2011** | **2010** | **2009** | **2008*** |
| **Guinness Global Energy Fund[1] (Class Y, 0.99% OCF)** | -19.1% | 24.4% | 3.0% | -13.7% | 15.3% | 61.8% | -48.2% |
| **MSCI World Energy NR Index** | -11.6% | 18.1% | 1.9% | 0.2% | 11.9% | 26.2% | -38.1% |
| | **2007*** | **2006*** | **2005*** | **2004*** | **2003*** | **20028** | **2001*** |
| **Guinness Global Energy Fund[1] (Class Y, 0.99% OCF)** | 37.9% | 10.0% | 62.3% | 41.0% | 32.3% | 6.7% | -4.1% |
| **MSCI World Energy NR Index** | 29.8% | 17.9% | 28.7% | 28.1% | 25.9% | -6.4% | -7.2% |
| | **2000*** | **1999*** | | | | | |
| **Guinness Global Energy Fund[1] (Class Y, 0.99% OCF)** | 39.6% | 22.5% | | | | | |
| **MSCI World Energy NR Index** | 6.0% | 22.0% | | | | | |

*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). The fund performance shown has been reduced by the current OCF of 0.99% per annum. Returns for share classes with different OCFs will vary accordingly. Performance returns do not reflect any initial charge; any such charge will also reduce the return.

**[1]TB Guinness Global Energy Fund**
UK investors should be aware that the Guinness Global Energy Fund is 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 wwww.guinnessgi.com Please contact 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.

## 4. PORTFOLIO Guinness Global Energy Fund

**Buys/Sells**

In November there were no buys or sells of full positions, but the portfolio was actively rebalanced.

**Sector Breakdown**

The following table shows the asset allocation of the Fund at **November 30 2022**.

| Asset allocation as %NAV | Current | *Change* | Last year end | Previous year ends | | | | |
|---|---|---|---|---|---|---|---|---|
| | Nov-22 | | Dec-21 | Dec-20 | Dec-19 | Dec-18 | Dec-17 | Dec-16 |
| **Oil & Gas** | **95.4%** | ***-1.5%*** | **96.9%** | **94.8%** | **98.3%** | **96.7%** | **98.4%** | **96.7%** |
| Integrated | 53.1% | *-4.6%* | 57.7% | 56.3% | 51.1% | 46.4% | 42.9% | 46.4% |
| Exploration & Production | 23.6% | *-0.2%* | 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 | 8.2% | *4.2%* | 4.0% | 4.6% | 9.6% | 8.6% | 9.5% | 8.6% |
| Storage & Transportation | 4.9% | *0.5%* | 4.3% | 4.4% | 4.0% | 0.0% | 3.5% | 0.0% |
| Refining & Marketing | 5.7% | *-1.4%* | 7.2% | 7.3% | 3.8% | 3.7% | 3.7% | 3.7% |
| Solar | 1.0% | *0.0%* | 1.0% | 1.8% | 0.7% | 0.9% | 1.4% | 0.9% |
| Coal & Consumable Fuels | 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% |
| Cash | 3.6% | *1.5%* | 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 November 2022 was on a price to earnings ratio (P/E) for 2021/2022 of 15.2x/6.6x versus the MSCI World Index at 18.1x/16.1x as set out in the following table:

| As at 30 November 2022 | P/E | | |
|---|---|---|---|
| | 2021 | 2022E | 2023E |
| Guinness Global Energy Fund | 15.2x | 6.6x | 7.5x |
| MSCI World Index | 18.1x | 16.1x | 15.3x |
| *Fund Premium/(Discount)* | *-16%* | *-59%* | *-51%* |

*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 November 30 2022 the median P/E ratio of this group was 11.6x 2021 earnings. We also have three Canadian integrated holdings, Suncor, Cenovus and Imperial Oil. All three 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, Diamondback, 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 2% of the portfolio.

The portfolio contains two midstream holdings, Enbridge and Kinder Morgan, two of North America's largest pipeline companies. With the growth of hydrocarbon demand expected in the US and Canada over the next five years, we believe both companies are well placed to execute their pipeline expansion plans.

We have reasonable exposure to oil service stocks, which comprise around 8% of the portfolio. The stocks we own provide exposure to both North American and international oil and natural gas development.

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 October 31 2022 (for compliance reasons disclosed one month in arrears)**

| Guinness Global Energy Fund (31 October 2022) | | | P/E | | | EV/EBITDA | | |
|---|---|---|---|---|---|---|---|---|
| **Stock** | **ISIN** | **% of NAV** | **2021** | **2022E** | **2023E** | **2021** | **2022E** | **2023E** |
| **Integrated Oil & Gas** | | | | | | | | |
| Exxon Mobil Corp | US30231G1022 | 6.1% | 21.1x | 8.3x | 10.2x | 8.8x | 4.6x | 5.4x |
| Chevron Corp | US1667641005 | 5.5% | 21.1x | 9.6x | 10.7x | 8.6x | 5.3x | 5.7x |
| Shell PLC | GB00BP6MXD | 4.7% | 11.7x | 5.1x | 5.4x | 4.6x | 2.8x | 3.1x |
| Total SA | FR0000120271 | 5.0% | 8.3x | 3.8x | 4.5x | 4.2x | 2.4x | 2.8x |
| BP PLC | GB000798059 | 4.8% | 8.8x | 3.8x | 5.1x | 3.9x | 2.6x | 3.0x |
| Equinor ASA | NO001009698 | 4.2% | 11.8x | 5.3x | 5.6x | 2.4x | 1.2x | 1.3x |
| ENI SpA | IT0003132476 | 2.6% | 9.6x | 3.6x | 4.8x | 3.2x | 2.1x | 2.4x |
| Repsol SA | ES0173516115 | 3.5% | 7.9x | 3.5x | 4.5x | 3.4x | 2.1x | 2.6x |
| Galp Energia SGPS SA | PTGALOAM00 | 2.6% | 15.8x | 9.3x | 8.0x | 4.4x | 3.0x | 3.1x |
| OMV AG | AT000074305 | 2.6% | 4.8x | 3.3x | 4.1x | 2.8x | 2.0x | 2.4x |
| | | **41.6%** | | | | | | |
| **Integrated / Oil & Gas E&P - Canada** | | | | | | | | |
| Suncor Energy Inc | CA8672241079 | 3.1% | 16.5x | 5.3x | 5.8x | 5.4x | 3.1x | 3.5x |
| Canadian Natural Resources Ltd | CA1363851017 | 3.4% | 12.6x | 7.1x | 8.0x | 6.1x | 4.3x | 4.7x |
| Cenovus Energy Inc | CA15135U1093 | 3.4% | 26.1x | 6.6x | 6.4x | 6.4x | 3.6x | 3.7x |
| Imperial Oil Ltd | CA453038408 | 3.8% | 18.6x | 6.9x | 7.5x | 8.3x | 4.3x | 4.6x |
| | | **13.7%** | | | | | | |
| **Integrated Oil & Gas - Emerging market** | | | | | | | | |
| PetroChina Co Ltd | CNE1000003W | 1.3% | 4.8x | 3.7x | 4.3x | 2.9x | 2.8x | 2.9x |
| | | **1.3%** | | | | | | |
| **Oil & Gas E&P** | | | | | | | | |
| ConocoPhillips | US20825C1045 | 5.3% | 20.9x | 8.9x | 9.7x | 8.2x | 4.6x | 5.0x |
| EOG Resources Inc | US26875P1012 | 3.8% | 15.7x | 9.5x | 9.0x | 7.5x | 5.2x | 5.1x |
| Diamondback Energy Co | US25278X1090 | 4.0% | 14.3x | 6.3x | 6.5x | 8.2x | 4.7x | 4.8x |
| Pioneer Natural Resources Co | US7237871071 | 3.8% | 20.0x | 8.1x | 9.5x | 9.6x | 4.9x | 5.6x |
| Devon Energy Corp | US25179M1036 | 4.6% | 22.9x | 8.7x | 8.1x | 10.0x | 5.5x | 5.2x |
| | | **21.4%** | | | | | | |
| **International E&Ps** | | | | | | | | |
| Pharos Energy PLC | GB00B572ZV9 | 0.1% | n/a | 0.4x | 0.3x | 2.2x | 1.1x | 1.0x |
| | | **0.1%** | | | | | | |
| **Midstream** | | | | | | | | |
| Kinder Morgan Inc | US49456B1017 | 2.3% | 14.3x | 15.6x | 15.7x | 9.2x | 9.7x | 9.7x |
| Enbridge Inc | CA29250N105C | 2.6% | 17.7x | 18.6x | 17.2x | 13.8x | 13.6x | 13.1x |
| | | **4.9%** | | | | | | |
| **Equipment & Services** | | | | | | | | |
| Schlumberger Ltd | AN806857108 | 4.3% | 41.0x | 24.3x | 17.6x | 16.9x | 12.9x | 10.4x |
| Halliburton Co | US4062161017 | 1.8% | 34.1x | 18.0x | 12.4x | 14.3x | 9.7x | 7.7x |
| Baker Hughes a GE Co | US05722G1004 | 1.5% | 42.0x | 31.9x | 16.6x | 12.0x | 10.7x | 8.5x |
| Helix Energy Solutions Group Inc | US42330P1075 | 0.9% | n/a | n/a | 23.7x | 12.6x | 11.2x | 5.5x |
| | | **8.5%** | | | | | | |
| **Oil & Gas Refining & Marketing** | | | | | | | | |
| China Petroleum & Chemical Corp | CNE1000002Q | 1.0% | 4.2x | 4.8x | 4.9x | 2.5x | 2.7x | 2.7x |
| Valero Energy Corp | US91913Y1001 | 4.7% | 71.6x | 4.7x | 7.9x | 13.6x | 3.3x | 5.0x |
| | | **5.7%** | | | | | | |
| **Research Portfolio** | | | | | | | | |
| Deltic Energy PLC | GB00B6SYKFC | 0.2% | n/a | n/a | n/a | n/a | n/a | n/a |
| EnQuest PLC | GB00B635TG2 | 0.4% | 4.6x | 1.6x | 1.3x | 2.0x | 1.4x | 1.4x |
| Reabold Resources PLC | GB00B95L0551 | 0.1% | n/a | n/a | n/a | n/a | n/a | n/a |
| Sunpower Corp | US8676524064 | 0.7% | 96.8x | 68.5x | 31.4x | 47.4x | 31.3x | 18.2x |
| Maxeon Solar Technologies Ltd | SGXZ25336314 | 0.0% | n/a | n/a | n/a | n/a | n/a | 13.8x |
| Diversified Energy Company | GB00BYX7JT7 | 0.4% | 29.4x | 5.2x | 9.6x | 7.2x | 4.6x | 4.7x |
| | | **1.8%** | | | | | | |
| Cash | Cash | 1.1% | | | | | | |

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 | 2021 | 2022E | 2023E |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | IEA | IEA |
| **World Demand** | 95.3 | 96.4 | 98.2 | 99.5 | 100.6 | 91.5 | 97.7 | 99.8 | 101.4 |
| Non-OPEC supply (inc NGLs) | 60.3 | 59.8 | 60.8 | 63.5 | 65.6 | 63.0 | 63.8 | 65.6 | 66.1 |
| OPEC NGLs | 5.2 | 5.3 | 5.4 | 5.5 | 5.4 | 5.1 | 5.1 | 5.4 | 5.5 |
| **Non-OPEC supply plus OPEC NGLs** | **65.5** | **65.1** | **66.2** | **69.0** | **71.0** | **68.1** | **68.9** | **70.9** | **71.6** |
| **Call on OPEC (crude oil)** | **29.8** | **31.3** | **32.0** | **30.5** | **29.6** | **23.4** | **28.8** | **28.9** | **29.8** |
| Congo supply adjustment | 0.3 | 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 | 0.2 |
| Eq Guinea supply adjustment | 0.1 | 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** | **29.9** | **29.0** | **22.8** | **28.2** | **28.3** | **29.2** |

*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 around 9m b/day, was heavily clouded by the impact of the COVID-19 virus and efforts to mitigate its spread. Demand recovered in 2021 by around 6.2m b/day, leaving overall consumption still around 3m b/day below the 2019 peak.

#### OPEC

The last few years have proved testing 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+/bl 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 included a cut in production from Russia (a non-OPEC country), creating for the first time the concept of an OPEC+ group.

***OPEC-10 oil production to November 2022***

| ('000 b/day) | 31-Dec-19 | 31-Oct-22 | 30-Nov-22 | Current vs Dec 2019 | Current vs last month |
|---|---|---|---|---|---|
| Saudi | 9,730 | 10,910 | **10,440** | 710 | -470 |
| Iran | 2,080 | 2,510 | **2,520** | 440 | 10 |
| Iraq | 4,610 | 4,570 | **4,480** | -130 | -90 |
| UAE | 3,040 | 3,420 | **3,180** | 140 | -240 |
| Kuwait | 2,710 | 2,810 | **2,670** | -40 | -140 |
| Nigeria | 1,820 | 1,150 | **1,140** | -680 | -10 |
| Venezuela | 730 | 660 | **690** | -40 | 30 |
| Angola | 1,390 | 1,050 | **1,040** | -350 | -10 |
| Libya | 1,110 | 1,170 | **1,090** | -20 | -80 |
| Algeria | 1,010 | 1,050 | **1,010** | 0 | -40 |
| **OPEC-10** | **28,230** | **29,300** | **28,260** | **30** | **-1,040** |

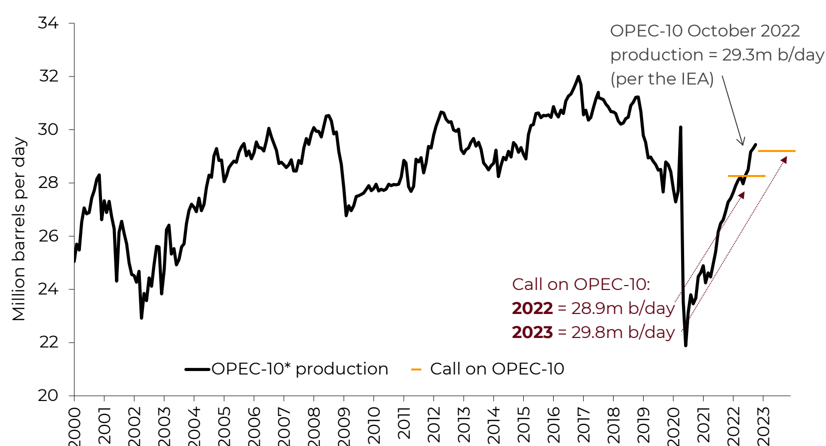
*Source: Bloomberg; Guinness Global Investors*

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 each month until September 2022, whilst still meeting monthly to ratify each production increase in light of the prevailing conditions. The agreement gave us confidence that OPEC was looking to do 'what it takes' to keep the market in balance, despite extreme challenges.

***OPEC-10 apparent production vs call on OPEC 2000 – 2023***




*Source: IEA Oil Market Report (November 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

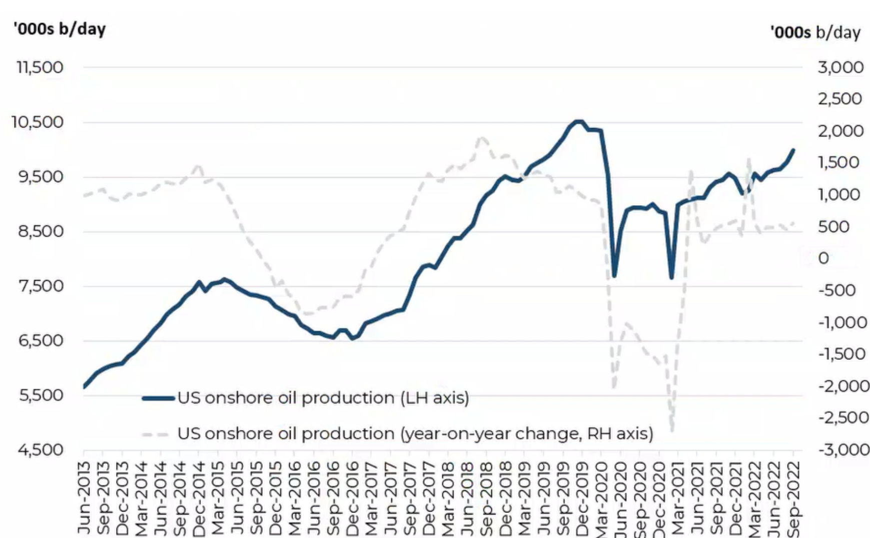
Nothing in the market in recent years has changed our view that OPEC can put a floor under the price – as they did in 2020, 2018, 2016, 2008, 2006, 2001 and 1998.

### 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.

**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. Since 2019, we have seen increased shareholder pressure applied to US E&P companies to improve their capital discipline and to cut their reinvestment rates.

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 reducing capital spending further as they attempted 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 is returning 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/bl+) 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 99.8m b/day, still around 0.8m 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, but high prices and slower economic growth are curtailing demand growth in certain sectors.

Post the COVID demand recovery and assuming typical economic growth, 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.

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 $75/bl oil price, the world oil bill as a percentage of GDP is around 3% and this will still be a stimulant of further demand growth. If oil prices persist in a higher range (say around $100/bl, representing 4% 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

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 10m, or 12% 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 | 97 |
| Brent | 82 | 103 | 67 | 84 | 115 | 112 | 108 | 99 | 52 | 45 | 54 | 72 | 60 | 42 | 70 | 100 |
| **Brent/WTI (12m MAV)** | **82** | **104** | **68** | **84** | **107** | **103** | **103** | **96** | **51** | **45** | **53** | **68** | **59** | **41** | **69** | **99** |
| **Brent/WTI y-on-y change** | 9% | 26% | -35% | 24% | 27% | -4% | 0% | -7% | -47% | -11% | 17% | 30% | -14% | -30% | 68% | 43% |
| Brent/WTI (5yr MAV) | 61 | 75 | 79 | 82 | 89 | 93 | 93 | 99 | 92 | 80 | 69 | 63 | 55 | 53 | 58 | 67 |

*Source: Guinness Global Investors, Bloomberg*

We believe that Saudi's long-term objective remains to maintain a 'good' oil price, something north of $75/bl. The world oil bill at around $75/bl represents 3.0% of 2021 Global GDP, under the average of the 1970 – 2021 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **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 | 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 |
| **Total demand** | **71.7** | **73.6** | **74.8** | **77.8** | **80.1** | **80.9** | **90.5** | **95.8** | **96.0** | **99.7** | **102.5** |
| **Demand growth** | **3.1** | **1.9** | **1.2** | **3.0** | **2.3** | **0.8** | **9.6** | **5.3** | **0.2** | **3.7** | **2.8** |

*Source: Guinness estimates; GS (October 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 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 average around $5-6/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.

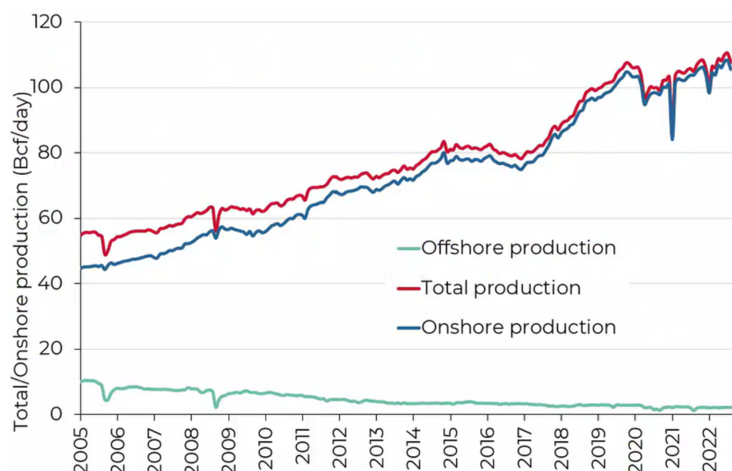
***US natural gas supply***

| Bcf/day | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022E |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **US natural gas supply:** | | | | | | | | | | | |
| US (onshore & offshore) | 65.7 | 66.3 | 70.9 | 74.2 | 73.4 | 73.6 | 84.0 | 92.3 | 9 | 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 |
| **Total supply** | **71.9** | **71.9** | **76.3** | **79.6** | **79.3** | **79.7** | **89.5** | **97.1** | **96.5** | **98.3** | **101.5** |
| **Supply growth** | **2.4** | **-** | **4.4** | **3.3** | **- 0.3** | **0.4** | **9.8** | **7.6** | **- 0.6** | **1.8** | **3.2** |
| **(Supply)/demand balance** | **- 0.2** | **1.7** | **- 1.5** | **- 1.8** | **0.8** | **1.2** | **1.0** | **- 1.3** | **- 0.5** | **1.4** | **1.0** |

*Source: EIA; GS; Guinness estimates*

Over the last 14 years or so, 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 155 at the end of November 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 (Nov 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.

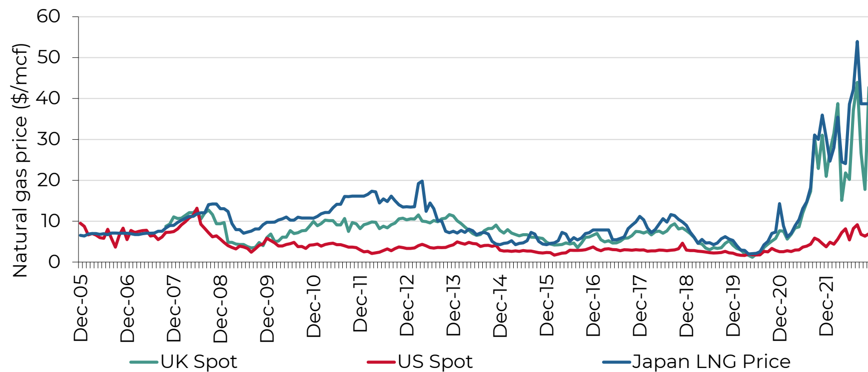
Associated gas production declined in 2021 with the fall of shale oil production, but will rise again in 2022 as shale oil grows again. Generally, we expect to see rates of around 2-3 Bcf/day of associated gas per 1m b/day of oil production growth. The Marcellus/Utica region, which includes the largest 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.

Overall, if the price averages in the $6-7/mcf range, we expect a rise in average onshore gas supply in 2022, up by around 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.$25-40/mcf versus c.$6-8/mcf). Asian spot LNG prices have also been extraordinarily strong, averaging over $10/mcf in 2021 and up over $35/mcf on a spot basis at the end of November 2022. There have been many factors at play, in particular the strong post-COVID demand recovery, 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 at least $5/mcf higher than Henry Hub.

***International gas prices to November 2022***

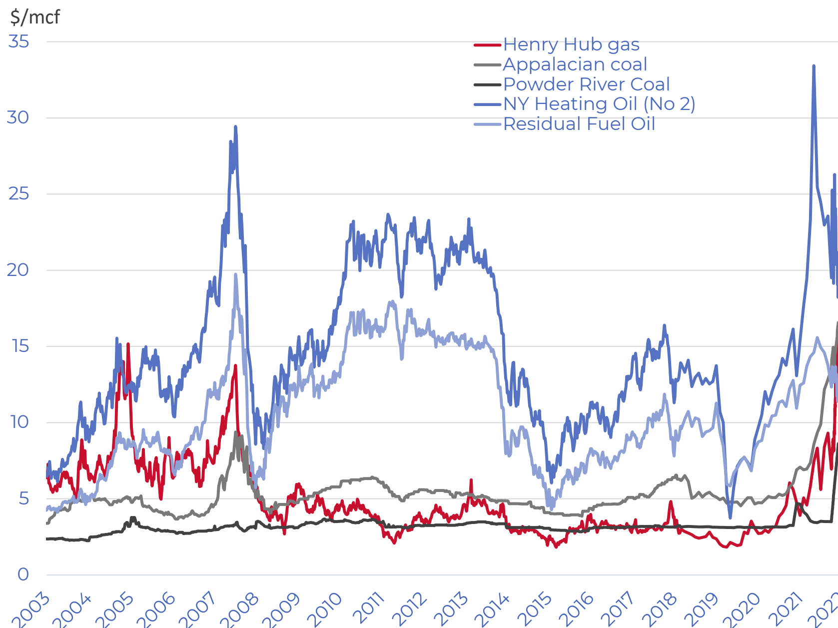



*Source: Bloomberg; Guinness Global Investors (Nov 2022)*

### 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 (Nov 2022)*

### 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 $4-5/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 four 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

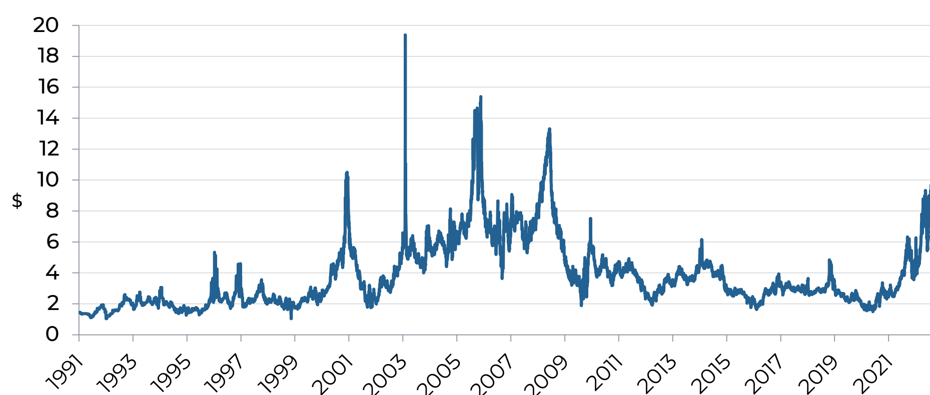
high as $147 by the middle of 2008. This spike was brought to an abrupt end by the collapse of Lehman Brothers and the financial crisis and recession that followed, all of which contributed to the oil price falling back by early 2009 to just above $30. OPEC's responded decisively and reduced output, 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) **2014-2020:** 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 rang 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.

4) **2021-:** Underinvestment in new oil capacity in the 2015-2020 period catalysed the start of a new cycle in 2021, pushing prices above $75/bl.

***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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