

25th January, 2023

Pulse Webinar

The Energy Transition

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Guinness Global Investors

novia
global

Risk & Performance

Risk: The Guinness Global Energy Fund and Guinness Sustainable Energy Fund are equity funds. 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 Guinness Global Energy Fund invests only in companies involved in the energy sector, the Guinness Sustainable Energy Fund invests only in companies in the alternative energy sector, they are therefore susceptible to the performance of these sectors and can be volatile. Details on the risk factors are included in the Funds' documentation, available on our website (guinnessgi.com/literature).

Guinness Global Energy Fund



Guinness Sustainable Energy Fund



The risk and reward indicator shows where the fund ranks in terms of its potential risk and return. The higher the rank the greater the potential reward but the greater the risk of losing money. The shaded area in the table shows the fund's rank. The Guinness Global Energy Fund is ranked as 7 because its volatility has been measured as high. The Guinness Sustainable Energy Fund is ranked as 6 because its volatility has been measured as above average to high. This is based on how investments have performed in the past and you should note that the funds may perform differently in the future and their rank may change. Historical data may not be a reliable indicator for the future.

Performance: Past performance is not a guide to future returns.

Investors should note that fees and expenses are charged to the capital of the funds. This reduces the return on your investment by an amount equivalent to the Ongoing Charges Figure (OCF). 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.

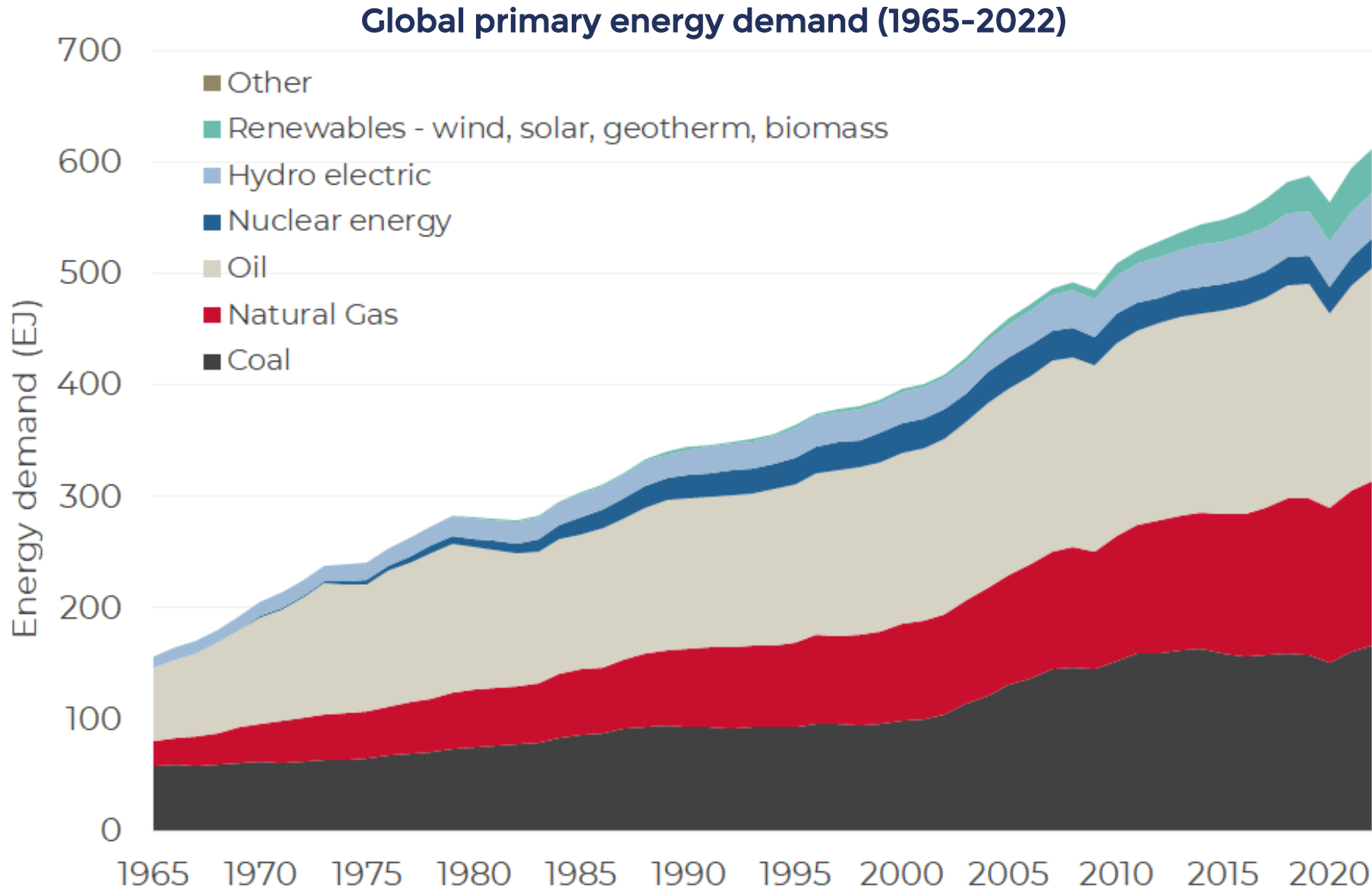
The Guinness Global Energy Fund is actively managed with the MSCI World Energy Index used as a comparator benchmark only. The Guinness Sustainable Energy Fund is actively managed with the MSCI World Index used as a comparator benchmark only.

The energy transition

- What does the energy transition look like?
- Likely path for hydrocarbon markets
- Outlook for renewable energy & energy efficiency
- How we invest in these themes

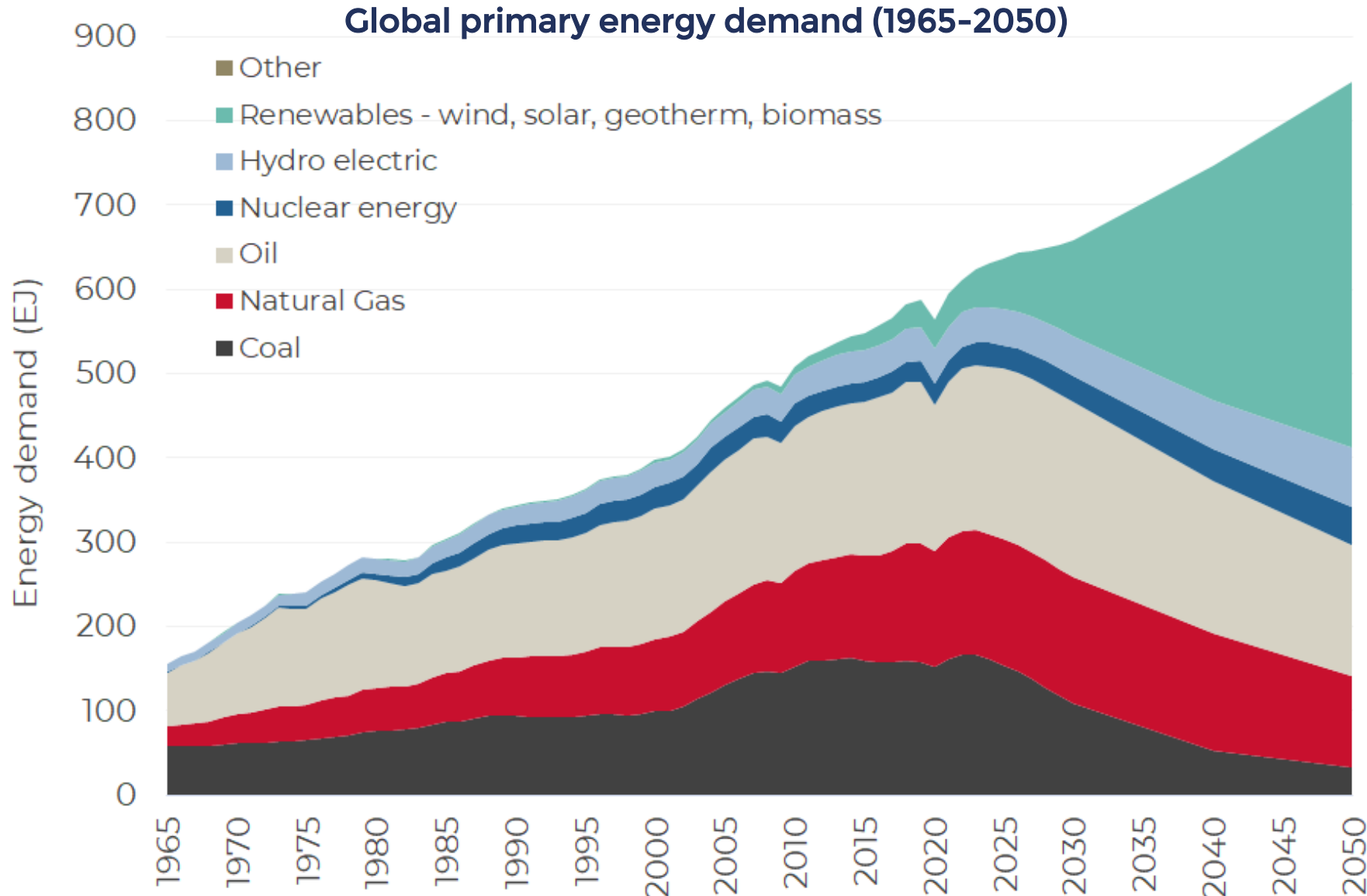
What does the energy
transition look like?

Energy demand has grown significantly since 1990



- Global energy demand has expanded by 75% over the last 30 years, from 349EJ to 612EJ of demand
- Hydrocarbons dominate, comprising 83% of the current energy mix

A future transition to renewables at the expense of coal



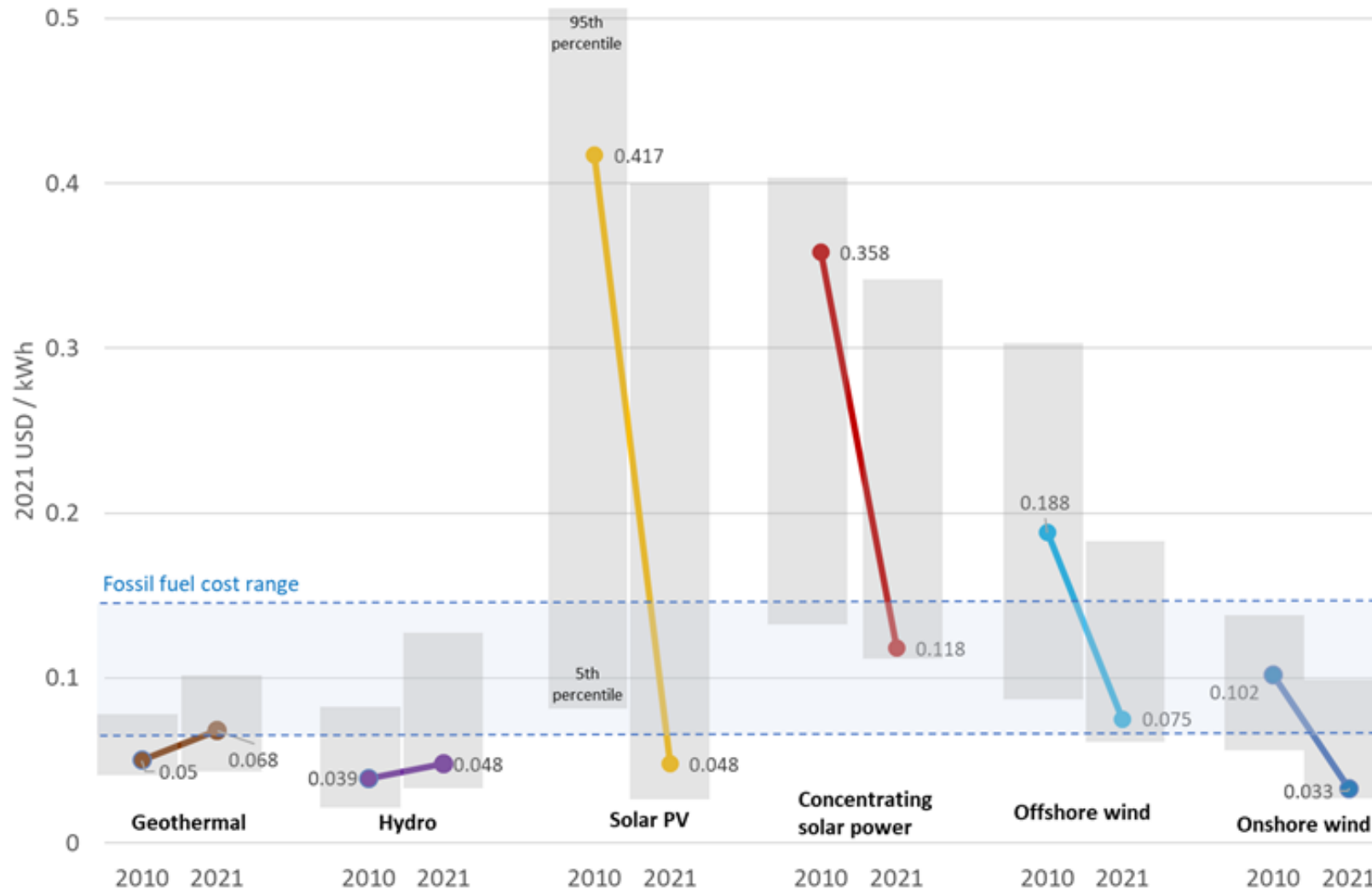
- Coal demand is nearing terminal decline, falling by over 75% by 2050
- Coal and natural gas are 17% of the mix in 2050, down from 51% in 2022
- Renewables (wind, solar, geothermal and biomass) expand rapidly from 6% in 2022 to 50% in 2050

Why will the sustainable energy transition occur?

- Over the next thirty years, the world will transition to a sustainable energy system. The key factors driving the transition are:
- **Population and GDP growth** put a significant strain on today's energy supply
- **Climate change** The world will reduce carbon emissions via cleaner energy
- **Pollution** Governments will drive air pollution out of cities via cleaner energy
- **Energy security** Sustainable energy tends to be distributed, will lower reliance on energy imports
- **Economics** Sustainable sources of energy will be cheaper than the incumbents

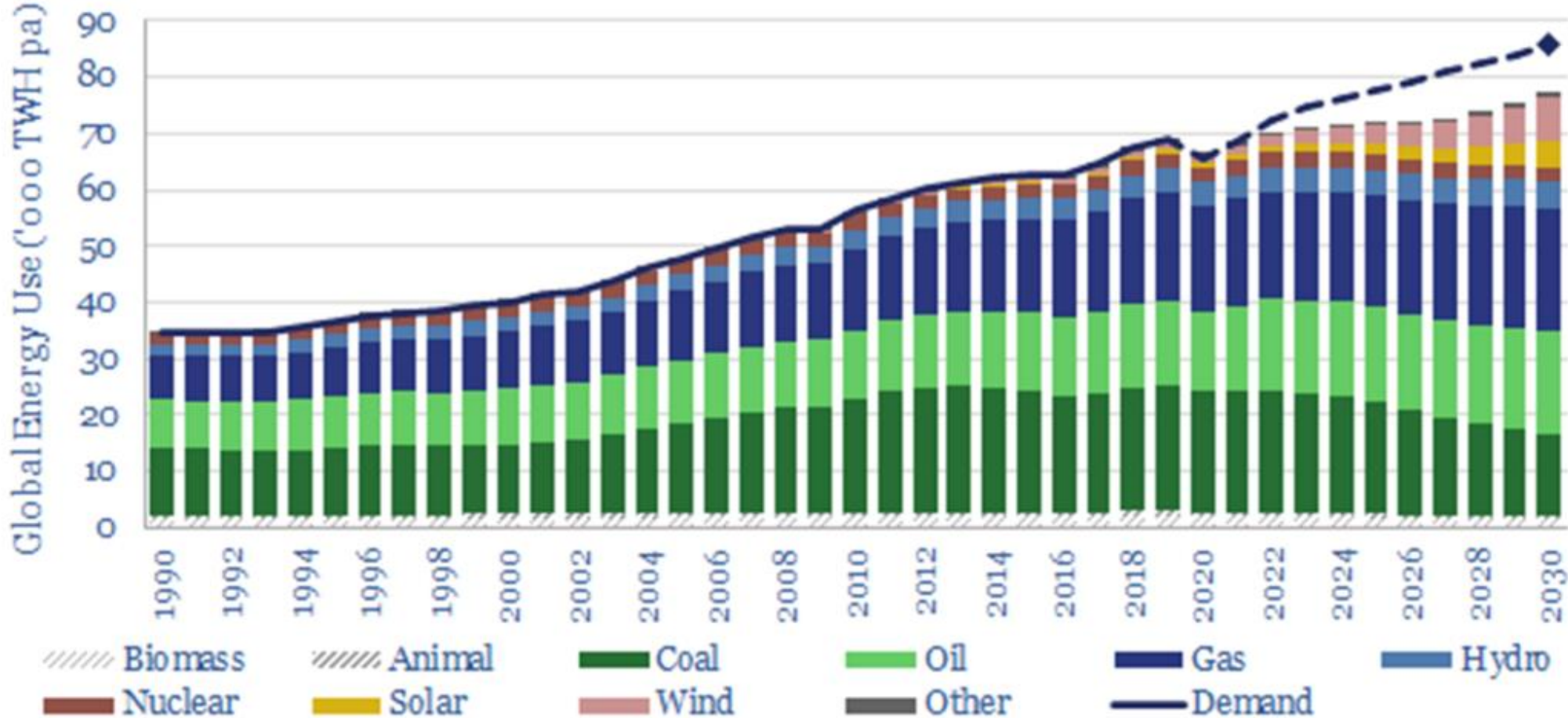
The cost of generating renewable electricity has collapsed

Global LCOE of utility-scale renewable power generation technologies (2010–2021)



Global energy shortage opening up in the 2020s

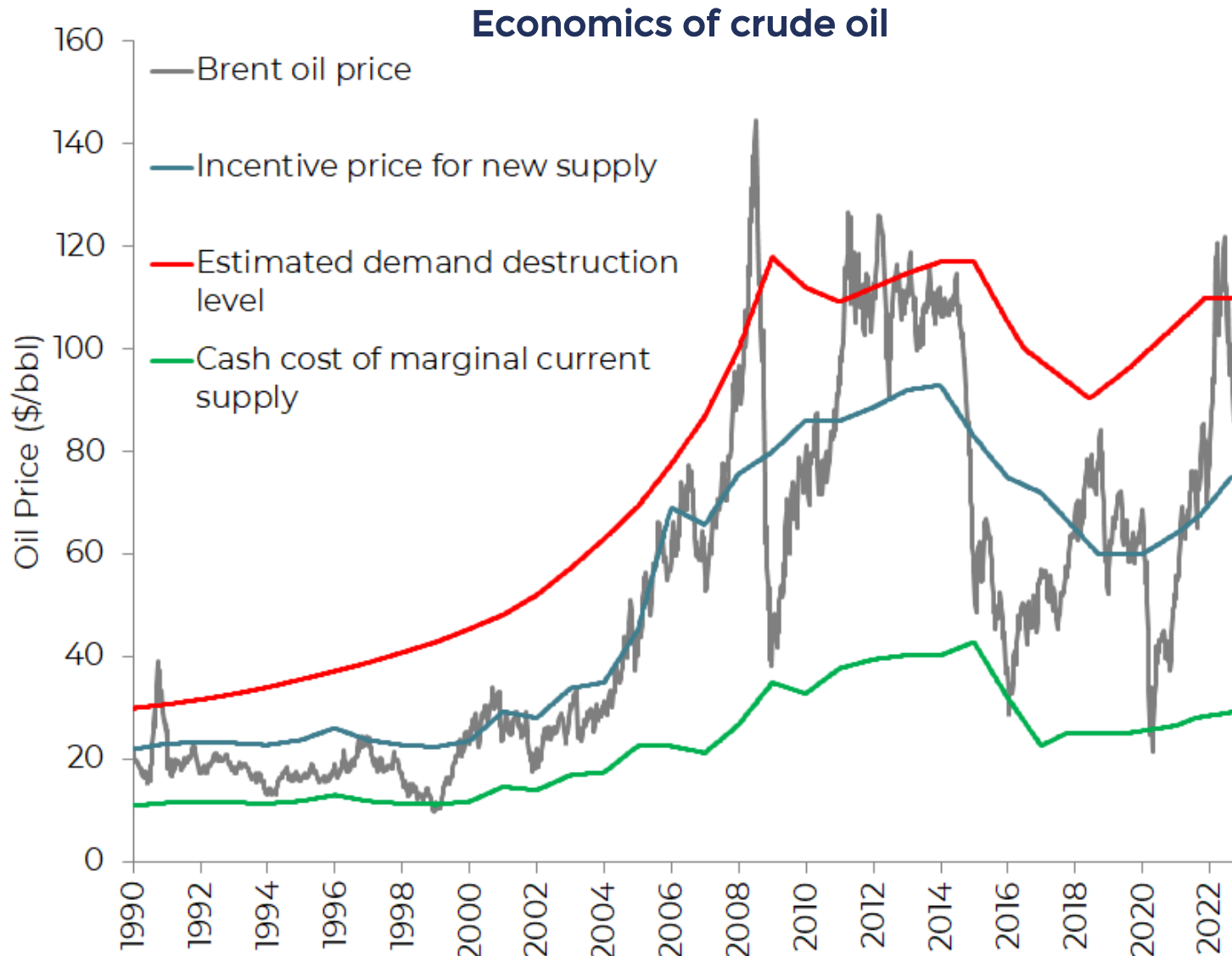
Global energy demand vs supply ('000s TWH pa)



- An energy supply deficit opened up in 2022 of around 2%, potentially widening to c.8% by 2030 (if current plans are pursued)

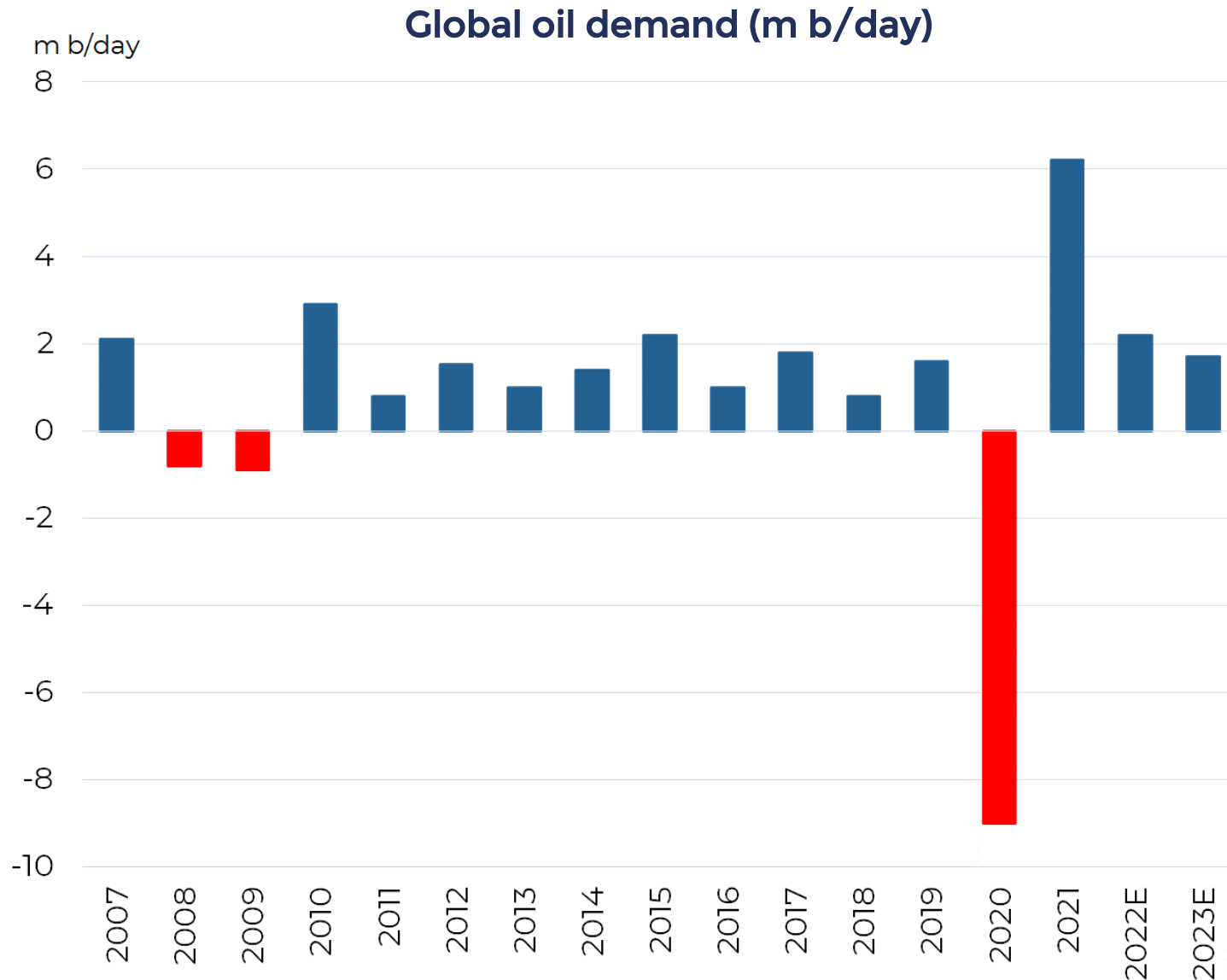
Likely path for hydrocarbon markets in the energy transition

Economics: marginal cost of supply has historically defined price



- Historically, both crude oil and natural gas commodity prices have traded between the cash cost of supply and the price at which demand is destroyed

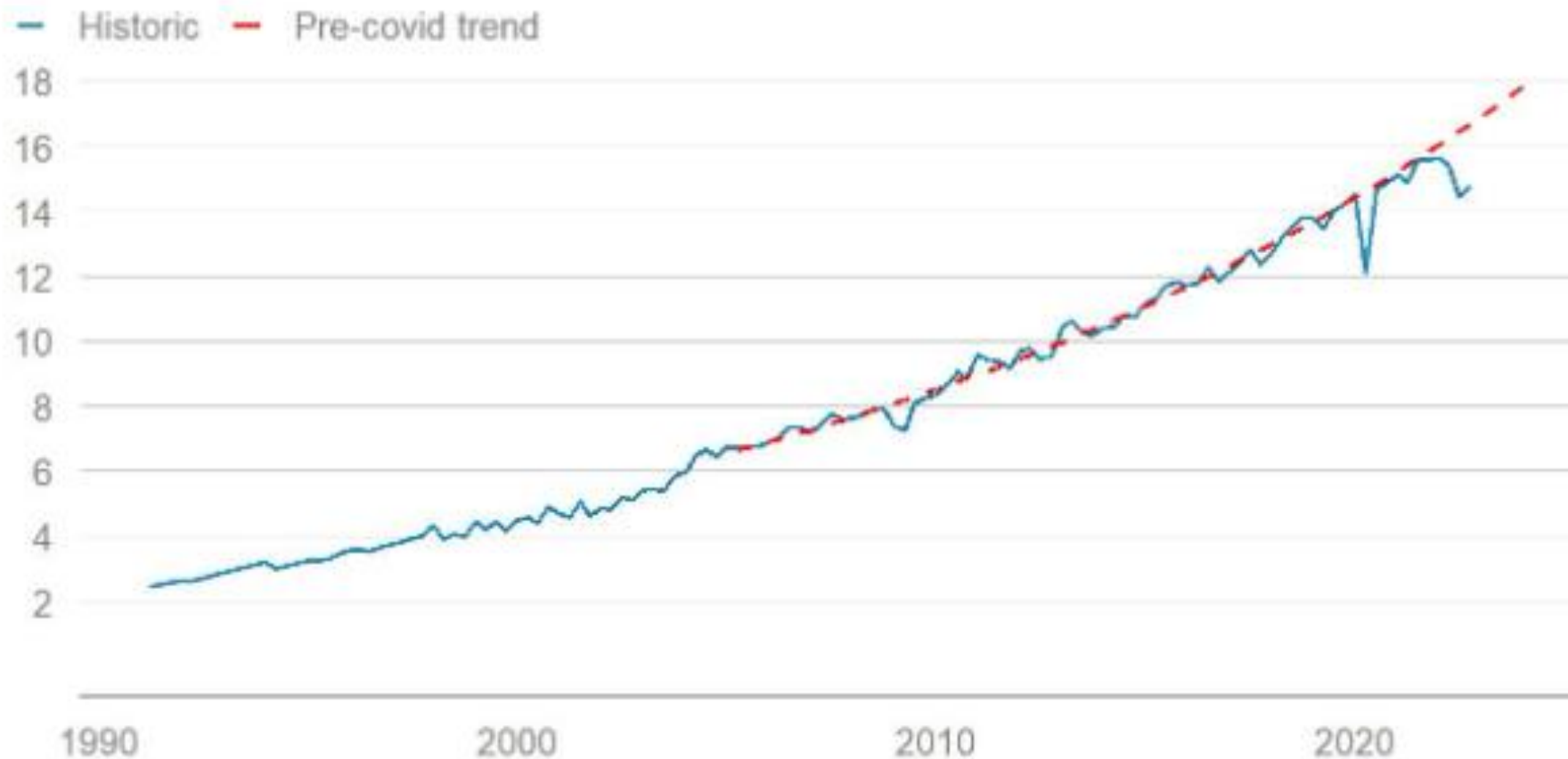
Global oil demand: recovery continues in 2023



- Global oil demand in 2020 down by 9m b/day – dwarfing any previous downturn
- A recovery of 6.2m b/day in 2021, followed by 2.3m b/day in 2022
- 2023 growth of 1.7m b/day slowed lower global GDP forecasts

Global oil demand: China poised for sharp rebound

Chinese oil demand (m b/day) and pre-COVID trend oil demand



- Zero-COVID policy has limited economic activity, resulting in Chinese oil demand being down in 2022 for the first time in >30 yrs.
- Re-opening will bring short-term softness in demand as the COVID wave passes, but eventually we see as much as 2m b/day of oil demand recovery

Global oil demand: jet fuel demand still recovering

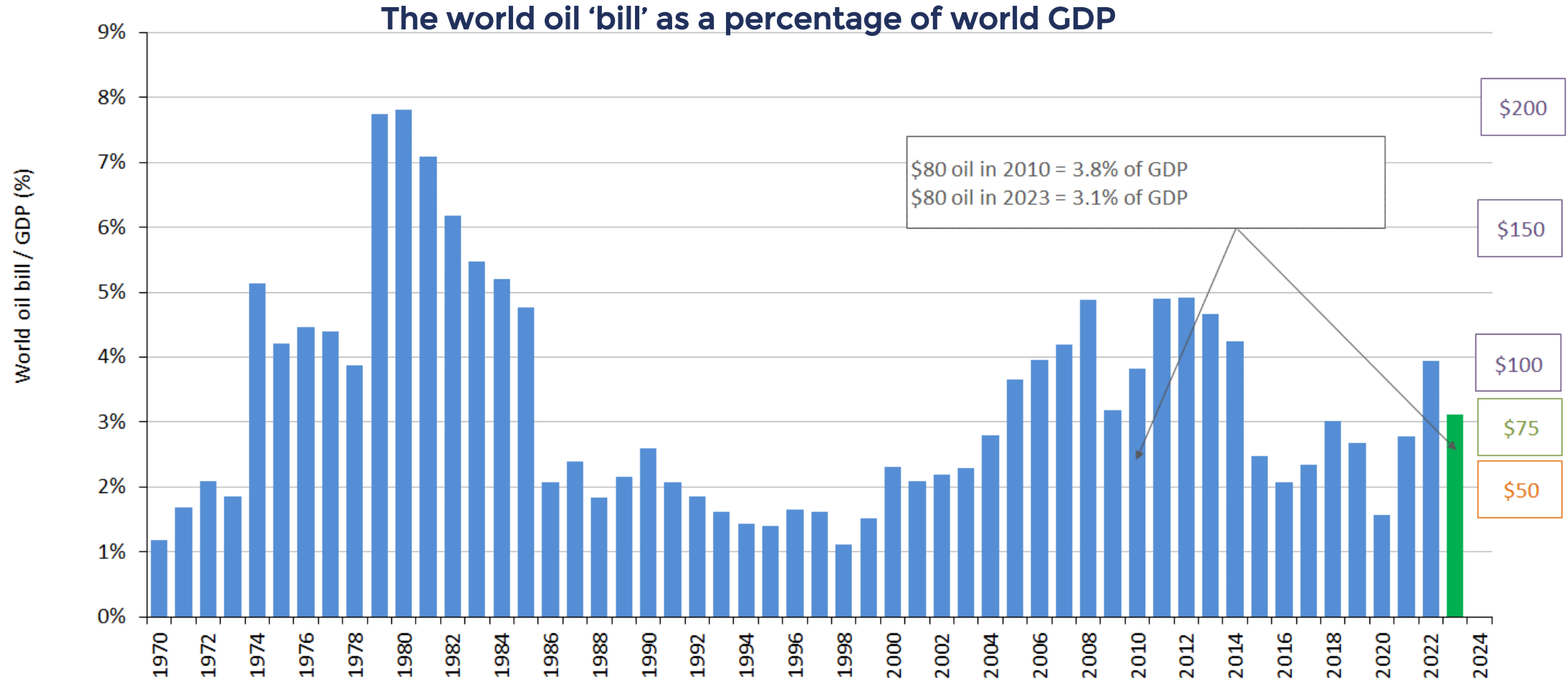
Global jet fuel demand and demand implied by flight schedules



- Jet fuel demand for aviation remains the weakest oil product group relative to pre-COVID trends. At 6.3m b/day, global jet fuel demand is still approximately 2m b/day below 2019 levels.
- Current schedules for commercial flights suggest an increase to around 7m b/day by 2Q 2023.

Oil price: \$80 oil implies spend of 3.1% of world GDP in 2023

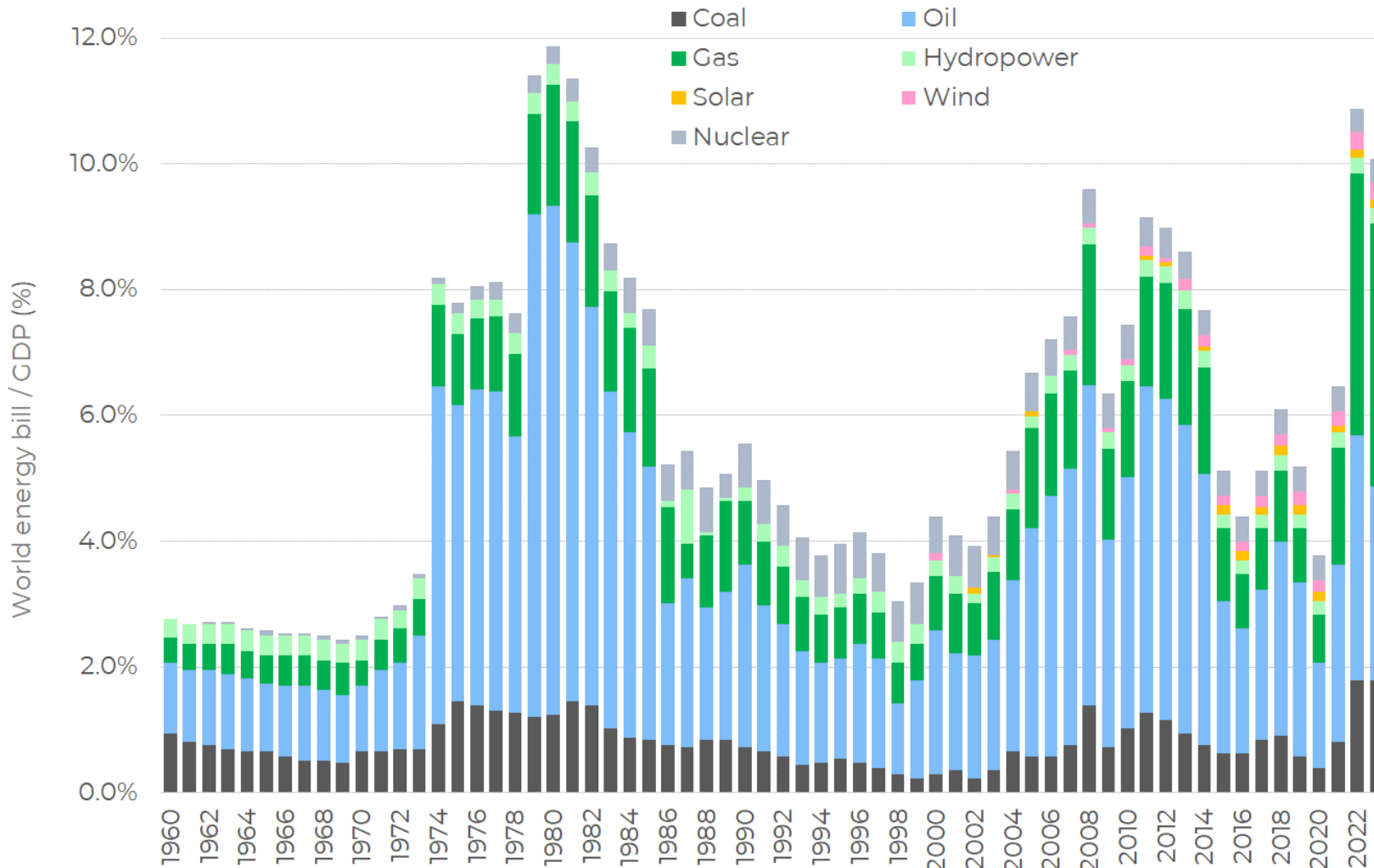
- L-T, we believe Saudi is targeting a price that gives a “reasonable” world oil bill
- 10yr average world oil bill is 3.0%, 20yr average is 3.4%, 30yr average is 2.9%



Source Bloomberg LP; Guinness Global Investors, data as of Jan 2023

Energy prices: 2022/23 prices creating similar burden as 1979/80 crisis

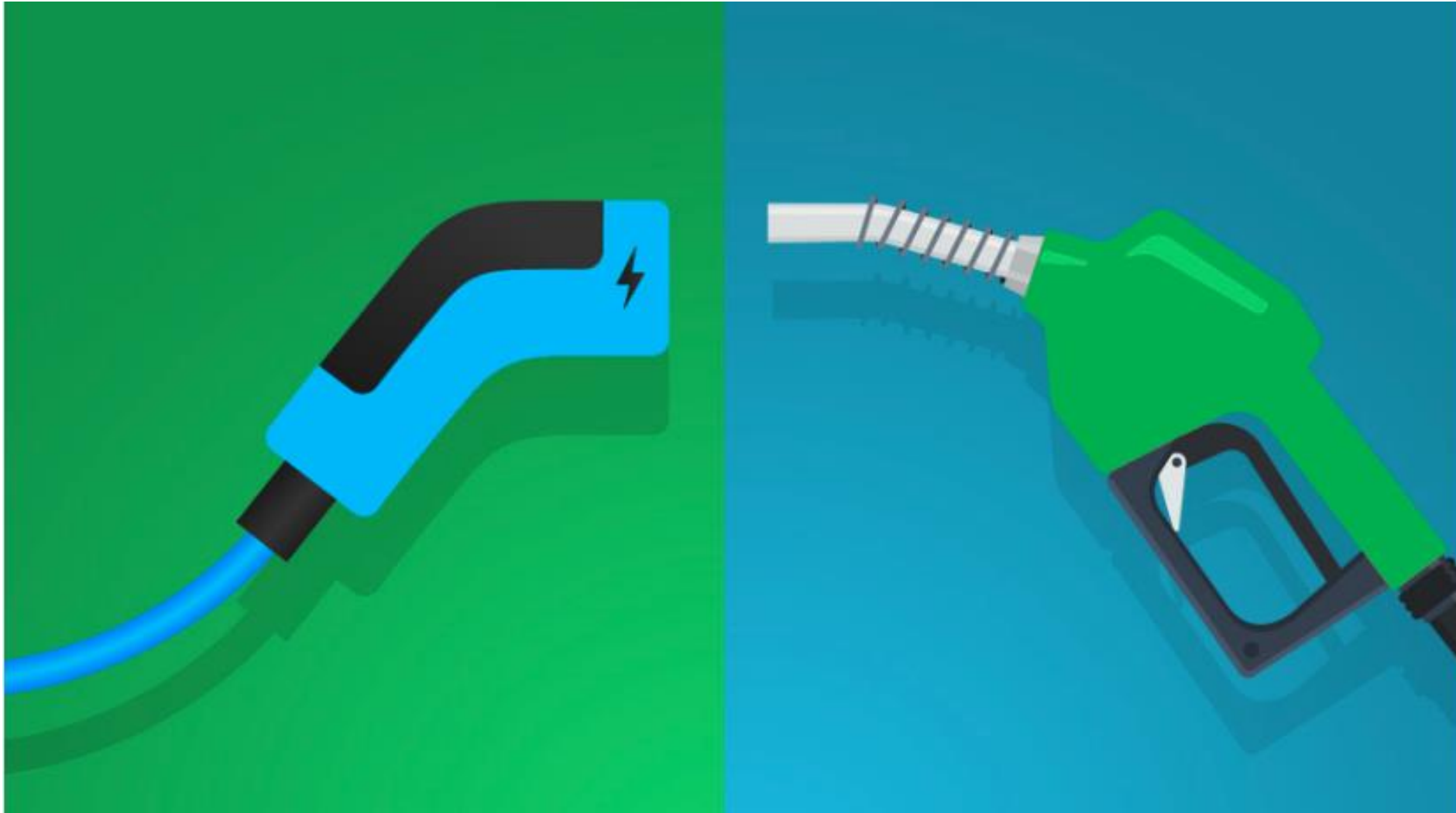
The world primary energy 'bill' as a percentage of world GDP



- The world energy bill in 2022, was around 11%, the highest in >40 years
- Similar conditions in 1979/80 caused a global GDP slowdown

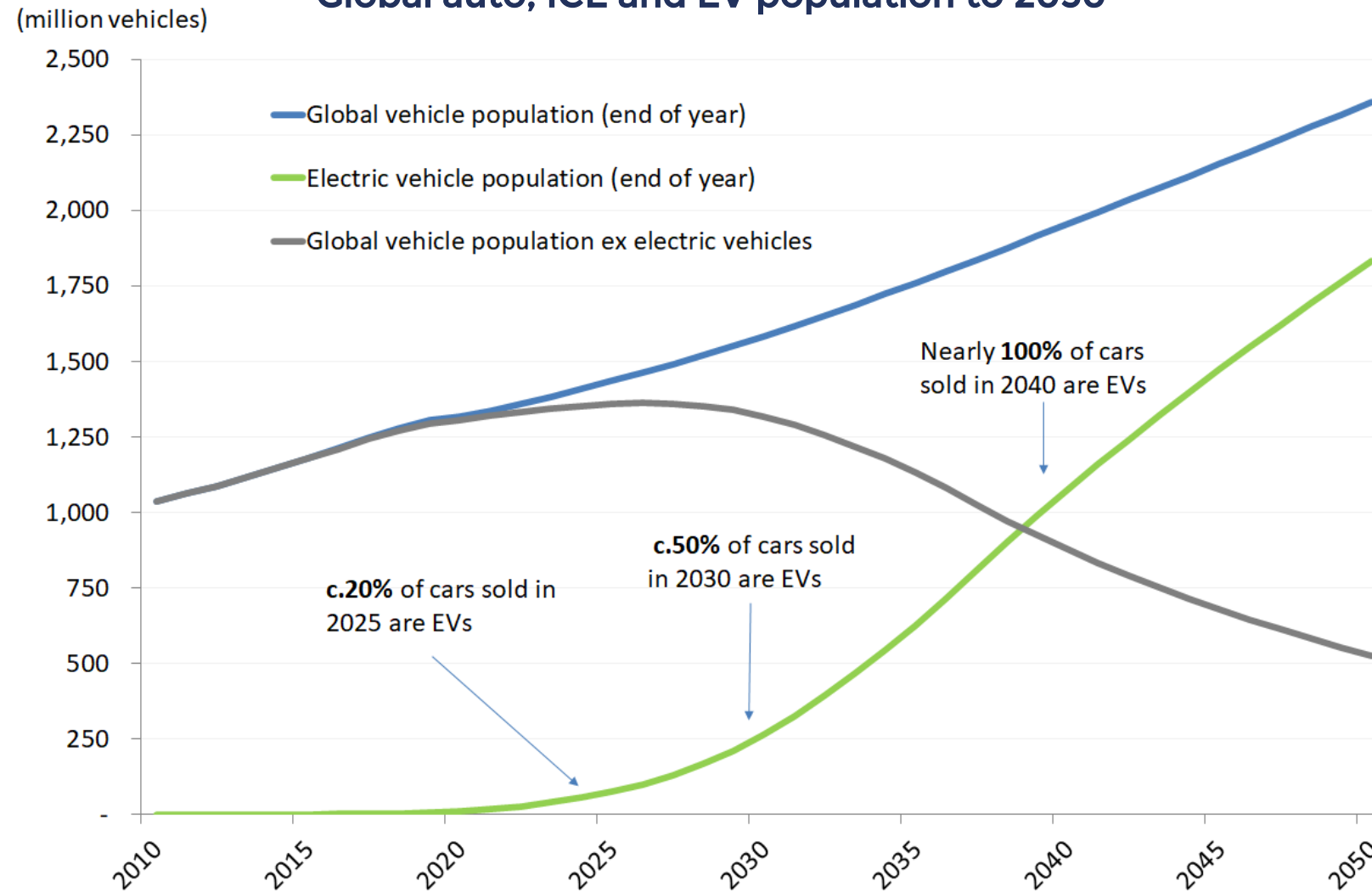
oil

Impact of EVS on oil demand



Oil demand: EVs starting to pressure light auto oil demand

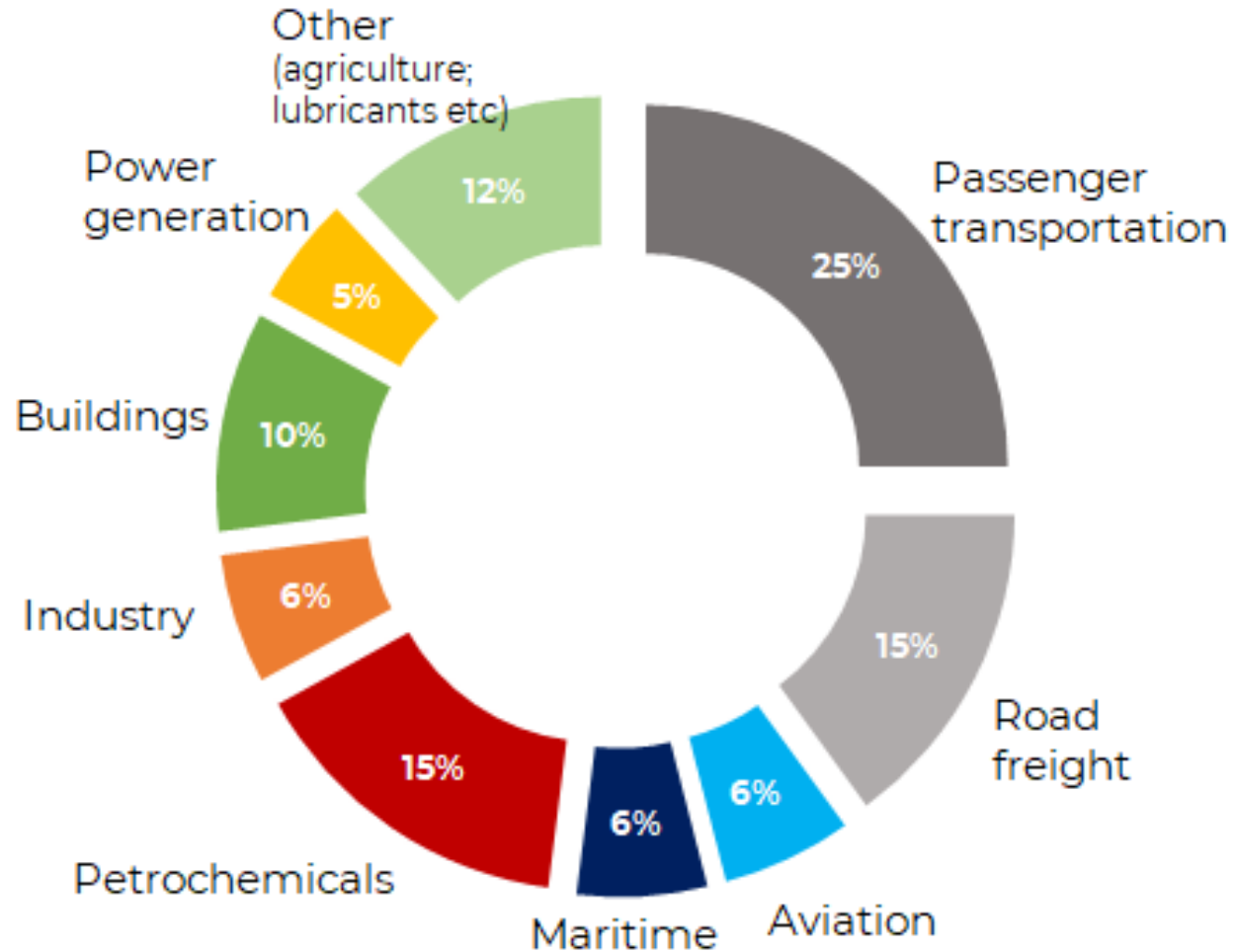
Global auto, ICE and EV population to 2050



- Crude oil is 25% used in light auto transportation - EVs starting to show up
- Global light auto oil demand likely peaks in the next 2-3 years

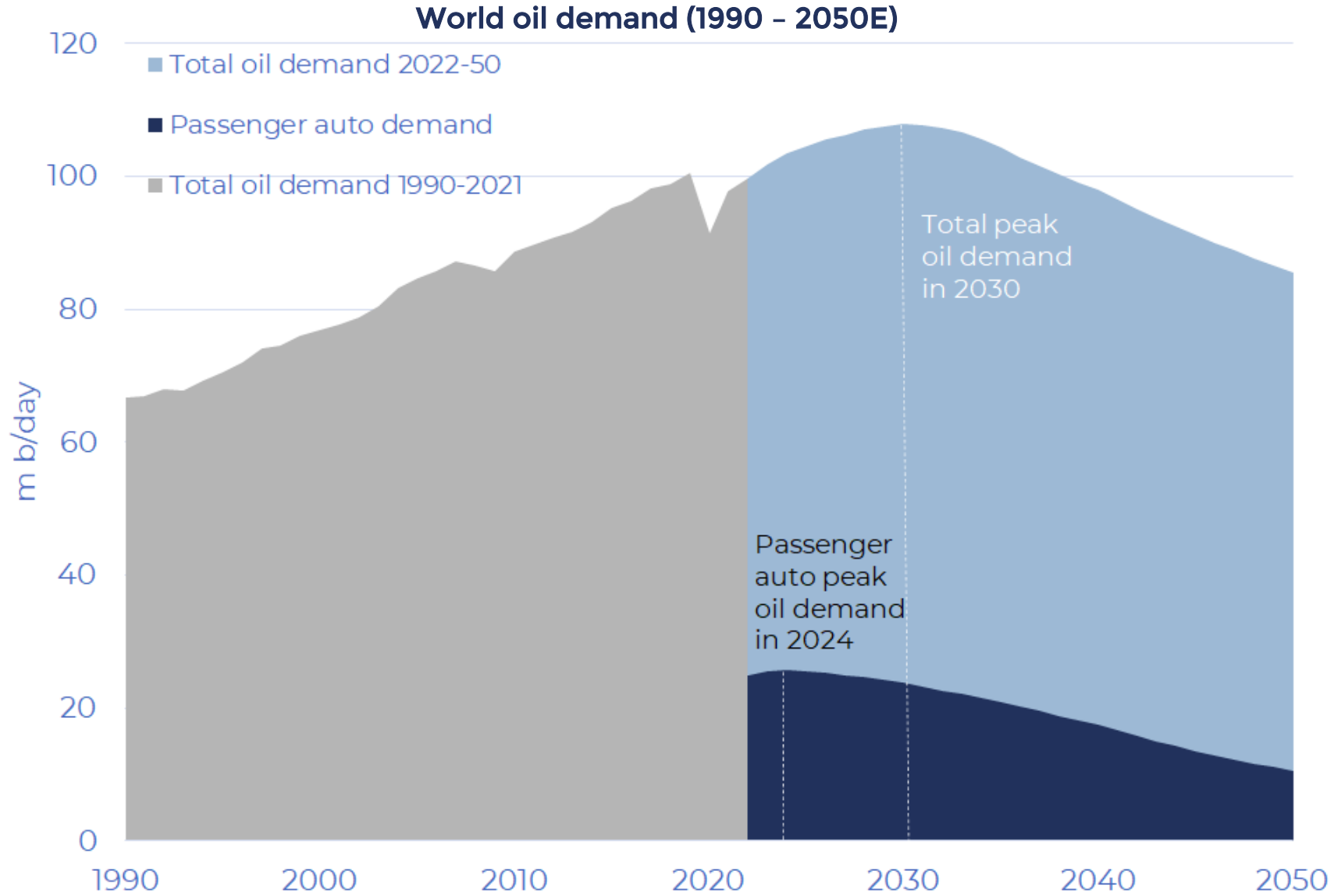
Oil demand: what about the rest?

Oil demand by sector



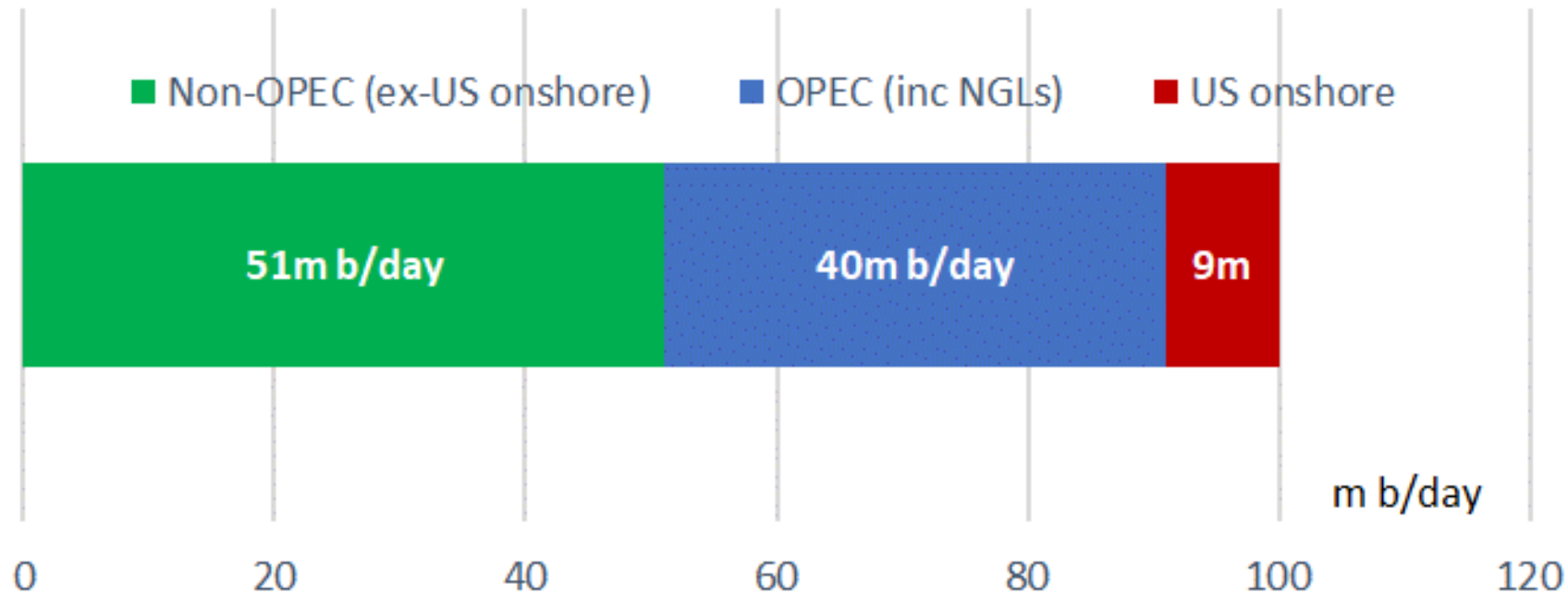
- Passenger vehicles account for 25% of oil demand
- Other key sources of demand (heavy transport; petrochemicals) more closely linked to GDP growth

Global oil demand: we see peak around 2030



Global oil supply: three main components

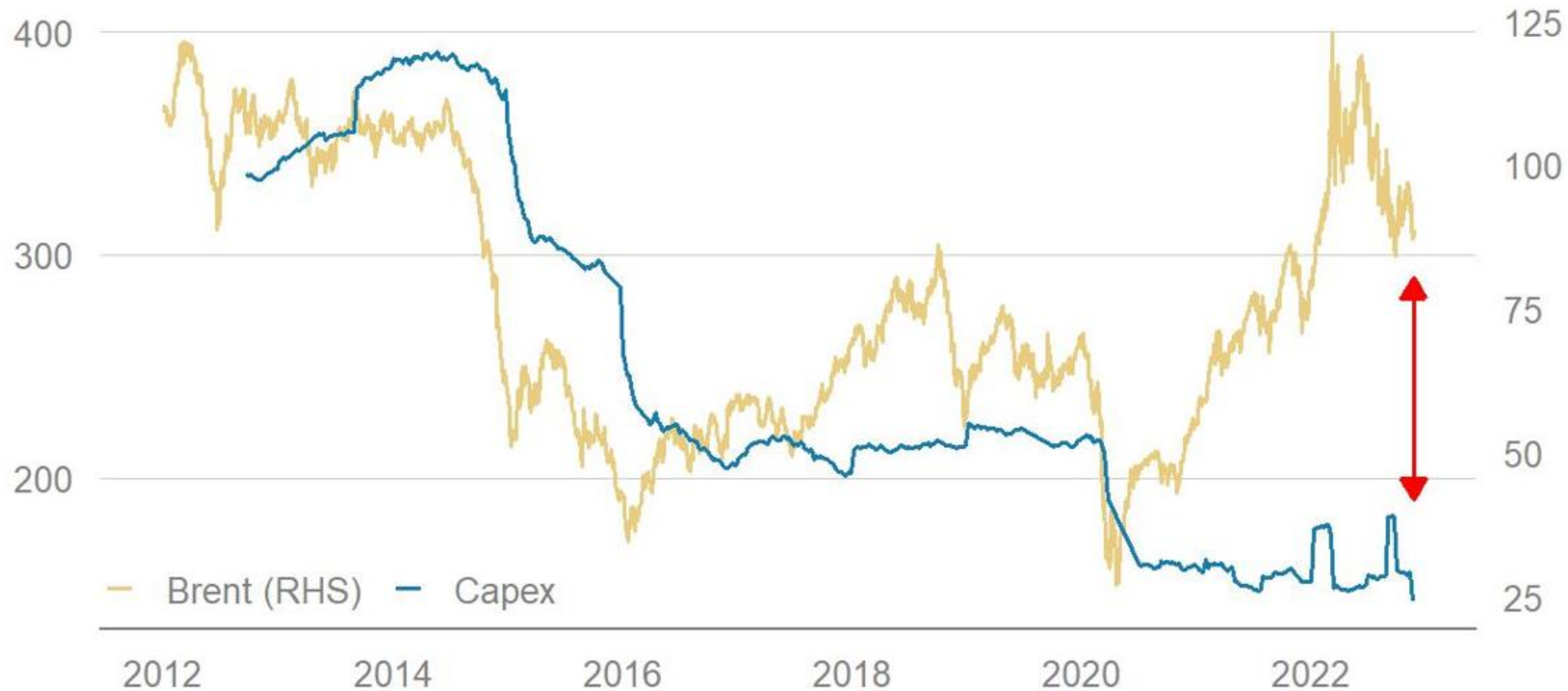
Global oil supply in 2022 (m b/day)



- **Non-OPEC (ex-US onshore):** holding up thanks to legacy projects, but facing stagnation
- **OPEC (inc NGLs):** low cost production, but spare capacity running low
- **US onshore:** shorter cycle, able to grow at \$50+/bl

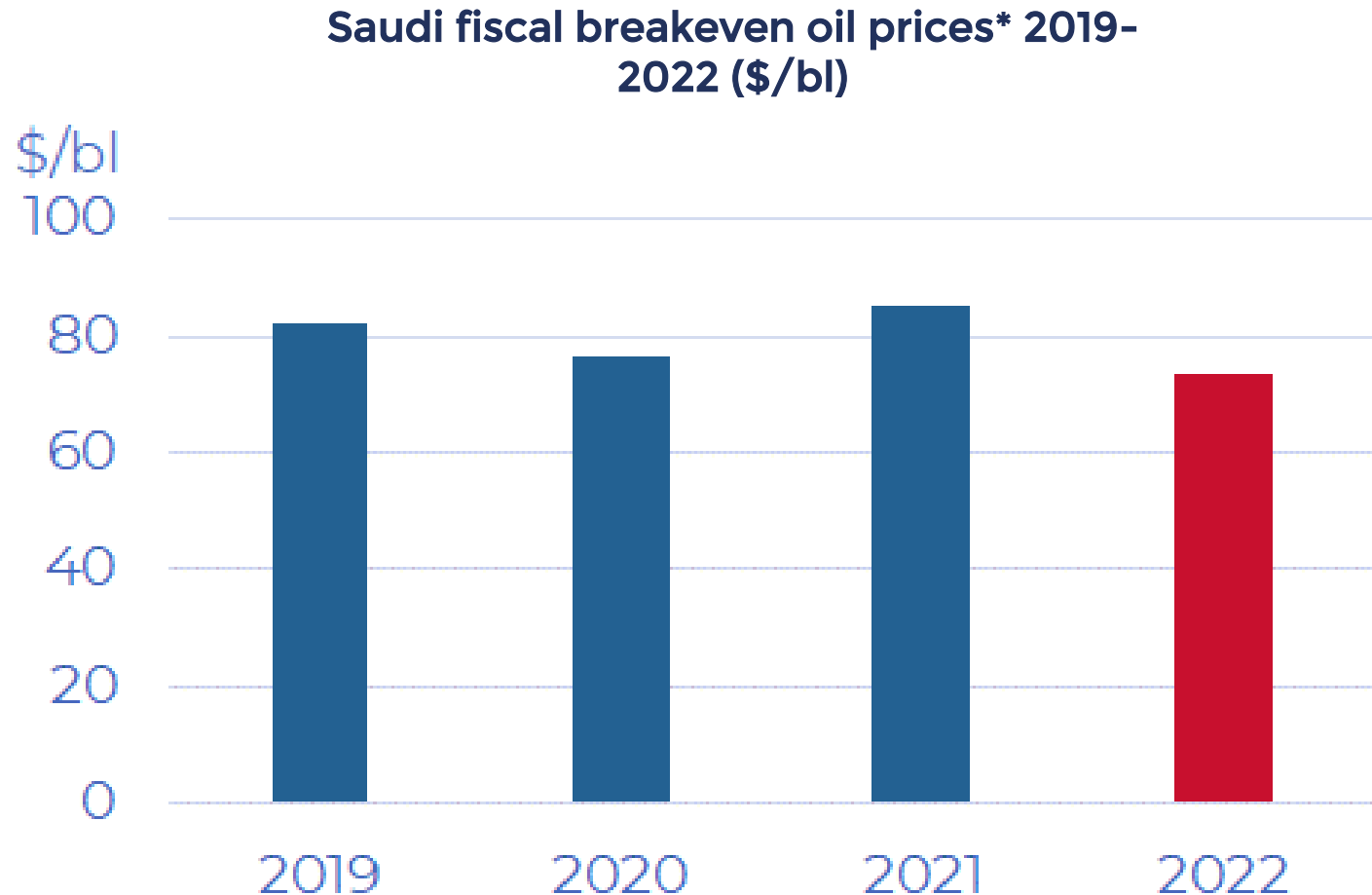
Capital expenditure lagging in the oil price recovery

Oil prices (RHS \$/bl) vs CAPEX for the 119 largest listed oil companies globally (LHS \$bn)



- Typically, there is a strong link between oil prices and subsequent upstream investment
- Capex plans are lagging the recovery in oil prices and there is little sign of increases planned

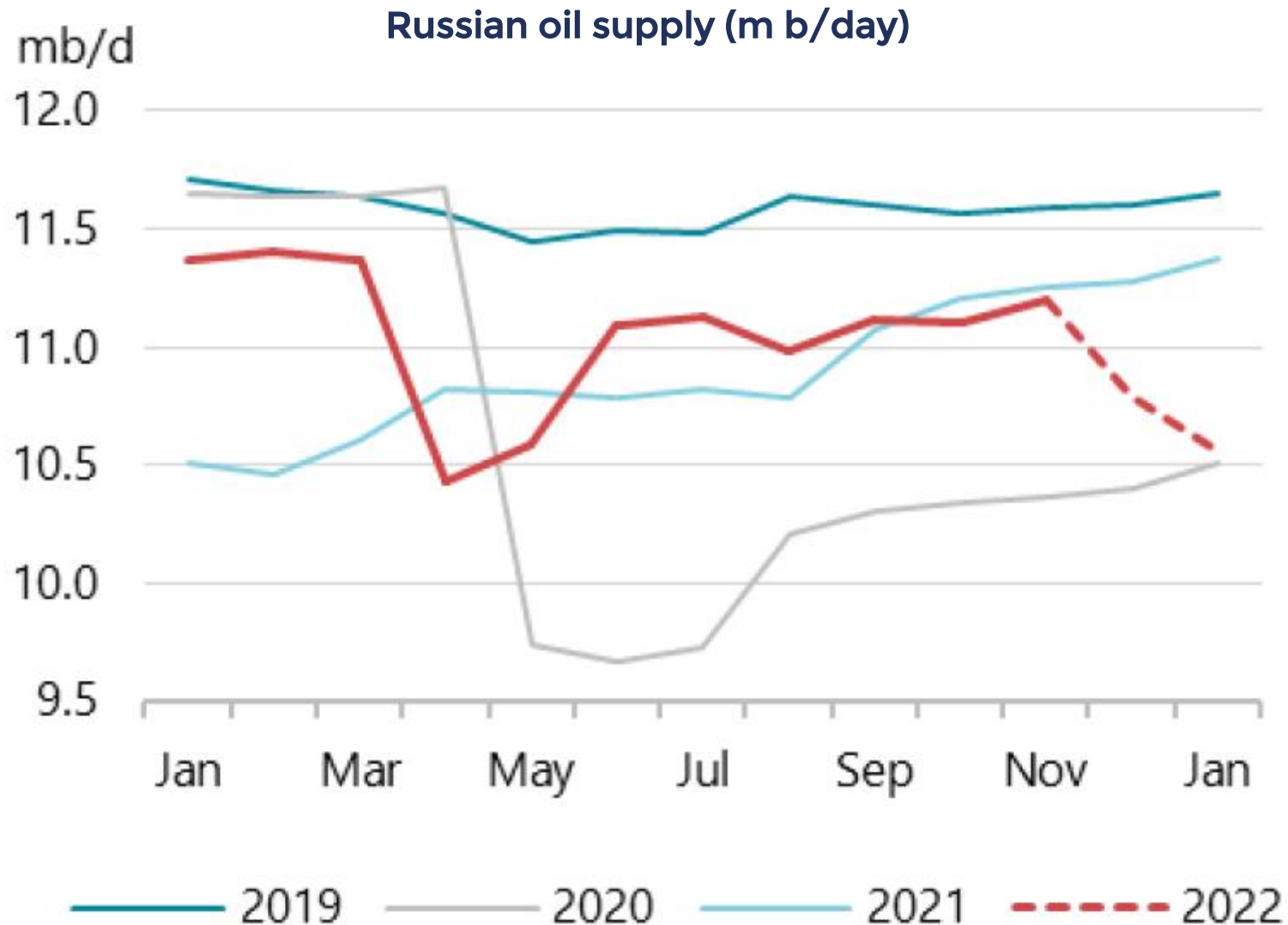
OPEC oil supply: Saudi fiscal budget imply high oil price needs



- The actual economic cost of developing most OPEC oil remains very low
- Higher levels of government expenditure necessitate greater oil revenues
- The fiscal breakeven oil price* for Saudi in 2022 is estimated to be \$73 per barrel

*Required oil price' is defined as the oil price that is needed by each country to balance fiscal budgets (source: IMF; Guinness Global Investors)

Russian oil supply: disruption minor in 2022, growing in 2023



- Russia normally produces around 11m b/day, of which 8m b/day are exported.
- The IEA estimates a supply shortfall from Russia of around 1.4m b/day by mid 2023 – a mix of crude oil and refined products.
- A portion of Russian exports already being rerouted to Asia, expect this to grow

Russian oil supply find new homes

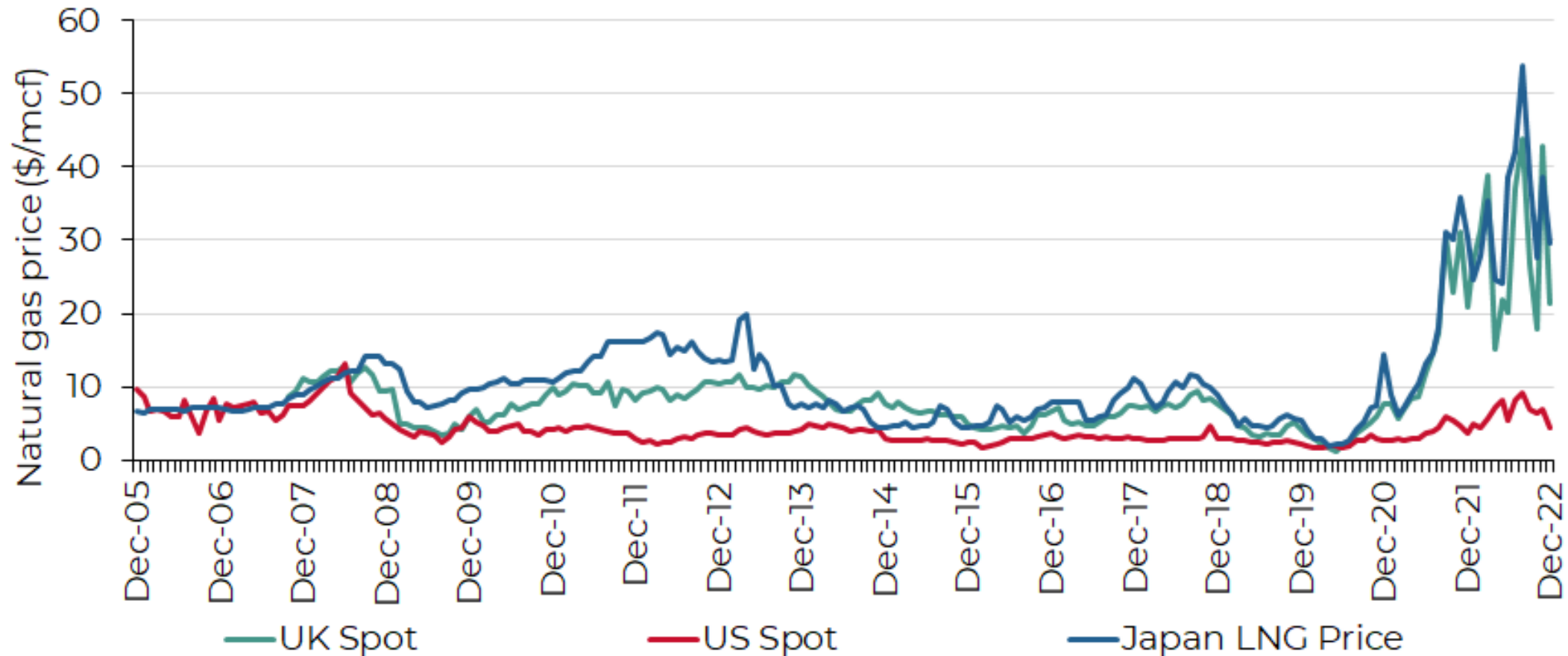
- Sales of “ice class” oil tankers in mid 2022 were 5x the level seen in 2021, with prices doubling



Natural gas: summary views

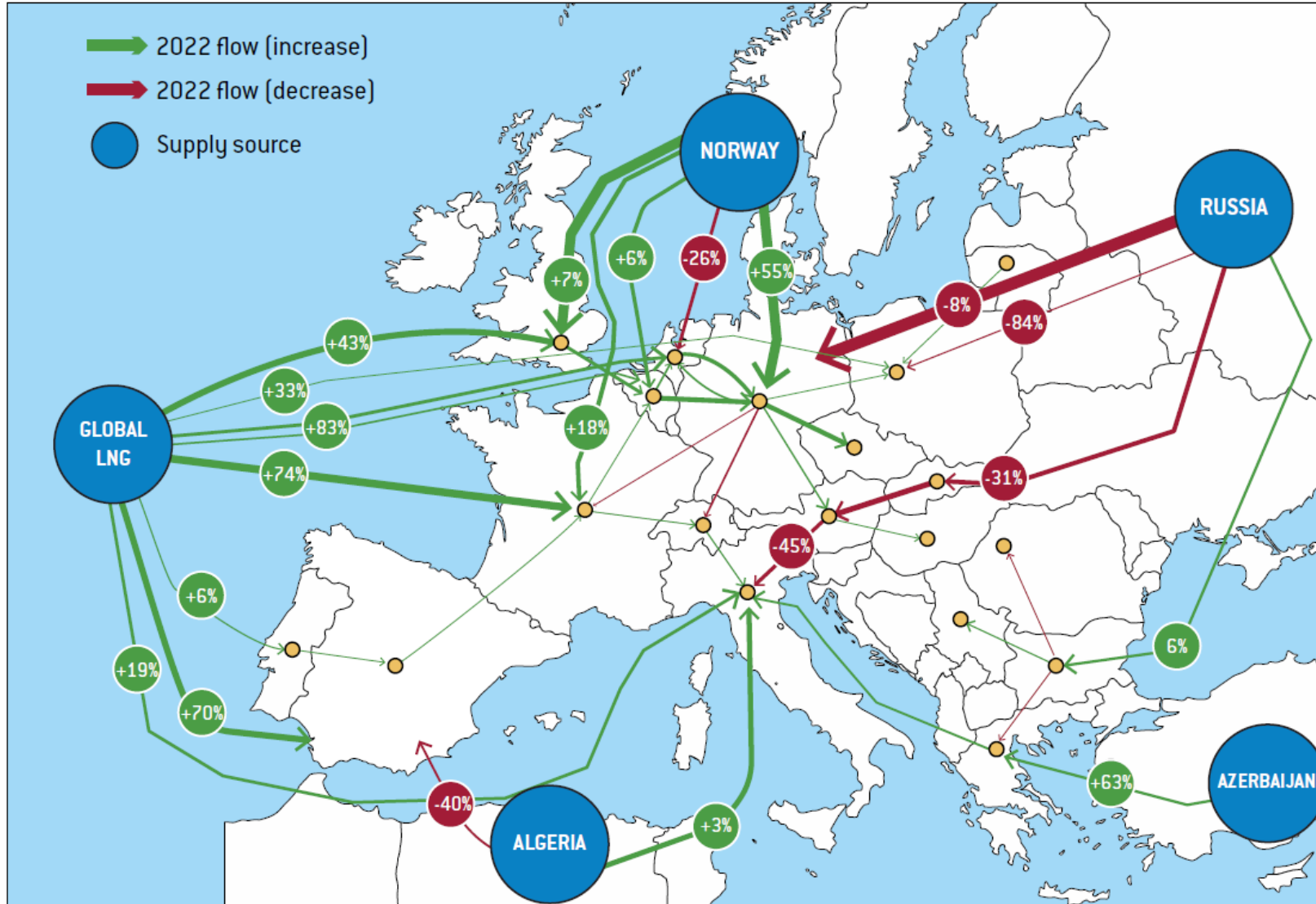
- Extraordinary spike in Asian and European gas prices on tight market conditions
- US gas price also being pulled higher, though largely dislocated from the world market

Global natural gas prices (US\$/mcf)



Natural gas: Europe still heavily reliant on flows from Russia

Flows of gas into Europe by origin (first half 2022 vs first half 2021)



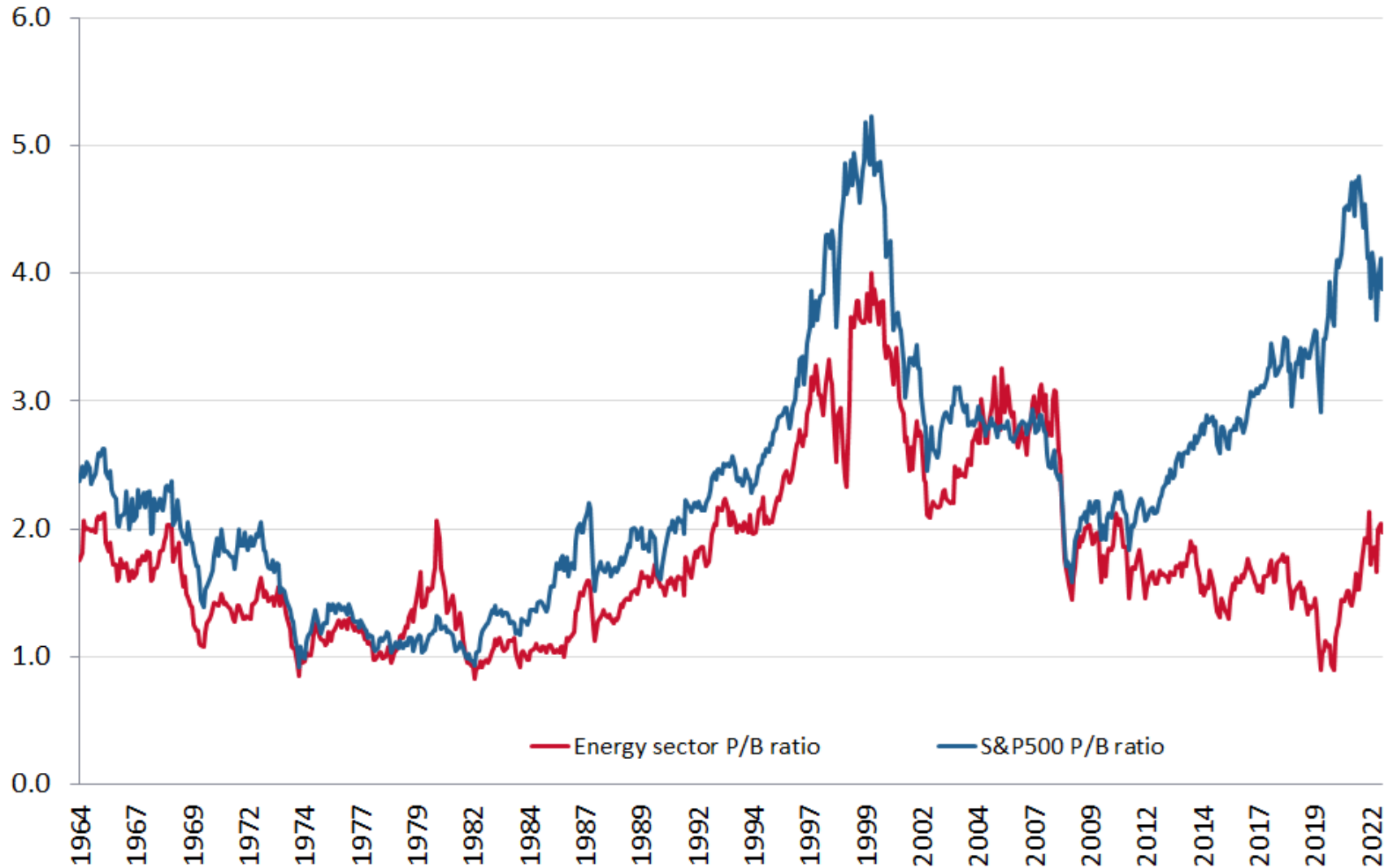
- In 2021, Europe imported 155bcm of natural gas from Russia, representing 45% of total EU imports and 40% of total gas consumption
- Replacing this gas with more LNG, other pipeline gas, coal and renewables will in the short-term be very challenging

How we invest in the oil & gas theme:

Guinness Global Energy Fund

Energy equities: price to book still dislocated vs broad market

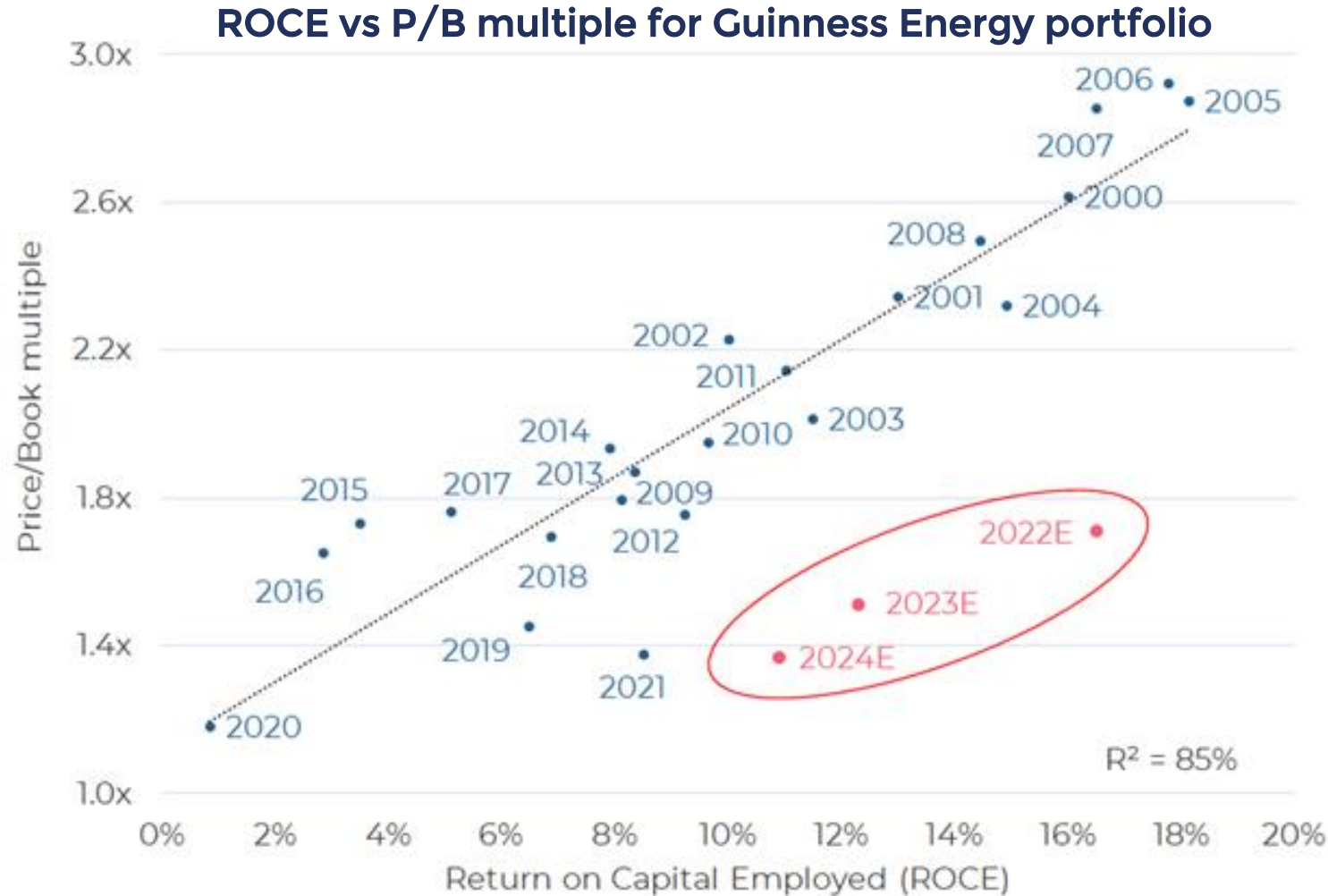
(P/B ratio) **Energy companies: historic price to book valuation relative to S&P 500**



- The energy sector is trading at a P/B ratio of 2.0x vs the S&P 500 on 3.9x

Improved ROCE not being priced in

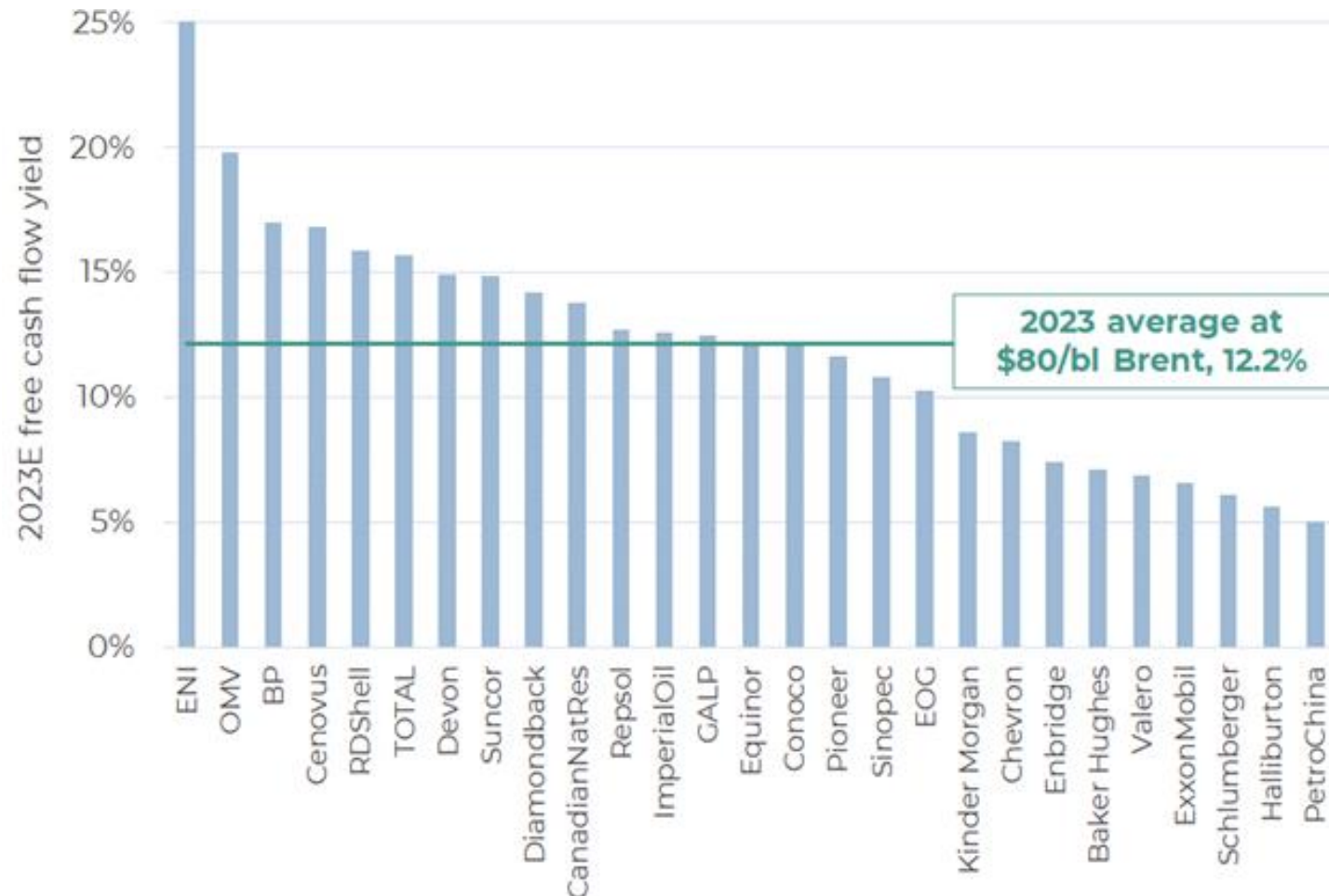
- Higher oil prices in 2022 took ROCE back to 15%+ while \$80 Brent in 2023 brings 12% ROCE (est)
- 12% ROCE (\$80/bl Brent) would imply P/B ratio for portfolio in 2023 rising to around 2.1x (+35%)

















Energy equities: strong portfolio FCF generation

- The estimated average free cashflow yield (after CAPEX) of holdings in the Guinness Global Energy Fund is 16.2% in 2022 (assumes \$100/bl Brent) and 12.2% in 2023 (assumes \$80/bl Brent)

Free cash flow yield of key holdings in the Guinness Global Energy fund 2023E



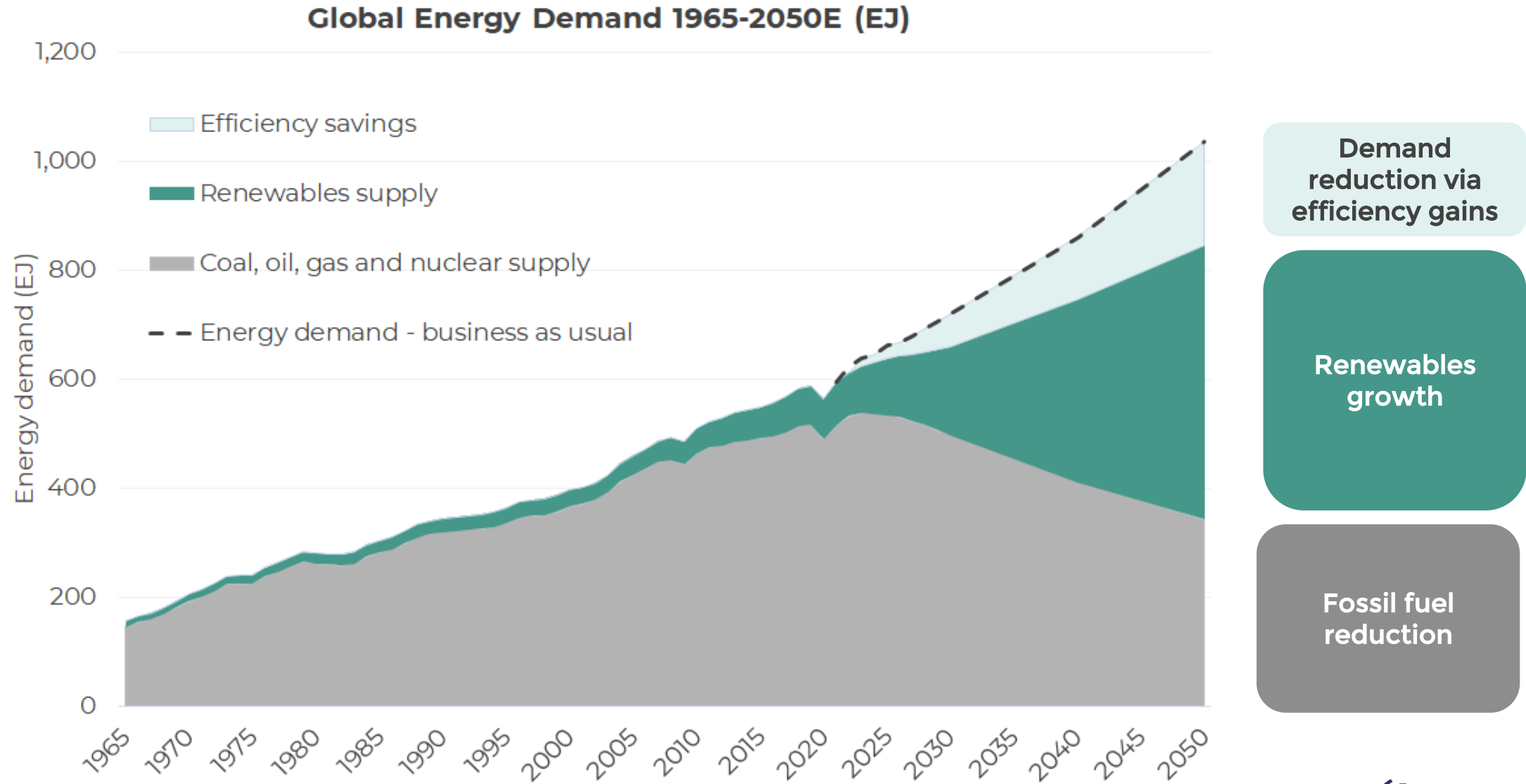
Fund positioning: key themes in the fund for 2023

Theme	Example holdings	Weighting (%)
1 Higher quality large cap oil & gas	 	27.7%
2 Oil & gas majors	  	26.6%
3 North American shale exposure	  	19.0%
4 Refining-focused	 	8.7%
6 Rising international oil & gas spending	 	9.0%
5 Undervalued international natural gas	 	5.8%
7 Other (incl cash)		3.2%
		100.0%

Source: Guinness Global Investors, 31 Dec 2022

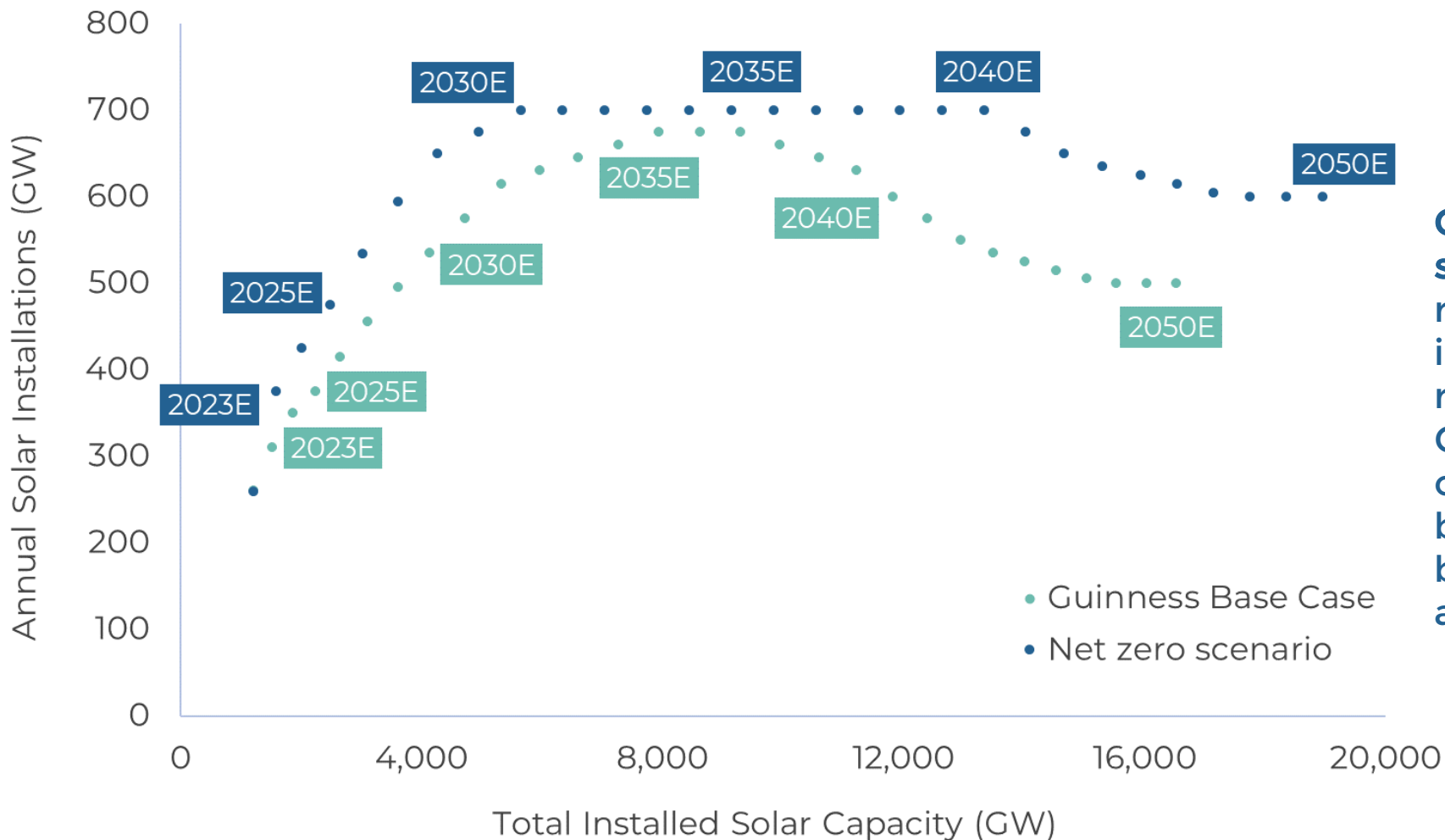
Outlook for renewable energy & energy efficiency

The energy transition: efficiency & renewables at expense of fossil fuels



Solar installations to grow rapidly

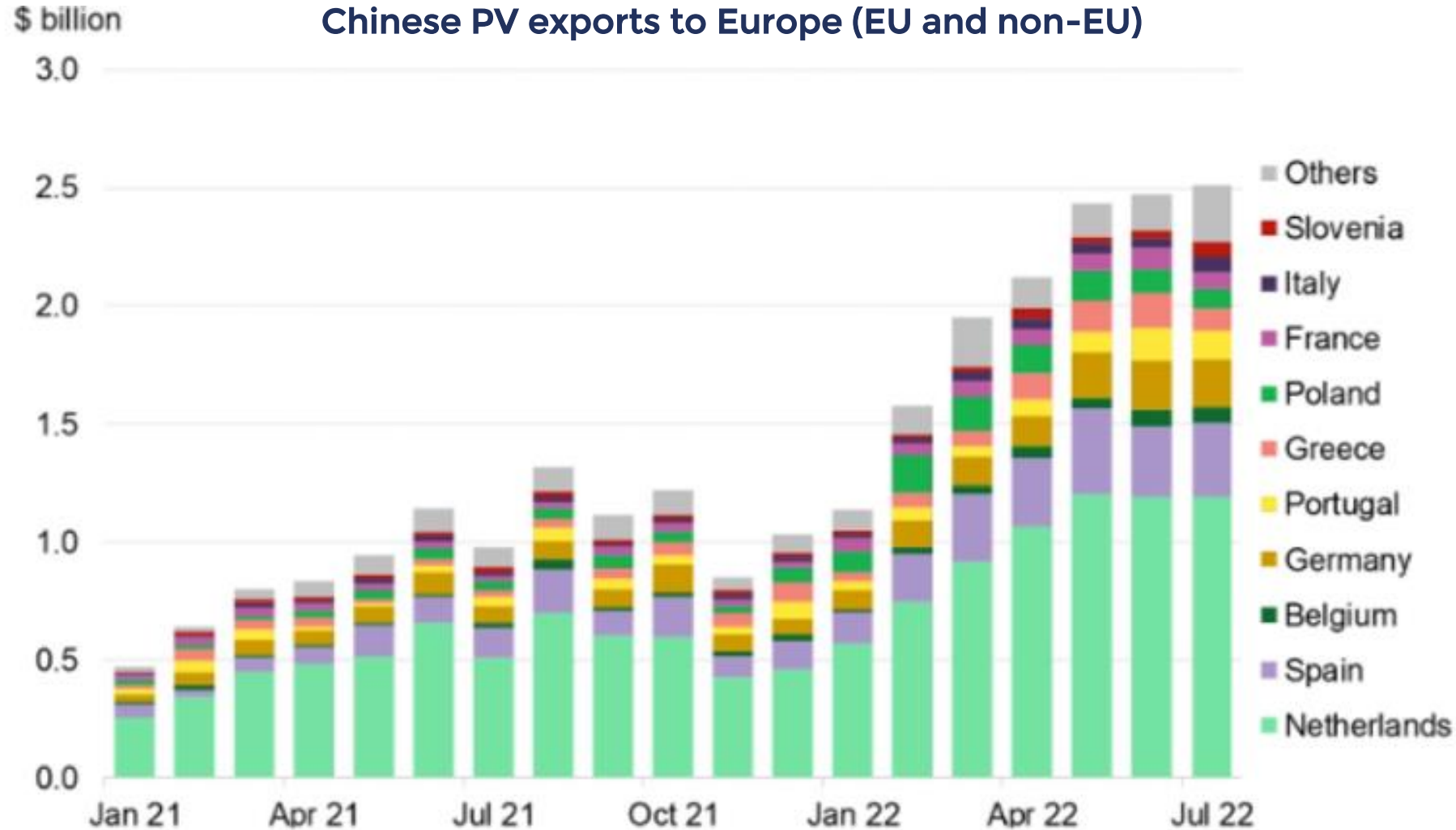
Global solar annual installations and installed capacity (5 year average)



Guinness base case says that between 2022 and 2040, solar installations are 10,300GW (nearly 10x more than current global capacity) with the installation rate reaching over 600 GWpa in the late 2030s

Guinness net zero scenario would require installations to reach around 700 GWpa with a total of 11,700GW being installed between 2022 and 2040

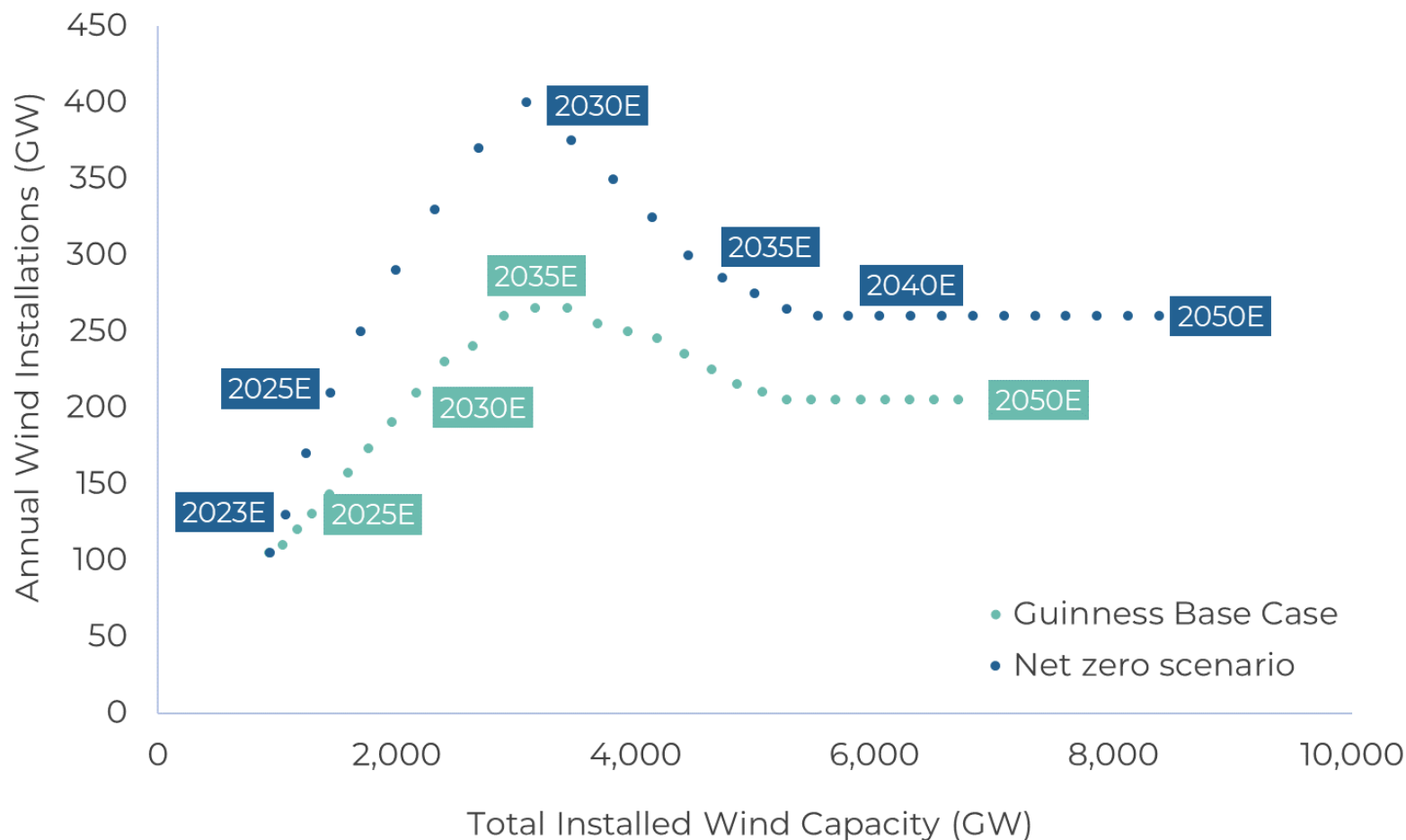
Broader acceleration of solar deployments across Europe



- In July 2022, China sold \$2.5bn of PV exports to European countries, up from around \$1bn per month at the start of 2022, and \$0.5bn per month at the start of 2021
- The biggest importers include Netherlands, Spain, Portugal and Germany

Wind annual installation to grow rapidly

Global wind annual installations and installed capacity (5 year average)

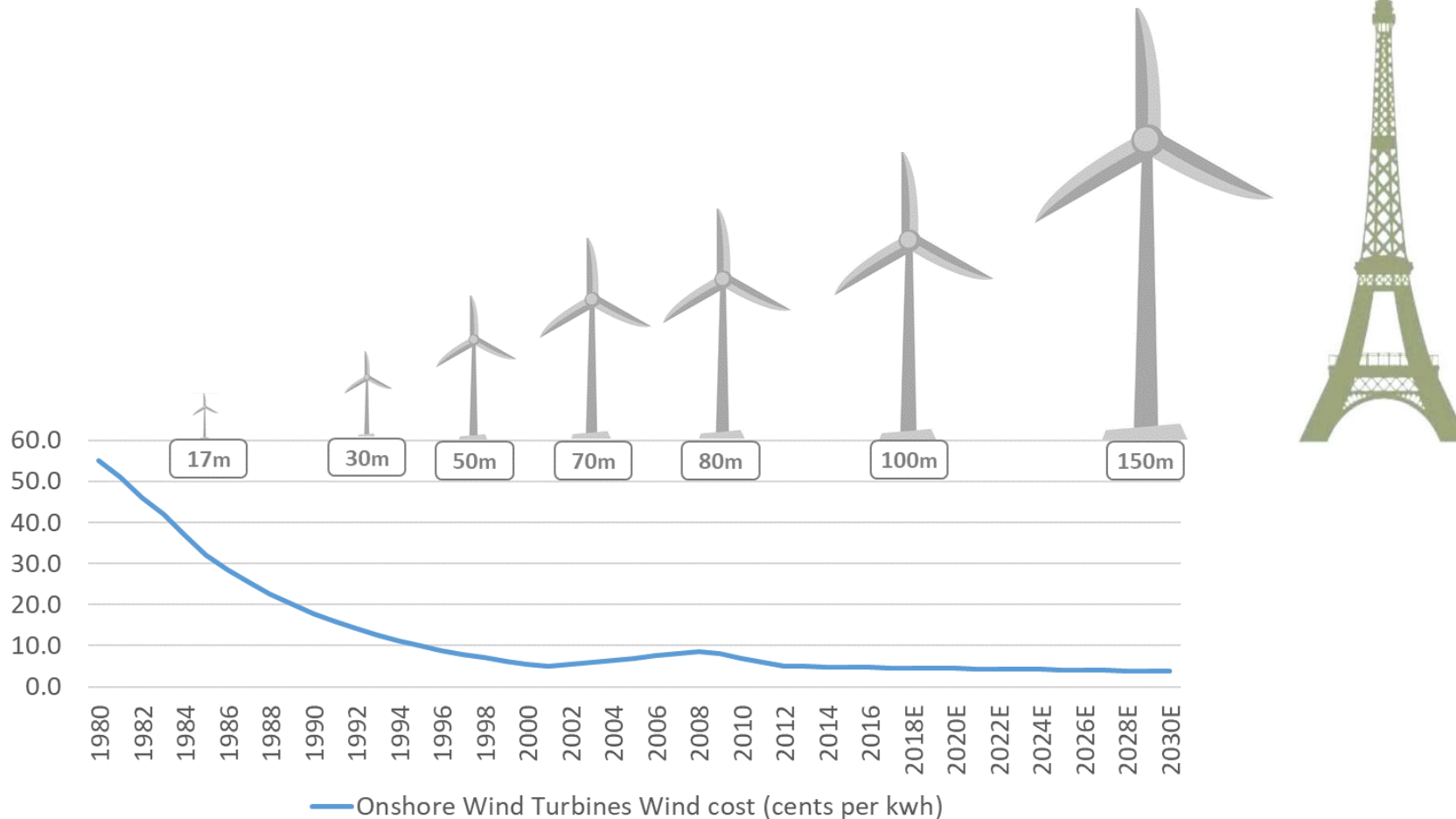


Guinness base case says that between 2022 and 2040, wind installations are 3,800 GW (>4x more than current global capacity) with the installation rate reaching over 250 GWpa in the mid 2030s

Guinness net zero scenario would require installations to reach around 400 GWpa with a total of over 5,200 GW being installed between 2022 and 2040

Wind power costs will fall as turbines get bigger

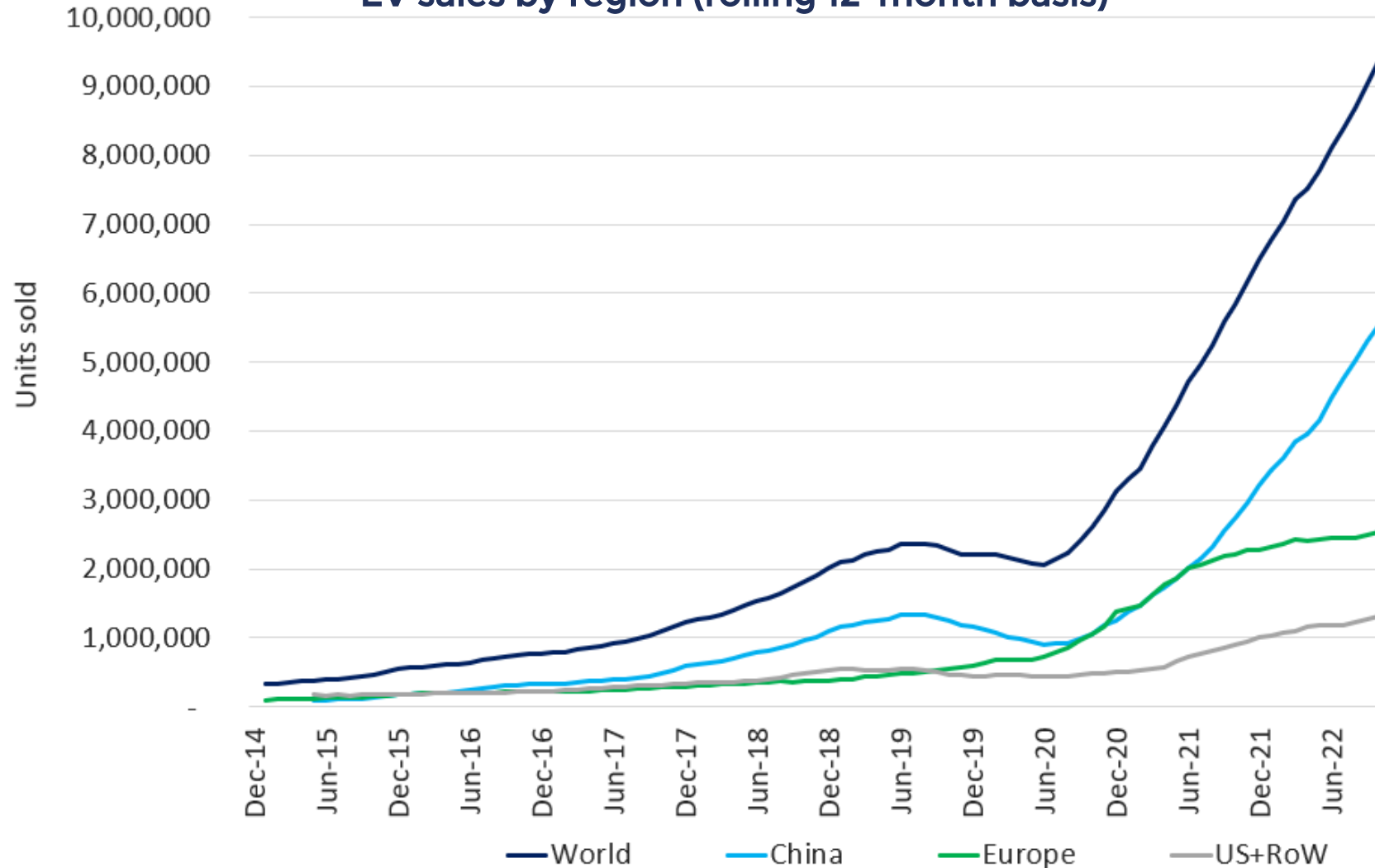
Onshore wind power costs since 1980 vs turbine height



- The power generated from a turbine is related to the square of the radius of the blade
- As new turbines get bigger, efficiencies will go from around 30% in 2019 to nearly 45% by end 2030 and even higher thereafter
- Planned turbine towers are over 150m high with each blade in excess of 100m long

Over 10 million electric vehicles sold in 2022

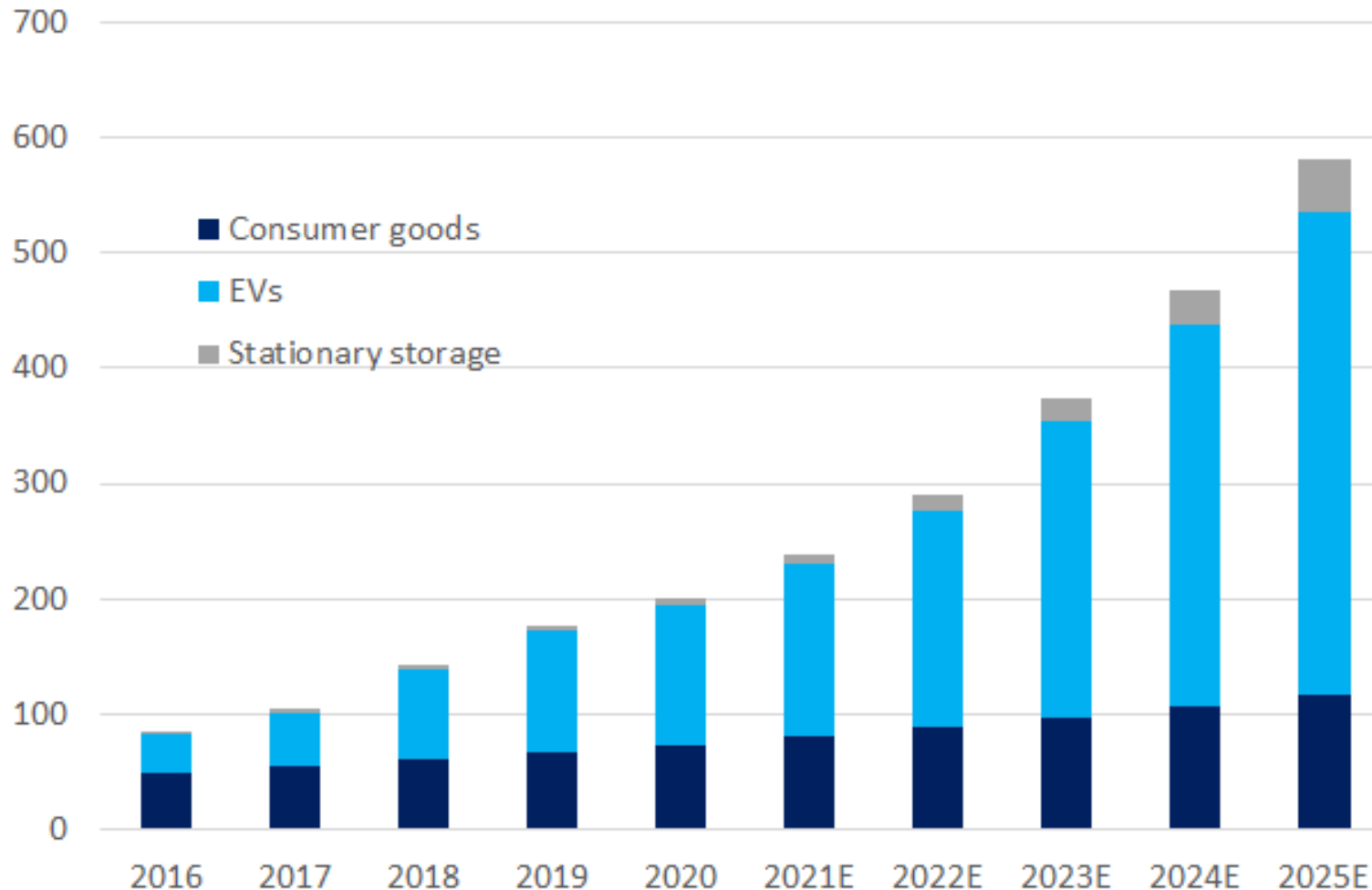
EV sales by region (rolling 12-month basis)



- New EV sales in 2021 around 6.5m vehicles, likely to be >10m in 2022 and 12-13m in 2023
- EV market share around 13% for 2022 (vs 4.0% and 2.4% in 2020 and 2019)
- Key drivers are improved economics, better range and quicker charging times

Batteries: demand growing at CAGR of around 20%

Global Lithium-ion battery demand 2016-25E (GWh)



- Lithium-ion battery demand is expected to have risen by around 20% in 2021, to c.240 GWh of new capacity
- Demand in 2025 is expected to increase to around 600 GWh, dominated by EV growth

The IRA in the US likely spurs significant renewables growth

Historical annual capacity additions (1950-2020) vs estimated additions under IRA (2022-35)

GW/year

250

200

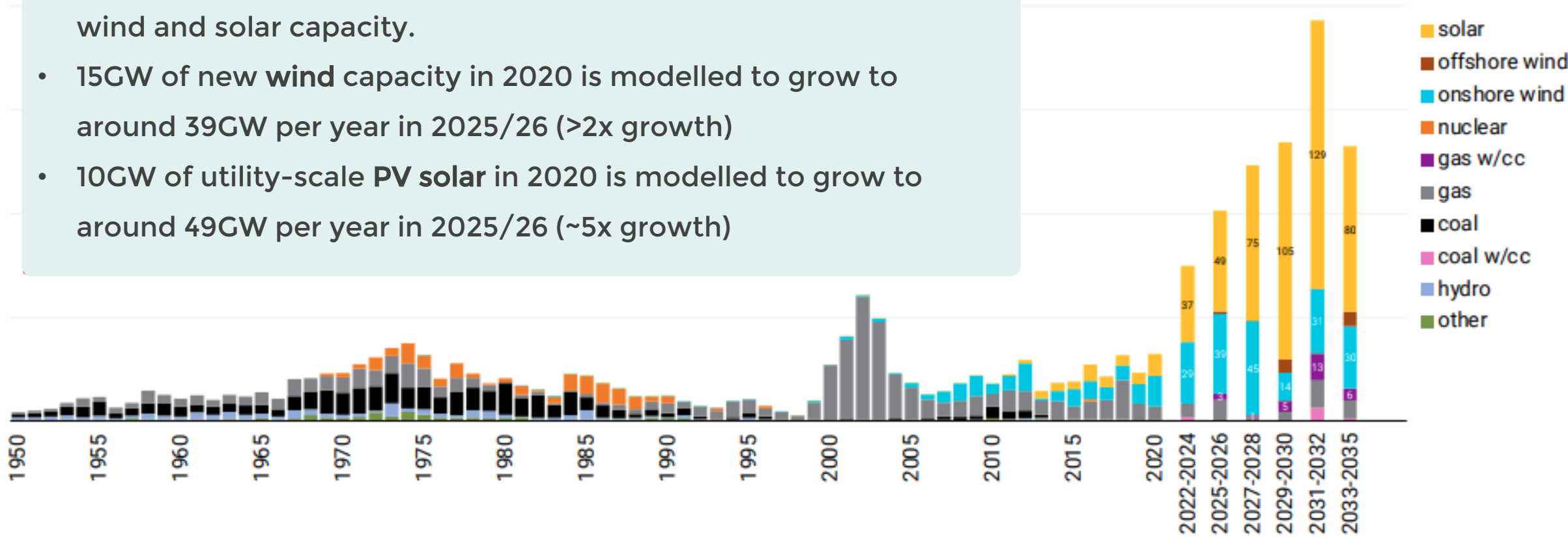
150

100

50

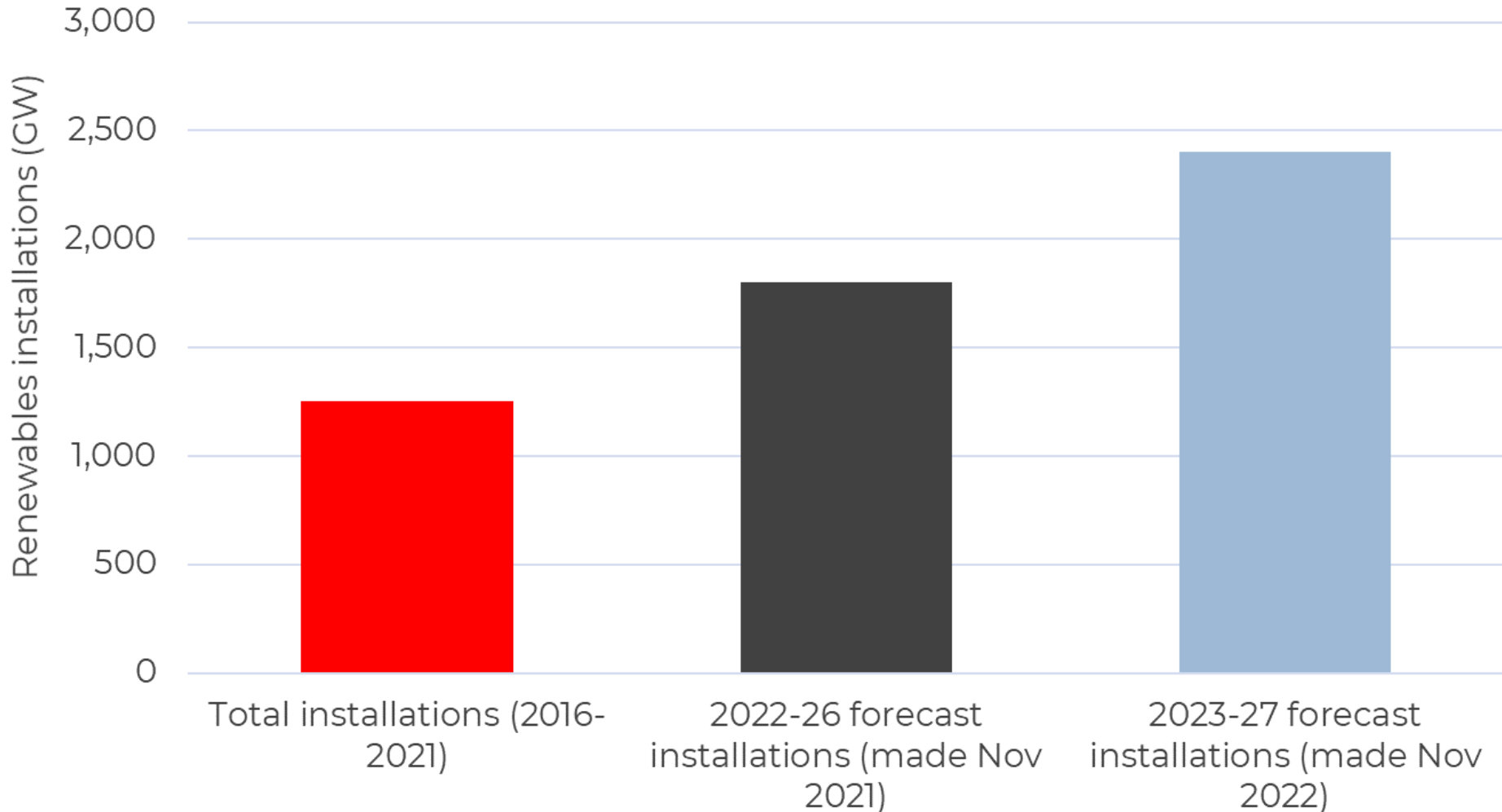
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- The Inflation Reduction Act looks likely to spur record growth in wind and solar capacity.
- 15GW of new wind capacity in 2020 is modelled to grow to around 39GW per year in 2025/26 (>2x growth)
- 10GW of utility-scale PV solar in 2020 is modelled to grow to around 49GW per year in 2025/26 (~5x growth)



Outlook for renewable installation continues to improve

Renewable capacity installations (GW over five years)

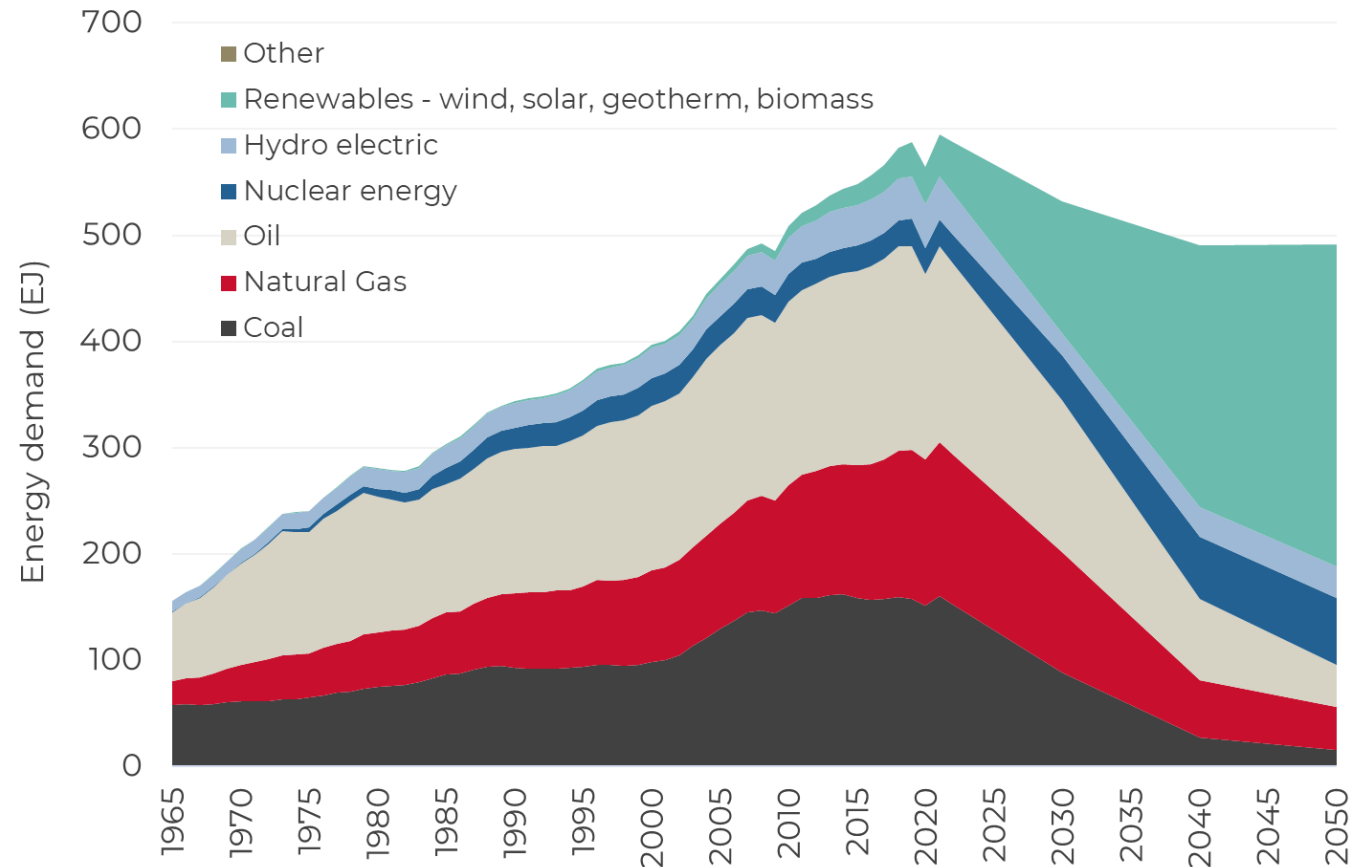


- The IEA is forecasting that renewable power additions over the next 5yrs will be just over 2,400 GW
- This is 30+% increase on its previous five-year forecast and equivalent to the entire current power capacity of China

Implications for sustainable energy of a “net zero” scenario

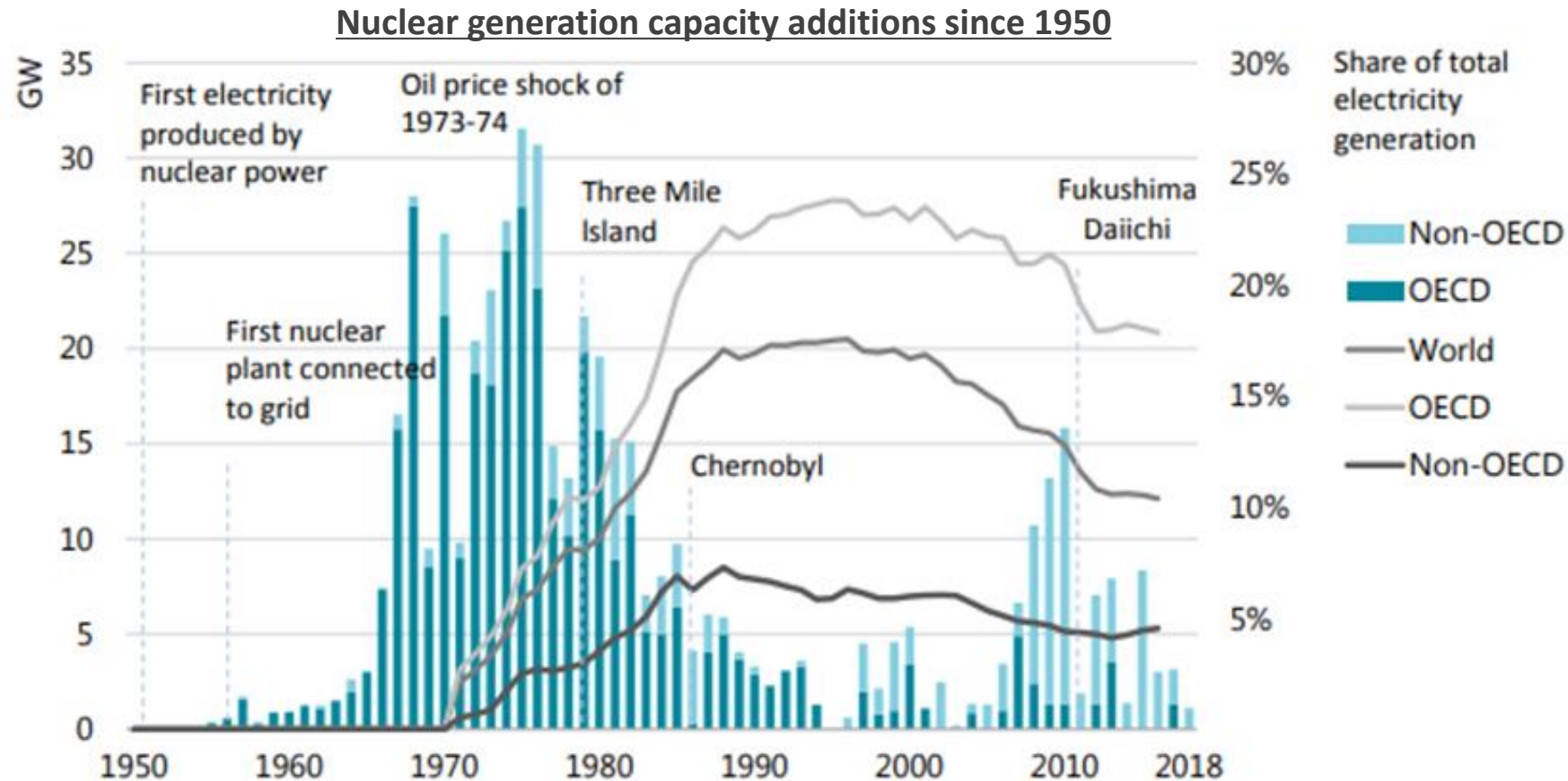
- A “net zero scenario” would require the following:
- **Flat or declining global energy demand growth in the 2020/30s (vs base est of 1%pa and historic growth of 1.9%pa)**
- **Solar power generation to grow >20%pa in the 2020s (vs base est of 17%pa)**
- **Wind power generation to grow at >15%pa in the 2020s (vs base est of 12%pa)**
- **Global energy investment would need to be over \$4.5trn pa (vs \$2trn pa currently)**

World energy demand in a net zero scenario



Nuclear power: will struggle to grow meaningfully

- Nuclear power provides 11% of world electricity supply
- Plants built in the 1970/80s now near the end of their assumed lives. Some will be extended, but many retired
- New projects are proving too expensive and too capital intensive for the private sector to finance



How we invest in these themes

Guinness Sustainable Energy Fund












Our investing solution to the Sustainable Energy transition

- The Guinness Sustainable Energy Fund prioritises returns whilst delivering concentrated exposure to companies playing a key role in global de-carbonisation
- The Fund's holdings map most directly to four of the UN's sustainable development goals
- The Fund is classified as Article 9 for the purpose of the EU SFDR



Sustainable Energy Fund: portfolio by theme

Sustainable Energy Fund: portfolio by theme

Theme	Example holdings	Weighting (%)
1 Electrification of the energy mix	 	20.2%
2 Rise of the electric vehicle and auto efficiency	 	20.1%
3 Battery manufacturing		7.7%
4 Expansion of the wind industry	 	10.6%
5 Expansion of the solar industry		18.6%
6 Heating, lighting and power efficiency	 	16.4%
7 Geothermal		4.2%
8 Other (inc cash)		2.3%

Portfolio holdings' impact – carbon dioxide emissions avoided

**Estimated annualised carbon cost vs carbon displaced
(tonnes) per \$1m of AuM by sector**



- In 2021, per US\$m of portfolio assets, we estimate that the annualised carbon:
 - cost was c.101 tCO₂e/\$m
 - displaced was c.655 tCO₂e/\$m

655 tonnes of CO₂ is equivalent to one of the following:

10,830	83	1,625,845	1,516
Tree seedlings grown for 10 years	Homes' energy use for one year	Miles driven by a passenger vehicle	Barrels of oil

Note: these are unaudited figures, which rely on internal estimates

The energy transition

- There is a need for greater investment across the breadth of the energy market to decarbonize and build security of supply
- The Guinness Global Energy fund provides exposure to oil and gas companies
- The Guinness Sustainable Energy fund provides exposure to renewable energy and efficiency companies

Investment team biographies



Will Riley

CA (Co-manager)

- Joined Guinness Global Investors in 2007
- Company valuation expert for PricewaterhouseCoopers 2000-2007
- Qualified as a Chartered Accountant in 2003
- Graduated from Cambridge University with a Masters degree in Geography in 1999



Jonathan Waghorn

(Co-manager)

- Joined Guinness Global Investors in 2013
- Co-portfolio manager of the Investec Global Energy Fund from February 2008 to May 2012
- Co-head of energy equity research at Goldman Sachs from 2000-2008
- Drilling engineer in Dutch North Sea for Shell



Jamie Melrose

CFA, CAIA (Analyst)

- Joined Guinness Global Investors in April 2019
- Investment Manager in Sustainable Ownership at RPMI Railpen from May 2016 to March 2019
- Thematic Analyst in Equity Research at Berenberg from September 2014 to April 2016
- Graduated from the University of Bath with a Bachelor's degree in Mathematics in 2014

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For your protection, calls to these numbers will be recorded

Appendix: definitions

Alpha is a measure of a fund's over or underperformance by comparison to its benchmark. It represents the return of the fund when the benchmark is assumed to have a return of zero, and thus indicates the extra value that the manager's activities have contributed.

Beta is a statistical estimate of a fund's volatility by comparison to that of its benchmark, i.e. how sensitive the fund is to movements in the section of the market that comprises the benchmark. A fund with a Beta close to 1 will move generally in line with the benchmark. Higher than 1 and the fund is more volatile than the benchmark.

Information Ratio An assessment of the degree to which a manager uses skill and knowledge to enhance returns, this is a versatile and useful risk-adjusted measure of actively-managed fund performance. It is calculated by deducting the returns of the fund's benchmark from the fund's overall returns, then dividing the result by its Tracking Error. In this way, we arrive at the value, per unit of extra risk assumed, that the manager's decisions have added to what the market would have delivered anyway.

Maximum Drawdown Represents the worst possible return over a period, e.g. buying at the highest price over the period and selling at the lowest.

Maximum Loss Represents the worst running return over a period, e.g. the longest running consecutive loss without making a gain

The **R-Squared** measure is an indication of how closely correlated a fund is to an index or a benchmark. It can be treated as a percentage, showing what proportion of a fund's movements can be attributed to those of the benchmark. Values for R-Squared range between 0 and 1, with 0 indicating no correlation at all, and 1, rarely, showing a perfect match.

Sharpe ratio is a commonly-used measure which calculates the level of a fund's return over and above the return of a notional risk-free investment, such as cash or Government bonds. The difference in returns is then divided by the fund's standard deviation - its volatility, or risk measurement. The resulting ratio is an indication of the amount of excess return generated per unit of risk.

Tracking Error this statistic measures the standard deviation of a fund's excess returns over the returns of an index or benchmark portfolio. As such, it can be an indication of "riskiness" in the manager's investment style. A Tracking Error below 2 suggests a passive approach, with a close fit between the fund and its benchmark. At 3 and above the correlation is progressively looser: the manager will be deploying a more active investment style, and taking bigger positions away from the benchmark's composition.

Volatility Standard deviation is a statistical measurement which, when applied to an investment fund, expresses its volatility, or risk. It shows how widely a range of returns varied from the fund's average return over a particular period. Low volatility reduces the risk of buying into an investment in the upper range of its deviation cycle, then seeing its value head towards the lower extreme.

ABOUT Guinness Global Investors

- Founded in **2003**, along with US sister firm Guinness Atkinson Asset Management Inc.
- **\$6.3bn** AUM (Guinness Group assets)
- **64** employees, including 20 investment professionals
- **100%** employee owned
- Key Investment strategies:
 - Global Equity
 - Energy
 - Asia & Financials

Source: Guinness Global Investors, August 2022

Important information

Issued by Guinness Global investors which is a trading name of Guinness Asset Management Limited, authorised and regulated by the Financial Conduct Authority.

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

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

Documentation

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

- the Manager: Link Fund Manager Solutions (Ireland) Ltd (LFMSI), 2 Grand Canal Square, Grand Canal Harbour, Dublin 2, Ireland; or,
- the Promoter and Investment Manager: Guinness Asset Management Ltd, 18 Smith Square, London SW1P 3HZ.

LFMSI, as UCITS Man Co, has the right to terminate the arrangements made for the marketing of funds in accordance with the UCITS Directive.

Investor Rights

A summary of investor rights in English is available here: <https://www.linkgroup.eu/policy-statements/irish-management-company/>

Residency

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

Structure & regulation

The Funds are a sub-fund of Guinness Asset Management Funds PLC (the "Company"), an open-ended umbrella-type investment company, incorporated in Ireland and authorised and supervised by the Central Bank of Ireland, which operates under EU legislation. The Funds have been approved by the Financial Conduct Authority for sale in the UK. If you are in any doubt about the suitability of investing in these Funds, please consult your investment or other professional adviser.

Switzerland

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

Singapore

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

Telephone calls will be recorded and monitored.