

## RISK

This is a marketing communication. Please refer to the prospectuses, KIDs and KIIDs for the Funds, which contain detailed information on their characteristics and objectives, before making any final investment decisions.

The Funds 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. Further details on the risk factors are included in the Funds' documentation, available on our website.

Past performance does not predict future returns.

## ABOUT THE STRATEGY

<b>Launch</b>	19.12.2007
<b>Index</b>	MSCI World
<b>Sector</b>	IA Commodity/Natural Resources
<b>Managers</b>	Will Riley Jonathan Waghorn
<b>EU Domiciled</b>	Guinness Sustainable Energy Fund
<b>UK Domiciled</b>	WS Guinness Sustainable Energy Fund

## INVESTMENT POLICY

The Guinness Sustainable Energy Funds are managed for capital growth and invest in companies involved in the generation, storage, efficiency and consumption of sustainable energy sources (such as solar, wind, hydro, geothermal, biofuels and biomass). We believe that over the next twenty years the sustainable energy sector will benefit from the combined effects of strong demand growth, improving economics and both public and private support and that this will provide attractive equity investment opportunities. The Funds are actively managed and use the MSCI World Index as a comparator benchmark only.

## CONTENTS

February in review	2
Managers' comments	3
Performance	6
Portfolio	7
Outlook	11
Important information	24

## COMMENTARY

### UPDATE ON OUTLOOK FOR SUSTAINABLE ENERGY

At the start of January we published an outlook piece for the year ahead. Here, we take the opportunity to provide updated comment on a number of the points made (reproduced in italics), in light of recent company results and developments.

### EQUITIES

The Guinness Sustainable Energy Fund (Class Y) delivered a return of 5.2% (in USD) in February, ahead of the MSCI World at +4.2%. Within the Fund, the strongest stocks were Chinese solar glass manufacturer Xinyi Solar and US smart grid company Itron. Xinyi announced strong gross margins at its results thanks to strong growth and moderating energy and raw material prices. Itron had strong bookings and its highest profitability since 2017 on improved component availability. Sunnova was our weakest performer after announcing a \$100m at-the-money stock offering program.

### CHART OF THE MONTH – BATTERY METAL PRICE FALLS

After strength in 2022, battery metal prices continue to fall. Lithium spot prices in China have fallen by c.85% from just over \$80,000/tonne in November 2022 to under \$14,000/tonne today. Cobalt and Nickel haven't fared much better, shedding 60% and 45% since highs in March and April 2022.






Battery metal prices rebased (Mar-22 = 100)



Source: Bloomberg

FEBRUARY NEWS AND EVENTS IN REVIEW

In this section, we review the key news items and their impact on our various portfolio sub-sectors over the last month.

News	Sub-Sector	Impact
Electric vehicle adoption remains strong, with data released in February showing a 69% jump in sales in January 2024 compared to a year earlier. China saw plugin penetration of 32% in January, closely followed by Europe at 29%, with the US lagging at closer to 12%. Plugin share gains in China have been especially strong with penetration rates growing from 6% in 2020 to 15% in 2021, 30% in 2022 and 37% in 2023. Further progress to 45%+ share is expected in 2024.	Electric vehicles	
According to environmental research group, Kayrros, US utility-scale solar installations hit a record high of 15 GW in 2023, up 60% from the prior year. The acceleration was partly thanks to a rebound following supply-chain and labour bottlenecks in 2022. This momentum is expected to continue in 2024 with the first quarter on track to post a further jump in completions. The US Energy Information Administration (EIA), expects solar energy to account for the largest share of new electric generating capacity in 2024 at 58%, with battery storage in second place at 23%.	US utility solar	
Miners are starting to feel the strain of a prolonged slump in battery metals. After a blistering rally 2 years ago, lithium prices are down 85% from their 2022 highs, while cobalt and nickel are off 60% and 50% respectively, pulled down by slowing electric vehicle demand growth and supply surpluses (see chart of the month). Lower prices led Albemarle, the world's largest lithium producer, to lay off 300 employees and scale back growth plans, while profits at SQM, the world's second largest lithium producer, fell over 80% year on year. Nickel faces the additional challenge of Indonesia rapidly expanding its low-cost supply. Lower metal prices are expected to feed into electric vehicle battery prices, helping to improve affordability for consumers.	Battery metal prices	
WindEurope believes the EU's wind power target of installing 33 GW a year out to 2030 is within reach after a rebound in investment and improved permitting procedures. In a report released last month, the agency forecast that the EU would install 29 GW each year, increasing capacity to 393 GW. They expect two thirds of the installations will be onshore, with offshore installations making up the remainder and picking up rapidly towards the end of the decade.	European wind	
Global automakers are turning to partnerships to challenge BYD and Tesla in the increasingly competitive electric vehicle market. Ford and GM announced they were open to partnerships with other OEMs (Original Equipment Manufacturers) to cut costs, while Stellantis and Volkswagen are working directly with Chinese OEMs Leapmotor and Xpeng to roll out new electric models. In some cases, these partnerships are extending to non-automotive companies in an attempt to offer differentiated products. BAIC is working with Huawei to bring out a high end intelligent sedan, while Honda is joining hands with Sony to benefit from their software and gaming expertise.	Auto OEMs	

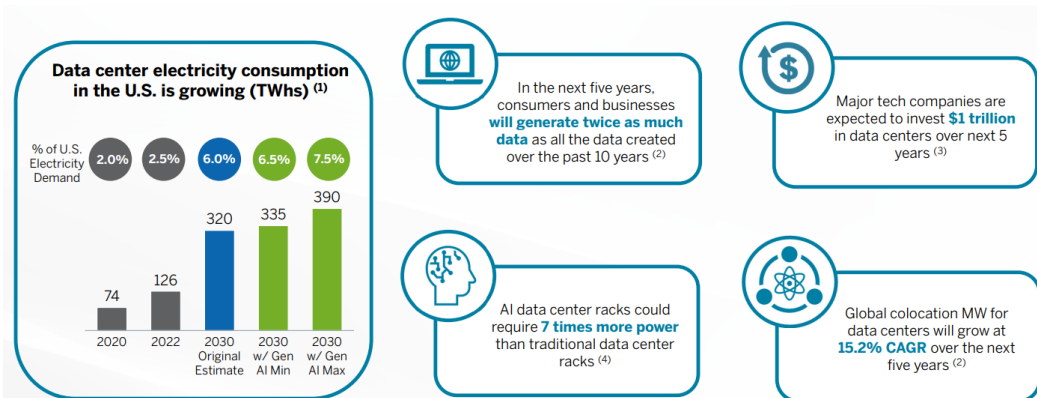
MANAGERS' COMMENTS

At the start of January we published an outlook piece for the year ahead. Here, we take the opportunity to provide updated comment on a number of the points made (reproduced in italics), in light of recent company results and developments:

*Renewable power generation* is expected to grow at around 7-8%, displacing some coal and gas power, which would result in the electricity sector's CO2 emissions declining. Grid investment will increase to support the growth, growing at twice its historic rate from \$300 bn in 2022 to over \$800 bn pa in the 2040s.

The latest quarterly results from our utility and IPP holdings largely support this thesis. Both NextEra Energy and Iberdrola reported in line earnings and reiterated guidance for high single digit earnings growth in 2024. Iberdrola grew their grid asset base by 8% in 2023, while NextEra noted increasing electricity demand from datacentres.

Datacentre growth proved to be a popular theme throughout the quarter, with various utilities noting that any Artificial Intelligence (AI) roll-out is likely to be highly energy intensive. Incremental power demand will have to be met by renewable installations or face potential grid curtailment and the violation of big tech's net zero targets. Constellation Energy Group (not held), the largest nuclear operator in the US, issued guidance 20% ahead of consensus driven by precisely this dynamic:



Source: CEG Q4 2023 investor presentation

The Southern Company, another US utility, is now expecting aggregate electricity demand (not just for renewables) to grow 6% out to 2028, 80% driven by datacentres. This compares to US electricity demand growth of around 1%pa over the last twenty years. These comments accord with analysis from Morgan Stanley that “GenAI” power demand is set to grow at a 70%pa over the next three years, at which point it will consume roughly the same amount of power as Spain currently does.

*Building efficiency and electrification* will see sharply greater investment, increasing from \$340bn in 2022 to \$600bn pa from 2026-30 (10%pa growth versus a historic rate of 5%pa) driven by energy security, economics and tightening building standards.

Our electrification holdings started 2024 strongly, with positive results across the board during the latest quarter and the majority of companies upgrading 2024 guidance ahead of expectations. In the US, both Hubbell and Eaton posted strong numbers, beating expectations and raising numbers for 2024. Hubbell noted continued strength in their utility segment driven by a strong transmission market, while Eaton noted that their “megaproject” pipeline had grown 9% quarter-on-quarter and is now approaching \$1bn. In Europe, both Legrand and Schneider produced inline results, with the latter guiding towards 6-8% organic growth for 2024, 2% ahead of consensus expectations, driven by strong trends in datacentres and grid infrastructure.

Itron, however, was the standout performer in the space in the quarter. The smart meter and smart grid company reported bookings that were more than 100% higher than the previous quarter, beat earnings expectations by 64% and provided 2024 guidance that was 15% ahead of consensus expectation.

Results on the efficiency side have been a little more mixed. Insulation and HVAC (Heating, Ventilation and Air Conditioning) names IBP and Trane both continued to perform, exceeding expectations despite lacklustre property markets. However, the market for European heat pumps appears to be going through something of a pause following a surge in demand at the start of the Ukraine invasion. Nibe noted headwinds in the form of the removal of state subsidies and a general destocking as extreme demand normalises. Accordingly, they downgraded guidance for 2024, but remain “relentlessly positive” about the longer-term growth outlook.

**EV sales should exceed 16 million in 2024**, representing around 20% of total passenger vehicle sales and coming in one year earlier than our long-held target of 20% EV penetration by 2025. Improved economics (lower lithium-ion battery prices in 2024) as well as better range and quicker charging times are the key drivers of improved EV sales. We expect the EV/ICE parity benchmark of \$100/kWh battery prices to come in 2027.

EV sales are off to a good start for 2024, with the latest data (January) suggesting industry growth of 55% YoY, versus full year expectations of 25-30%. A lot of this growth was driven by China which accounted for c.60% of all sales and continues to boast the highest regional growth rate of 82% YoY. Europe is the second largest and second fastest growing region, accounting for c.20% of all sales and growing at 32% YoY. The US accounted for 12% of sales and is growing at just 3%.

Against this backdrop, most of our EV holdings continue to post growth rates ahead of the broader auto market, although some noted a temporary slowdown in growth driven by the delayed roll out of new EV models, particularly in Europe. Aptiv, for example, lowered their “growth over market” guidance from 8-10% to 6-8% on precisely this dynamic. Offsetting this, Infineon held solid on their automotive guidance, while the standout holding in the quarter was Gentherm, who despite reporting largely in line numbers, had the positive news that their “ClimateSense” system is set to feature on all future GM models, both ICE and EV, prompting the shares to appreciate by 20%.

Deflation in lithium prices and other battery raw materials combined with significant new battery manufacturing capacity continues to help deflate the overall cost of batteries. Historically we have argued that we expect battery prices to hit \$100/kWh in 2027, which is the economic tipping point, where EVs reach cost parity with internal combustion engines. However following the latest bout of deflation we note that various commentators are now forecasting this to occur in 2025, which would prove very positive for EV volumes and be a strong positive for some of the names mentioned earlier.

**Solar** remains the cheapest form of new electricity supply and we expect record low module prices at the end of 2023 to spur growth in all major geographies with full year global installations likely topping 500 GW in 2024. China will still represent more than half of all installations with European and US solar demand set to rise to 70 GW and 38 GW respectively.

Throughout 2023 we saw something of a bifurcation of the solar market, with utility solar continuing to go from strength to strength, but residential solar increasingly a victim of higher interest rates and a vicious inventory correction. Results over the last couple of months suggest an evolution in this narrative with utility solar continuing to grow nicely and residential solar showing early signs of recovery.

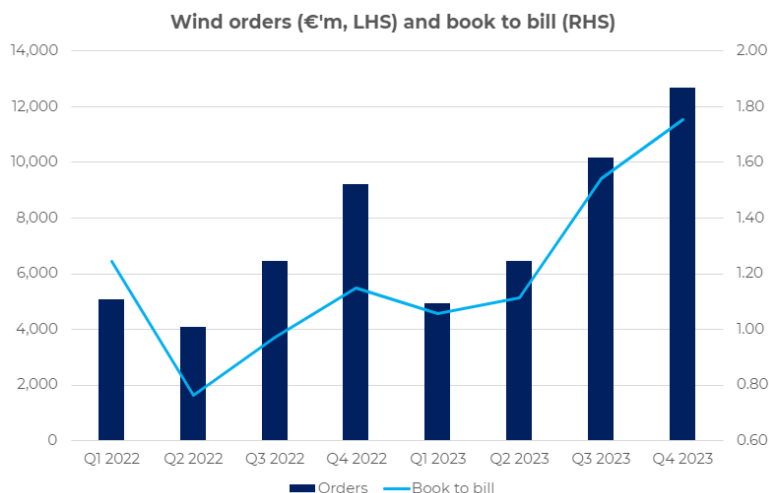
On the utility side, we had results from both Xinyi Solar and First Solar. Xinyi – a leading manufacturer of solar glass – posted very strong results, growing EPS nearly 50% year-over-year driven by better pricing, lower costs and efficiency improvements. They also guided to lower capex and capacity growth, which coupled with ongoing strong end market growth should lead to a better supply/demand outlook for solar glass. First Solar beat EPS expectations by 5% and issued an outlook in line with expectations, with a book to bill of 1.1x.

On the residential side, both Solaredge and Enphase appeared to grasp the nettle and took active steps to clear the distribution channel. The resultant “undershipping” of product led to material downgrades to 2024 earnings expectations but should speed the process of the inventory normalisation. Importantly, both companies noted a stabilisation in the end market in the US and guided that Q1 is to be the trough in terms of revenues. While there have been a number of false starts in this area of the market, this is the first time that we have seen relative stability in the end market. This coupled with aggressive actions by both players should mean that we begin to see an inflection in the coming quarters.

## Guinness Sustainable Energy

Global **wind** installations will grow in 2024 to a new record of 115 GW, driven by policy support in China, Europe and the US. Beyond 2025 many of the current bottlenecks will dissipate, allowing installations to grow to around 170 GW, a growth rate of 7%pa. Offshore installations are set to grow to 40 GW by 2030, a 20%pa growth rate.

The wind industry continued to show signs of repair during the latest quarter with the industry level book to bill ratio (a ratio of new orders to existing sales) now hitting 1.8x, suggesting a very healthy outlook for industry growth.



Source: Vestas, Nordex, Siemens Energy 01.01.22 to 31.12.23

Vestas, the core wind holding within our portfolio, saw orders grow 55% year-on-year to EUR 18.5bn. They posted revenue growth towards to the top end of the prior guidance alongside an inflection in margins as supply chain issues begin to abate. They also guided that they expect to exit 2024 with margins in the “high single digits”, which bodes well for beating 2025 margins expectation of just 8.5%. Longer term, the company reiterated their aspiration to deliver a 10% EBIT margin through cycle.

Both Nordex and Siemens Energy, the other two (non-held) listed players, reported similarly. Nordex delivered a book to bill ratio of 1.5x, beating consensus revenue and, importantly, free cash flow expectations. Siemens Energy, which has been troubled in recent times by product quality issues, posted strong orders, improving profitability and an improved balance sheet through the sale of their Indian operations.

At 31 December 2023, the **Guinness Sustainable Energy fund** traded on a one year forward (2024) P/E ratio of 16.6x, around 13% lower than one year ago. The consensus earnings per share growth outlook for the fund remains strong at 19.1%pa, forecast between 2023-2026, relative to the MSCI World at 8.4%pa – a premium of over 10%pa.

With the bulk of the portfolio having reported, the Guinness Sustainable Energy fund now trades on a 2024 P/E of 16.7x. This is 12% lower than a year ago and an 11% discount to the MSCI world, trading at 18.8 P/E. The consensus earnings per share growth outlook for the fund continues to remain strong at 20.8%pa, forecast between 2023-2026, relative to the MSCI World at 8.1%pa.

PERFORMANCE

Past performance does not predict future returns.

The Guinness Sustainable Energy Fund (Class Y, 0.68% OCF) delivered a return of 5.2% in the month, while the MSCI World Index (net return) delivered +4.2% (all in USD terms).

Cumulative performance to 29.02.2024	Ytd	1 Yr	3 Yrs	5 Yrs	10 Yrs*
Fund (Class Y)	-4.3%	-10.5%	-10.9%	90.7%	34.0%
MSCI World NR Index	5.5%	25.0%	28.2%	73.6%	138.1%
Out/Underperformance	-9.8%	-35.5%	-39.1%	-17.1%	-104.1

Annual performance	2023	2022	2021	2020	2019
Fund (Class Y)	-0.4%	-12.5%	10.4%	84.1%	31.4%
MSCI World NR Index	23.8%	-18.1%	21.8%	15.9%	27.7%
Out/Underperformance	-24.2%	5.6%	-11.4%	68.2%	3.7%

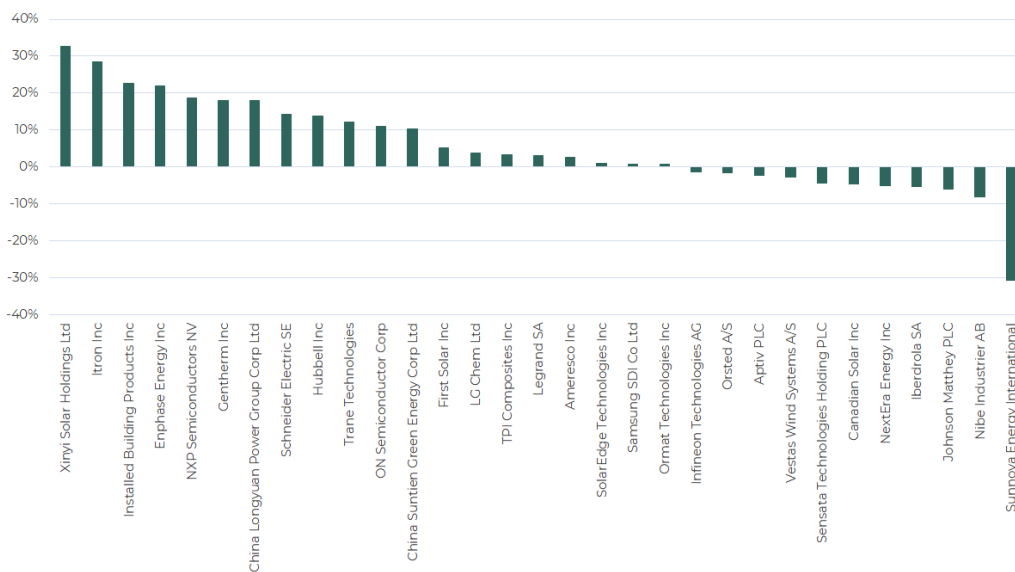
Annual performance	2018*	2017*	2016*	2015*	2014*
Fund (Class Y)	-15.2%	20.2%	-15.4%	-12.0%	-12.1%
MSCI World NR Index	-8.7%	22.4%	7.5%	-0.9%	4.9%
Out/Underperformance	-6.5%	-2.2%	-23.0%	-11.2%	-17.0%

The Fund was launched on 19/12/2007. \*Simulated Past Performance prior to the launch of the Y class on 16/02/2018. The Performance shown is a composite simulation for Y class performance being based on the actual performance of the Fund’s E class, which has an OCF of 1.24%. Source: FE fundinfo, bid to bid, total return. On 31/12/2018, the benchmark became the MSCI World NR. Prior to this, the benchmark was the Wilderhill Clean Energy Index (ECO Index).

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 0.68% per annum. Returns for share classes with different OCFs will vary accordingly. Transaction costs also apply and are incurred when a Fund buys or sells holdings. Performance returns do not reflect any initial charge; any such charge will also reduce the return.

Within the Fund, the strongest performers were Xinyi Solar, Itron, Installed Building Products, Enphase Energy, and Gentherm while the weakest performers were Sunnova, Nibe, Johnson Matthey, Iberdrola, and NextEra Energy.

Stock by Stock performance over the month, in USD

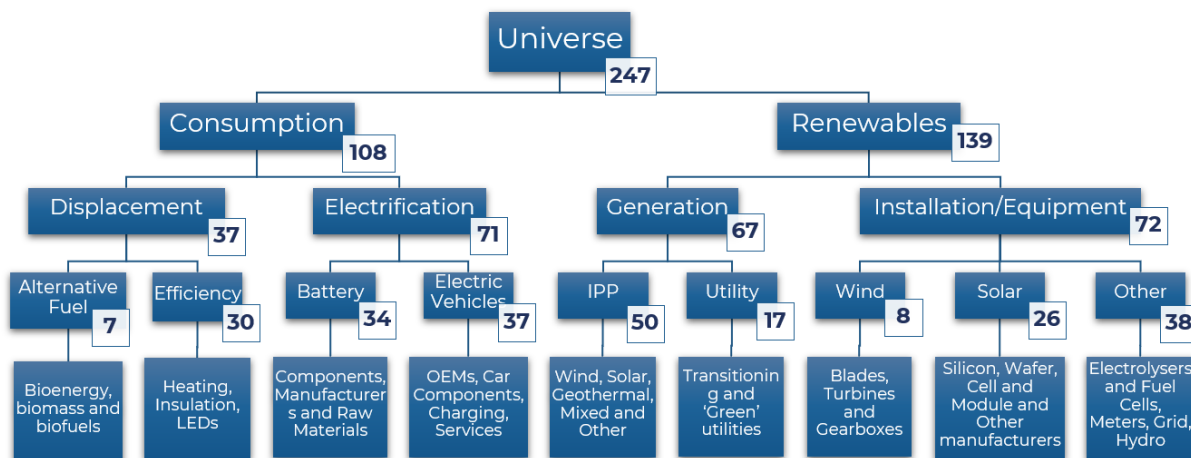


Source: Bloomberg. As of 29<sup>th</sup> February 2024

PORTFOLIO

The Guinness Sustainable Energy Fund is positioned to benefit from many of the long-term themes associated with the transition towards a lower-carbon economy and of sustainable energy generation via investment in companies with activities that are economic with limited or zero government subsidy and which are profitable. Our investment universe comprises around 250 companies which are classified into four key areas:

- **Generation** includes companies involved in the generation of sustainable energy, either pure-play companies or those transitioning from hydrocarbon-based fuels
- **Installation** includes companies involved in the manufacturing of equipment for the generation and consumption of sustainable energy
- **Displacement** includes companies involved in the displacement or improved efficient usage of existing hydrocarbon-based energy
- **Electrification** includes companies involved specifically in the switching of hydrocarbon-based fuel demand towards electricity, especially for electric vehicles



We monitor each of the industry areas very closely and hope that detailed top-down (macro) analysis of each (complemented with disciplined equity screening and stock valuation work) will allow us to deliver attractive fund performance via a broadly equally weighted portfolio of 30 stocks. The portfolio is designed to create a balance between maintaining fund concentration and managing stock-specific risk.

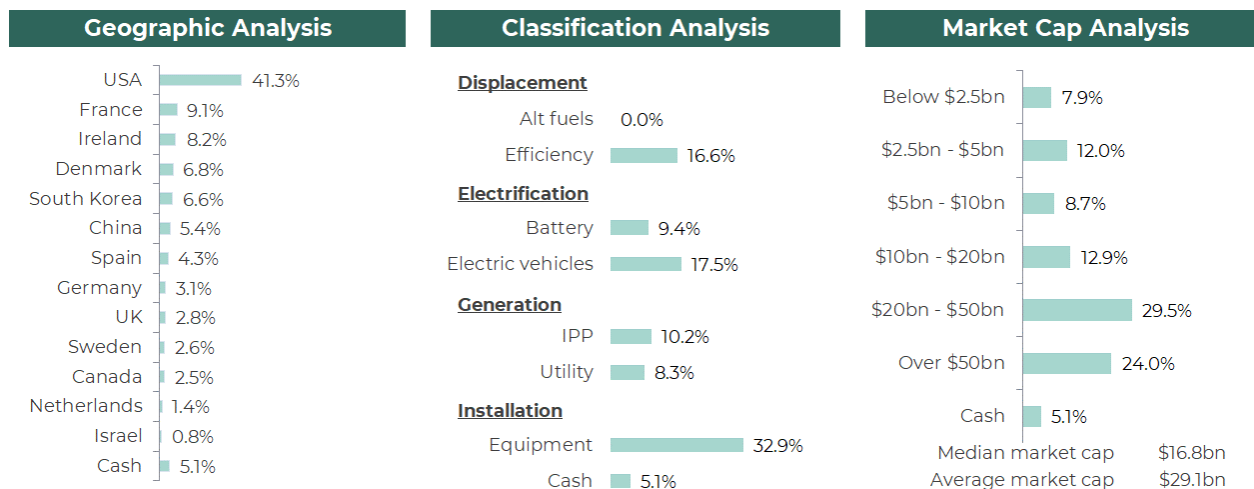
**Guinness Global Investors is a signatory of the United Nations Principles for Responsible Investment. The Guinness Sustainable Energy Fund prioritises returns whilst delivering concentrated exposure to companies playing a key role in global decarbonisation. The Fund’s holdings align most closely with four of the UN’s sustainable development goals:**



## Buys/Sells

During the month, we initiated a position in NXP Semiconductor. NXP is among the market leaders in automotive semis, specializing in microcontrollers (MCUs) which serve as the brains of electrification. MCUs can be found in all the core power electronics in an electric vehicle including the traction inverter, DC/DC controller, onboard-charger and the battery management system. We believe that the company is well placed to benefit from the secular trend of electrification.

## Portfolio structure analysis



Source: Guinness Global Investors. Portfolio holdings are subject to change.

## Portfolio sector breakdown

The following table shows the asset allocation of the Fund at month end and at previous year ends.

Asset allocation as %NAV	Current	Change	Year end		Previous year ends			
	Feb-24		Dec-23	Dec-22	Dec-21	Dec-20	Dec-19	Dec-18
<b>Consumption</b>	<b>43.5%</b>	<b>-0.4%</b>	<b>43.9%</b>	<b>44.9%</b>	<b>43.4%</b>	<b>36.7%</b>	<b>41.7%</b>	<b>26.5%</b>
Displacement	16.6%	1.3%	15.3%	15.0%	11.8%	9.9%	13.4%	16.4%
Alternative Fuel	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.9%
Efficiency	16.6%	1.3%	15.3%	15.0%	11.8%	9.9%	13.4%	12.5%
Electrification	26.9%	-1.7%	28.5%	29.9%	31.6%	26.8%	28.2%	10.1%
Batteries	9.4%	-0.8%	10.2%	11.6%	8.9%	10.8%	12.6%	3.9%
Electric vehicles	17.5%	-0.9%	18.4%	18.2%	22.8%	16.0%	15.7%	6.2%
<b>Renewables</b>	<b>51.4%</b>	<b>-0.5%</b>	<b>51.9%</b>	<b>49.3%</b>	<b>51.3%</b>	<b>60.4%</b>	<b>54.1%</b>	<b>69.7%</b>
Generation	18.5%	-1.0%	19.5%	17.7%	23.1%	24.6%	22.2%	27.3%
IPP	10.2%	-0.8%	10.9%	8.7%	14.5%	17.0%	18.9%	26.7%
Utility	8.3%	-0.3%	8.6%	9.0%	8.6%	7.6%	3.2%	0.6%
Installation	32.9%	0.5%	32.4%	31.6%	28.2%	35.8%	32.0%	42.5%
Equipment	32.9%	0.5%	32.4%	31.6%	28.2%	35.8%	32.0%	42.5%
Cash	5.1%	0.9%	4.2%	5.8%	5.3%	3.0%	4.2%	3.8%

Source: Guinness Global Investors

## Valuation

At the month end, the Guinness Sustainable Energy portfolio traded on the following multiples:

As at 29 February 2024	PE			EV/EBITDA			Dividend Yield		EPS Growth (%pa)		CFROI	
	2023	2024E	2025E	2023	2024E	2025E	2024E	2025E	2018-23	2023-26	2024E	2025E
Guinness Sustainable Energy Fund	18.8x	16.7x	13.3x	12.2x	10.8x	9.0x	1.6%	1.8%	6.7%	20.8%	6.1%	8.9%
MSCI World Index	19.9x	18.8x	16.9x	12.9x	11.6x	10.7x	2.0%	2.1%	5.1%	8.1%	8.0%	8.5%
Fund Premium/(Discount)	-5%	-11%	-22%	-6%	-7%	-16%						

2023 P/E = Latest month-end price / 2023 earnings; Portfolio = median CFROI; Index data = Credit Suisse MSCI World ETF median CFROI

Source: Guinness Global Investors, Bloomberg



### Portfolio holdings as at end February 2024

Our portfolio is typically allocated across 30 broadly equally weighted equities providing exposure across the value chain of sustainable energy.

We hold c.44% weight to companies associated with the consumption (or demand) of sustainable energy. Our largest exposure here is to companies involved in the electrification of demand, either via the creation of new batteries (9%) or the electrification of transportation (18% weight), while we have 17% weight to those companies involved in either displacing existing energy sources or improving overall energy efficiency.

We hold two lithium-ion battery manufacturers. LG Chem is a Korean chemicals company and the largest lithium-ion battery manufacturer in the world, while Samsung SDI is a pure-play lithium-ion battery manufacturer currently in the top 10 in the world.

The portfolio holds five names in the electric vehicle sub-category, giving it exposure to companies that provide semiconductors, electronics, components and software/services to the growing EV and autonomous vehicle industry. Onsemi and Infineon are providers of power semiconductors that are a necessity for higher-voltage electric vehicles to become competitive with ICE (internal combustion engine) vehicles, while Gentherm, Aptiv and Sensata are component manufacturers and service providers that should benefit from the ever-increasing amount of electronics present in electric vehicles.

Our displacement holdings provide pure-play quality exposure to heating industries (Nibe Industrier), insulation installation (Installed Building Products), energy efficient electrical equipment and services (Hubbell) and energy efficiency projects (Ameresco), and the group as whole will benefit from the increasing industry focus on energy efficiency that is expected to be a very long-term trend.











In terms of the supply of sustainable energy, we hold a 19% weight to companies involved in the generation of sustainable energy and 33% weight to those exposed to the installation of or equipment used in the process of sustainable energy generation.

China Suntien and China Longyuan are our two pure-play Chinese wind power producers and they represent two of our seven generation holdings. The remaining exposure comes in the form of geothermal (Ormat), US residential solar (Sunnova) and then offshore wind and broad-based wind/solar renewable energy generation through Orsted and NextEra Energy (the largest producer of renewable energy in the world). Iberdrola is our one utility.

We hold exposure to the solar and wind equipment and manufacturing value chains. Xinyi Solar is the world's largest supplier of the glass used in solar cell modules, and both Enphase and SolarEdge manufacture the inverters required to convert DC solar power into consumable AC electricity. Canadian Solar and First Solar give integrated exposure to the solar cell and module manufacturing process. Vestas provides broad exposure to the strong growth that we expect in the onshore and offshore wind markets, while TPI Composites offers niche exposure to the high-skilled business of manufacturing wind turbine blades.

Our remaining exposure to installation (Itron, Eaton and Schneider Electric) consists of companies that provide equipment and services to improve the efficiency and metering of electricity transmission and consumption.

Portfolio themes as at end February 2024

Theme	Example holdings	Weighting (%)
1 Electrification of the energy mix	 	26.2%
2 Rise of the electric vehicle and auto efficiency	 	20.3%
3 Battery manufacturing		6.6%
4 Expansion of the wind industry		10.1%
5 Expansion of the solar industry		12.0%
6 Heating, lighting and power efficiency	 	16.6%
7 Geothermal		3.1%
8 Other (inc cash)		5.1%

Portfolio at end January 2024 (one month in arrears for compliance reasons)

Guinness Sustainable Energy Fund (31 January 2024)		P/E			EV/EBITDA			Price/Book			Dividend Yield		
Stock	% of NAV	2023	2024E	2025E	2023	2024E	2025E	2023	2024E	2025E	2023	2024E	2025E
<b>Displacement/Efficiency</b>													
Hubbell Inc	4.5%	23.2x	20.7x	19.3x	17.4x	16.6x	15.5x	6.3x	5.3x	4.7x	1.4%	1.5%	1.7%
Nibe Industrier AB	2.9%	26.7x	28.9x	24.7x	15.6x	16.7x	14.4x	4.1x	4.0x	3.6x	1.0%	1.0%	1.2%
Trane Technologies PLC	4.8%	27.9x	24.7x	22.1x	19.7x	19.4x	17.9x	8.2x	7.6x	6.8x	1.2%	1.3%	1.3%
Installed Building Products Inc	2.6%	22.6x	16.8x	15.2x	14.4x	13.5x	12.4x	8.2x	6.1x	4.6x	1.1%	1.5%	1.2%
Ameresco Inc	1.3%	16.3x	12.4x	9.3x	11.1x	8.9x	8.2x	1.1x	1.0x	0.9x	n.m.	n.m.	n.m.
	<b>16.1%</b>												
<b>Electrification/Battery</b>													
LG Chem Ltd	3.5%	21.8x	15.5x	8.0x	8.3x	6.4x	4.3x	1.0x	0.9x	0.8x	1.5%	1.7%	2.4%
Samsung SDI Co Ltd	3.1%	12.2x	13.2x	10.3x	8.7x	7.6x	5.8x	1.2x	1.2x	1.1x	0.3%	0.3%	0.3%
Johnson Matthey PLC	3.1%	10.0x	11.2x	9.6x	6.2x	6.4x	5.9x	1.2x	1.2x	1.1x	4.5%	4.7%	4.9%
	<b>9.7%</b>												
<b>Electrification/Electric Vehicles</b>													
Aptiv PLC	3.7%	18.7x	14.3x	11.3x	9.4x	8.4x	7.5x	2.0x	1.8x	1.6x	0.0%	0.2%	0.3%
ON Semiconductor Corp	4.0%	14.0x	16.6x	13.8x	10.3x	12.1x	10.2x	3.9x	3.3x	2.7x	0.0%	0.0%	0.0%
Infineon Technologies AG	4.2%	14.3x	16.2x	12.9x	8.5x	9.3x	7.5x	2.9x	2.4x	2.1x	1.0%	1.1%	1.2%
Sensata Technologies Holding PLC	3.8%	10.6x	9.8x	8.6x	7.5x	8.7x	8.0x	1.8x	1.7x	1.5x	1.3%	1.3%	1.4%
Gentherm Inc	2.6%	22.6x	17.1x	13.4x	11.0x	9.6x	8.1x	2.4x	n.m.	n.m.	0.0%	n.m.	n.m.
	<b>18.5%</b>												
<b>Generation/IPP</b>													
China Longyuan Power Group Corp Ltd	1.6%	4.7x	4.0x	3.5x	9.1x	8.0x	7.1x	0.5x	0.4x	0.4x	4.2%	5.0%	5.7%
Ormat Technologies Inc	3.2%	31.3x	29.2x	27.9x	14.1x	10.7x	9.9x	1.7x	1.5x	1.5x	0.7%	0.8%	0.8%
NextEra Energy Inc	4.4%	18.8x	17.3x	16.0x	12.0x	12.8x	11.6x	2.5x	2.2x	2.1x	3.2%	3.5%	3.8%
Sunnova Energy International I	1.6%	n.m.	n.m.	n.m.	372.8x	25.1x	17.4x	0.8x	0.6x	0.5x	0.0%	0.0%	0.0%
Orsted A/S	2.9%	29.5x	18.3x	15.0x	7.7x	8.3x	7.5x	2.8x	2.3x	1.9x	0.0%	3.8%	3.7%
China Suntien Green Energy Corp Ltd	1.3%	4.8x	3.9x	3.2x	10.2x	9.3x	8.1x	0.5x	0.4x	0.4x	7.5%	9.3%	11.6%
	<b>15.0%</b>												
<b>Generation/Utility</b>													
Iberdrola SA	4.7%	14.8x	14.3x	13.7x	10.6x	9.7x	9.2x	1.6x	1.5x	1.4x	4.9%	5.0%	5.2%
	<b>4.7%</b>												
<b>Installation/Equipment</b>													
Schneider Electric SE	4.7%	25.7x	22.0x	19.8x	17.4x	16.5x	15.0x	3.9x	3.6x	3.3x	1.7%	2.0%	2.2%
Legrand SA	4.4%	19.7x	19.7x	18.5x	12.8x	13.2x	12.5x	3.5x	3.2x	3.0x	2.1%	2.4%	2.6%
Eaton Corp PLC	4.7%	29.5x	24.3x	21.8x	21.9x	20.1x	18.4x	5.2x	5.0x	4.6x	1.4%	1.5%	1.6%
Itron Inc	3.9%	40.6x	20.4x	16.8x	24.0x	18.6x	15.5x	2.5x	2.2x	1.9x	0.0%	n.m.	n.m.
Xinyi Solar Holdings Ltd	1.7%	7.6x	6.1x	4.8x	5.8x	4.8x	4.5x	0.9x	0.8x	0.7x	7.6%	9.4%	11.4%
SolarEdge Technologies Inc	0.8%	49.9x	n.m.	14.2x	19.3x	n.m.	9.0x	1.6x	1.7x	1.6x	0.0%	0.0%	0.0%
Enphase Energy Inc	1.7%	32.2x	33.2x	20.3x	28.2x	28.7x	17.8x	14.4x	11.7x	7.7x	0.0%	0.0%	0.0%
First Solar Inc	3.4%	17.3x	10.8x	7.0x	11.4x	7.4x	4.9x	2.3x	1.9x	1.5x	0.0%	0.0%	0.0%
Canadian Solar Inc	2.7%	5.7x	7.1x	4.7x	6.8x	5.7x	4.4x	0.5x	0.5x	0.4x	0.0%	0.0%	0.0%
Vestas Wind Systems A/S	4.3%	208.5x	44.6x	21.6x	21.7x	14.7x	9.9x	8.6x	7.2x	5.7x	0.0%	0.5%	1.1%
TPI Composites Inc	0.1%	n.m.	n.m.	n.m.	n.m.	40.0x	12.5x	n.m.	n.m.	n.m.	0.0%	n.m.	n.m.
	<b>32.4%</b>												

The Fund's portfolio may change significantly over a short period of time; no recommendation is made for the purchase or sale of any particular stock.

## OUTLOOK - sustainable energy & the energy transition

Over the next thirty years, the world will continue its transition to a sustainable energy system. The key factors driving the transition are:

- **Population and GDP growth** putting a significant strain on today's energy supply
- **Economics** as sustainable sources of energy will be cheaper than the incumbents
- **Climate change** leading the world to reduce carbon emissions via cleaner energy
- **Pollution** forcing governments to drive air pollution out of cities via cleaner energy
- **Energy security** as sustainable energy sources, which are more evenly spread across all countries, facilitate lower reliance on energy imports.

The outcomes of the energy transition will of course be wide-ranging. On the **supply** side, we see a sustained shift towards renewable power generation, fulfilling global power generation needs which are set to double by 2050. On the **demand** side, we believe that improved energy efficiency will be key to limiting energy consumption growth to a manageable level so that it can be increasingly satisfied by renewable sources.

The long-term direction is clear and is driven by economics, in our opinion, while near-term geopolitical issues (such as the invasion of Ukraine in February 2022) could potentially have an effect on the speed of the transition and the relative importance of the factors stated above.

### Policy support for decarbonisation

Policy commitment in recent years has been particularly supportive. However, the path has not always been smooth and it is unlikely to be a smooth ride from here. The most significant policy milestones in 2023 include:

- Further details were provided in **Europe** about how the EU will localise clean technology manufacturing and supply chains, in order to reduce its reliance on China, as part of its goal to achieve carbon neutrality by 2050. The EU plans include a 55% cut to emissions, 13% lower final energy consumption and 45% renewables in the energy mix by 2030.
- In the **United States** there was a meaningful surge in activity thanks to the Inflation Reduction Act (IRA), with \$369bn of tax breaks morphing into \$1.6 trillion of capital being mobilised towards achieving net zero aims. According to the World Economic Forum, this will create over 170,000 jobs and more than 9 million jobs over the next decade. Importantly, with 2024 being an election year, 80-90% of these new jobs are within Republican states.
- From a **global** perspective, around 130 countries have now signed up to the COP 28 Global Renewables and Energy Efficiency Pledge, committing to deep emissions reductions by 2030, requiring a tripling of global installed renewable energy capacity and a doubling of the rate of annual energy efficiency improvements.

### Energy displacement

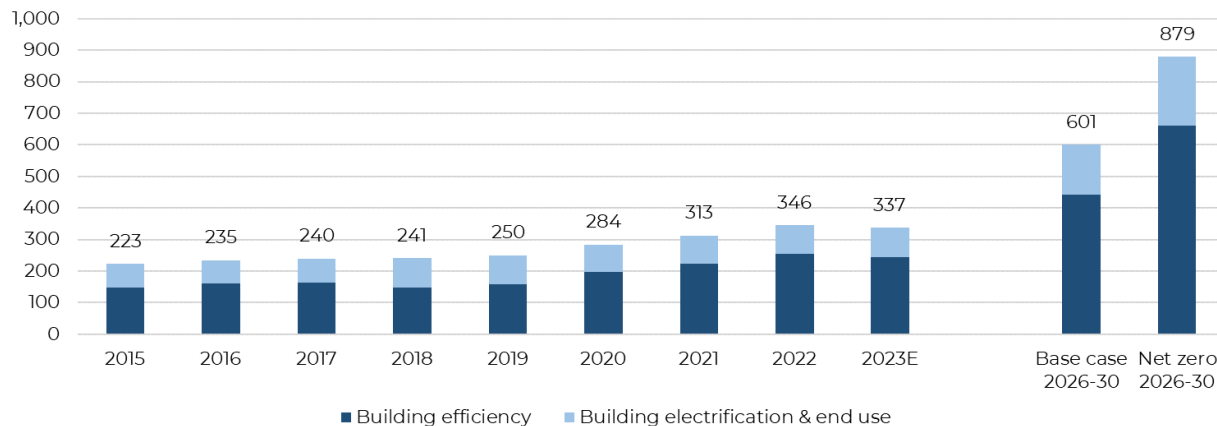
It is a common misconception that achieving rapid growth in renewable power generation will be enough to deliver government targets for pollution, energy security and decarbonisation. Renewable power generation is a key part of the solution, but we see the displacement and more efficient use of existing energy sources as just as critical, and arguably more urgent, in achieving these goals. The IEA refers to the theme of energy efficiency as being the 'first fuel' that should be considered in delivering the energy transition. It is the one energy source that every country can access in abundance today.

In our base case, we assume global energy demand growth over the next 30 years of around 1% pa. This assumes significant efficiency improvements relative to an historical energy demand growth rate of around 2% pa. Within the energy displacement sector, the key areas of focus are **efficiency** and **alternative fuels**.

**Energy efficiency**

Buildings account for around 30% of global emissions, with space heating, water heating, and space cooling accounting for 60% of their energy use. Decarbonising buildings will require investment in heat pumps to electrify space and water heating, insulation to improve thermal efficiency, and efficient cooling to help inhabitants cope with rising outdoor temperatures. We see spending on building efficiency and electrification increasing from \$340bn in 2022 to \$600bn pa from 2026-30 (a forecast rate of around 10% pa versus a historic rate of around 5% pa) driven by energy security, economics and tightening building standards.

**Global building efficiency-related investment by scenario (\$bn)**



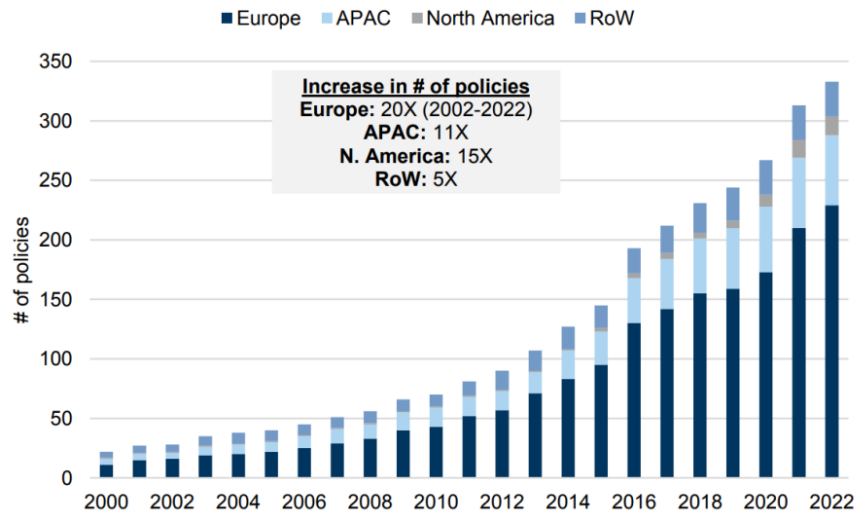
Source: IEA, Guinness Global Investors; December 2023

**Heat pumps** are a vital tool for electrifying and decarbonising heat and reducing reliance on natural gas imports, especially in the EU, where over one-third of natural gas is used for heating in buildings. European heat pump sales have grown strongly in recent years, increasing by 35% and 39% in 2021 and 2022 respectively, bringing annual sales to over 3 million units. This expansion was primarily driven by high gas prices and increased policy support as a result of Russia's invasion of Ukraine, since heat pumps remain a vital tool to secure Europe's energy independence from Russia. The EU's target to install 60 million additional heat pumps between 2023-30 is expected to reduce the bloc's household gas demand by 40% and would require installations to grow at around 20% pa.

**Insulation** can improve the thermal efficiency of a building's exterior walls and roof. As a result, insulation can help reduce energy consumption from heating and cooling by up to 40%, offering payback periods as short as 1-3 years.

Over the past 20 years, most regions have seen a 10x increase in government policies targeting building energy efficiency (including insulation). Government incentives, stricter energy efficiency requirements and higher energy costs have helped the global insulation market to grow at 6.5% pa from 2012-22 and we see economics and ratcheting regulation continuing to drive strong growth out to 2030.

Global policies targeting building insulation, envelope technologies and eco-design



Source: IEA, Goldman Sachs, December 2023

**Space cooling** is the largest driver of building electricity demand, with energy consumption more than tripling since 1990. Ensuring access to energy efficient cooling is of primary importance to minimise the number of heat-related deaths, especially among the elderly. The number of air conditioning units in operation globally has increased by 2.5x in the past 20 years and is set to grow by a further 50% by 2030. Thanks to a consolidated industry and a fragmented customer base, air conditioning manufacturers enjoy strong pricing power and we expect this to continue out to 2030.

**Alternative fuels**

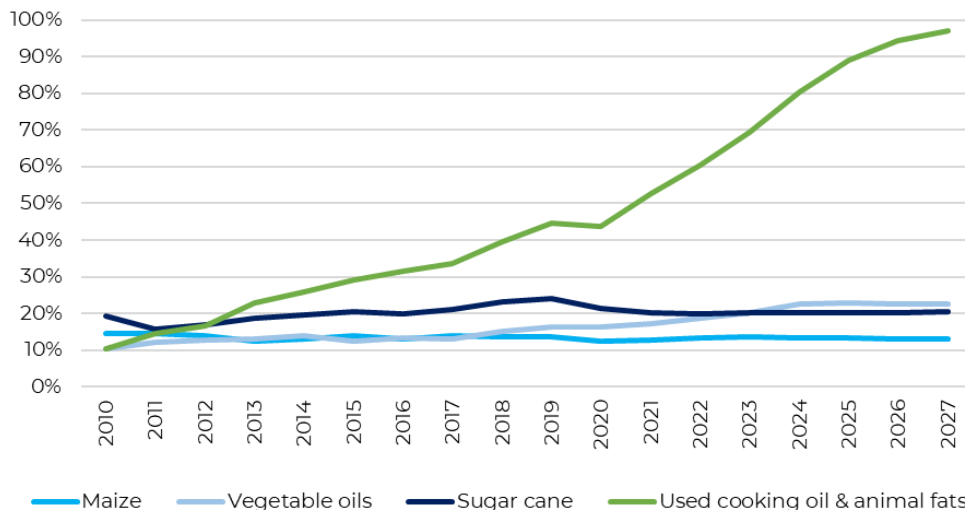
Global biofuel consumption is expected to be just under 180bn litres in 2023, displacing around 2 million barrels of oil per day, equating to 4% of oil demand from transportation. The market continues to be dominated by the USA, Brazil, Europe and Indonesia, which make up 85% of global consumption.

Biofuel demand is expected to have grown by 6% in 2023 versus 2022, with growth continuing to be underpinned by policy and regulation. Demand benefited from prices falling from 2022 highs thanks to lower vegetable oil prices and increasing supply, while new Clean Fuel Regulations from Canada helped to provide visibility to future growth.

From 2023-2027, biofuel demand is expected to expand at 3-4% pa. Nearly two-thirds of growth will be driven by emerging economies, skewing heavily towards first-generation biofuels such as bioethanol and biodiesel. These fuels are derived from edible crops such as sugarcane and corn, and despite their sizeable role in reducing transportation related emissions, they have attracted criticism for diverting farmland away from food production.

The remaining third of demand growth will come from developed markets seeking higher volumes of second-generation biofuels such as renewable diesel and Sustainable Aviation Fuel (SAF). These fuels are derived from waste products such as animal fats and used cooking oil. They garner higher subsidy support in the United States and also meet strict EU requirements. Demand for these feedstocks is set to increase by 35% over the next four years, taking biofuels to 95% of total demand in 2027 (up from 70% in 2023).

**Biofuel demand as a percentage of total feedstock supply**



Source: IEA, Guinness Global Investors estimates; December 2023

Despite generous incentives and strict standards creating an industry where production costs are still 2-3x that of fossil fuel equivalents, further government intervention may be required to avoid a supply crunch in the near future.

**Implications of a net zero scenario on our displacement outlook**

Our base case for the energy transition assumes global energy demand growth of 1% pa, which compares to historic long-run average demand growth of 2% pa. Reducing energy demand growth to 1% pa requires significant investment in energy efficiency across buildings, heating, transportation and industry.

To be clear, however, reducing energy demand growth to 1% pa does not align with net zero. A net zero scenario would require world energy demand to be broadly flat over the next two decades and we do not yet see the investment, industry scale or technologies in place to achieve this. Examples of changes to energy efficiency or alternative fuel production that would be needed to align with net zero include the following:

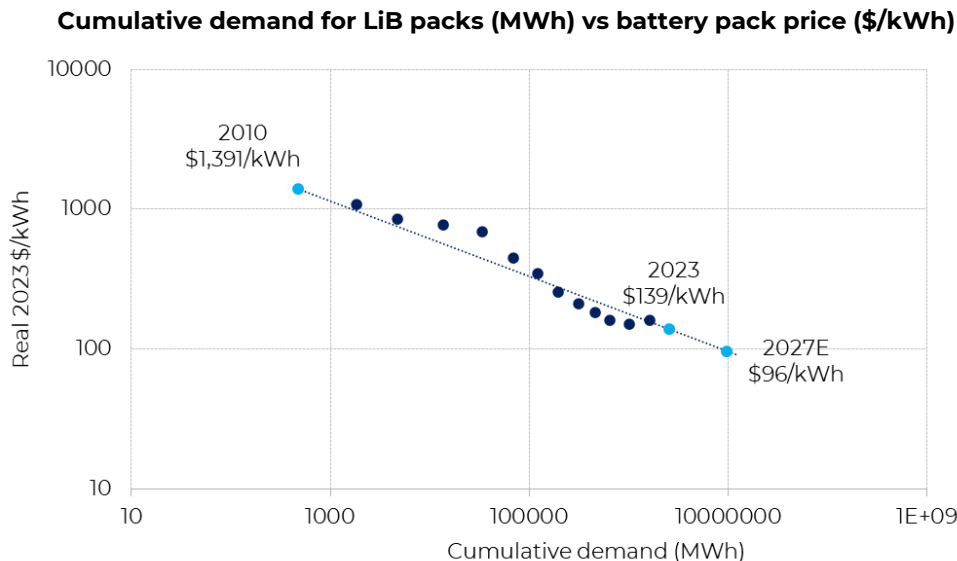
- Within **efficiency**, annual improvements in energy intensity would need to double from 2% in 2022 to average 4% pa out to 2030 globally. This translates into building efficiency, electrification and end-use investment increasing to over \$800bn pa this decade (from \$350bn today). Installation of heat pumps would need to increase globally by 20% pa out to 2030 while air conditioner efficiency must improve by more than 50% by the end of this decade.
- **Alternative fuel** production growth would need to more than double, averaging over 11% pa out to 2030 to help reduce emissions from new and existing trucks, planes, ships and passenger vehicles. SAF would face the biggest challenge of growing from less than 0.1% of aviation fuel demand today to around 10% in 2030.

**Electrification**

The steps required to transition to a low-carbon economy can broadly be summarised into three actions: i) reduce demand, ii) clean up electricity supply and iii) electrify the remaining demand. Our electrification sector includes enablers across lithium-ion battery and electric vehicle supply chains which do all three of these. **Batteries** serve a key role in cleaning up electricity, capturing excess clean energy during the day and releasing it when supply is low. They contribute towards electrification, acting as the power source for **electric vehicle** (EV) drivetrains. On top of this, EVs contribute towards greater energy efficiency, converting over 85% of energy stored into motion, compared to less than 40% for internal combustion engines. We consider each of these areas in turn below.

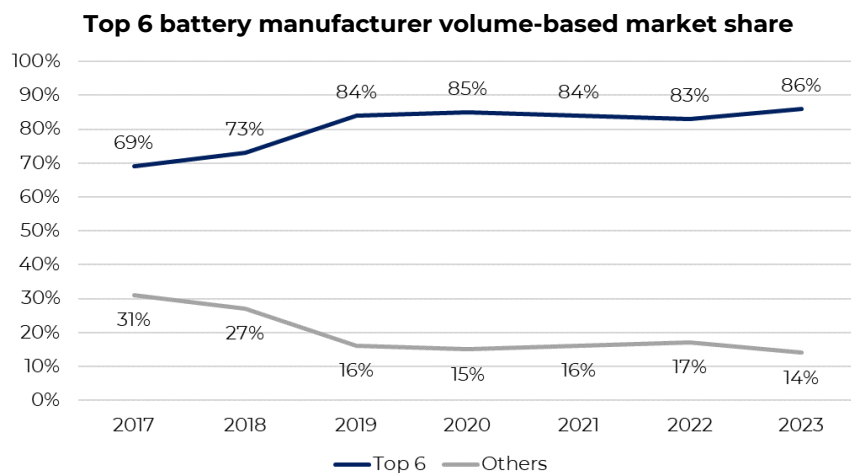
**Batteries**

In last year’s outlook, we reported that 2022 was the first year on record that **lithium-ion battery** pack costs had increased, driven by soaring metal prices. In 2023, this trend reversed, with lithium and nickel prices cooling by 80% and 40% respectively due to slower electric vehicle demand growth. Shrinking commodity costs helped to drive a 14% decline in average battery pack prices to \$139/kWh. According to Bloomberg New Energy Finance (BNEF), this meant that real battery prices have fallen by 90% since 2010 and are forecast to fall below the EV/ICE parity benchmark of \$100/kWh in 2027.



Source: BNEF, Guinness Global Investors, December 2023

In the year, the industry faced **oversupply concerns**, with CRU Group suggesting that planned Chinese capacity would be 2.5-3x higher than global demand from 2025-2030. While we do see overcapacity in the sector, we believe this is likely overstated. The top six battery manufacturers (CATL, BYD, LGES, Samsung SDI, SK On, and Panasonic) are responsible for 85% of electric vehicle battery volumes. These companies are behind just 50% of planned capacity additions out to 2025, with capital expenditure plans typically underpinned by supply arrangements with EV manufacturers. The remaining 50% of additions are expected to be brought online by more indebted and less profitable tier-2 suppliers. A lot of this tier-2 capacity ultimately may not come online, as declining share and poor cashflows lead to funding constraints and sector consolidation.

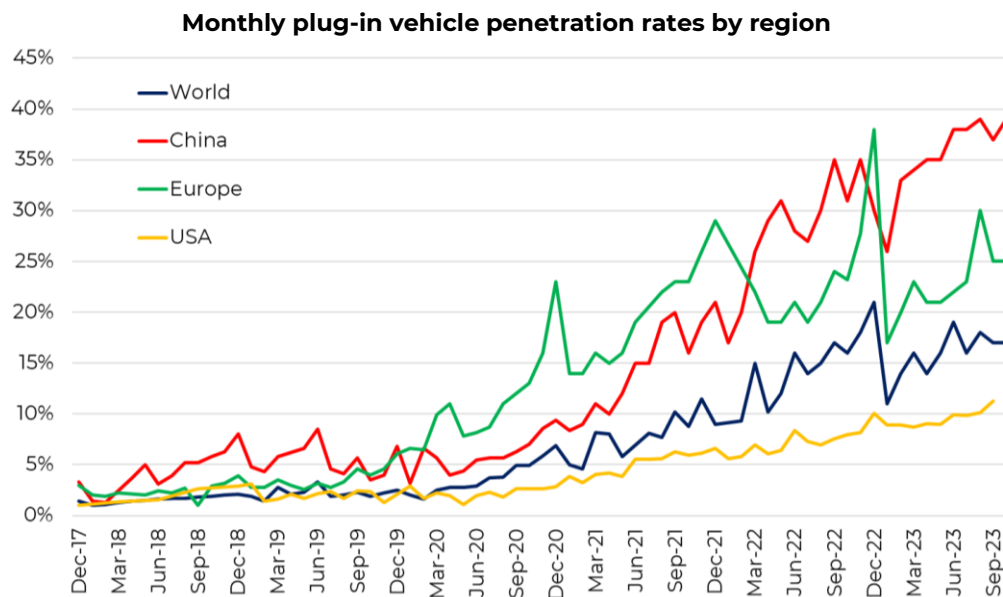


Source: EV-Volumes, HSBC, Guinness Global Investors, December 2023

The last 12 months have also seen legislators wrestle for control over **battery supply chains** to reduce their dependence on Chinese imports. The EU announced its Critical Raw Materials Act and the US released guidance that EVs with Chinese battery components would not be eligible for full IRA tax benefits. With China processing around 75% of the world's lithium and supplying over 50% of battery components globally, we believe it will be extremely challenging to extricate Chinese companies from Western supply chains.

### Electric vehicles

Electric vehicles saw continued adoption in 2023, albeit at a slower pace than seen in recent years. After growing at over 100% and over 50% in 2021 and 2022, sales of plug-in vehicles are expected to have grown by around 35% in 2023 to around 14 million units, representing an 18% penetration rate. China will retain its crown as the largest market for EVs, representing 60% of global plug-in vehicle sales, with monthly penetration rates approaching 40%. Europe will come in second, at 25% of global sales and penetration rates of around 25%, with the USA in third at around 10% of global sales, breaching 1 million units and seeing EVs making up over 10% of monthly sales for the very first time.



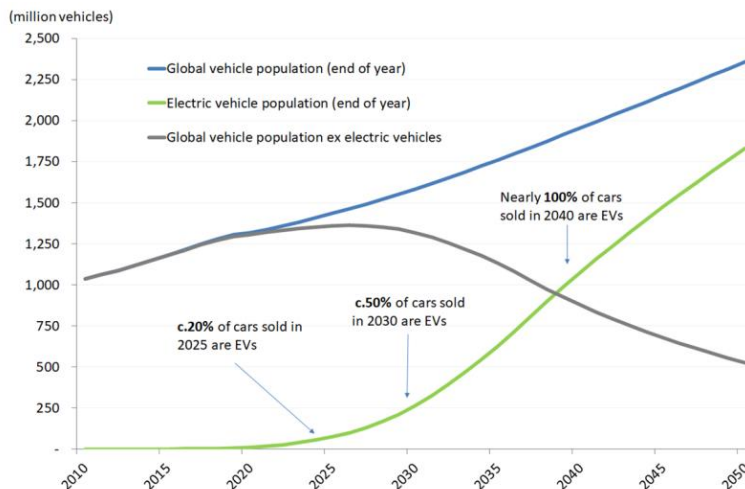
*Source: Cleantechnica, AtlasEVhub, Guinness Global Investors, December 2023*

These regional differences largely reflect the main driver of adoption: affordability.

- China** saw the withdrawal of government EV subsidies at the end of 2022, resulting in a slowing of sales at the start of 2023, sparking a year-long price war among manufacturers. This, combined with a bias for cheaper lithium iron phosphate (LFP) chemistries and smaller average battery sizes, resulted in sales prices for electric vehicles across multiple segments reaching price parity with internal combustion engine vehicles.
- Europe** has a more nuanced picture, where moderate subsidies and higher gasoline prices led to certain models being cheaper to own than petrol or diesel counterparts. However, the threat of cheap Chinese imports in 2023 has impelled local manufacturers to cut costs to avoid losing out to imports.
- The market for electric vehicles in the **United States** is generally less competitive. Import tariffs and subsidies for local producers have led to higher prices, allowing cost-advantaged Tesla to take a 50% market share. A preference for larger vehicles (SUVs, trucks) with larger batteries (100kWh+) alongside lower average pump prices mean that the relative economics of owning an EV are not as attractive as in other regions. Despite record EV sales and penetration rates in 2023, further battery price declines are needed to see continued adoption.



Global auto, ICE and EV population to 2050



Source: US DOE, Guinness Global Investors estimates; December 2023

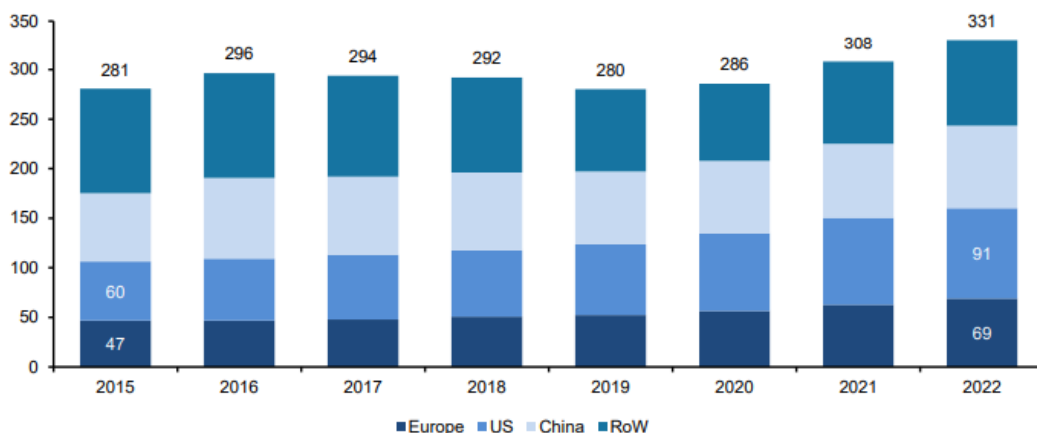
The decline in battery prices (and commensurate improvement in EV affordability) observed over recent years has coincided with climbing expectations of EV sales (Bloomberg New Energy Finance has upgraded its electric vehicle sales estimates by 100% and 50% for 2025 and 2030 in the past five years alone). We estimate that EV sales should exceed 16 million in 2024, representing around 20% of total passenger vehicle sales and coming in one year earlier than our long-held target of 20% EV penetration by 2025. Beyond that, we maintain our long-held view that electric vehicles continue to take share, reaching 50% of global light vehicle sales by 2030 and nearly all new vehicle sales by 2040. At that point, it implies an overall population of one billion EVs, over 35 times greater than the global stock in 2022 of 27 million.

Power grids

The global power grid consists of over 2.6 million miles of transmission lines, over 43 million miles of distribution lines and over 700,000 substations. A significant proportion of this infrastructure in the US and Europe is ageing, analogue (rather than digital) and increasingly capacity constrained.

According to the IEA, global grid investment averaged c.\$300bn from 2018-22 and has been growing slowly (2% pa) over the past eight years. Growth has predominantly been driven by Europe and the US (c.6% pa) due to decarbonisation and replacement spending. Distribution (low and medium-voltage) accounted for roughly two-thirds of the spend with transmission (high-voltage) making up the rest.

Annual transmission and distribution investments (\$bn)



Source: Bernstein, IEA, December 2023

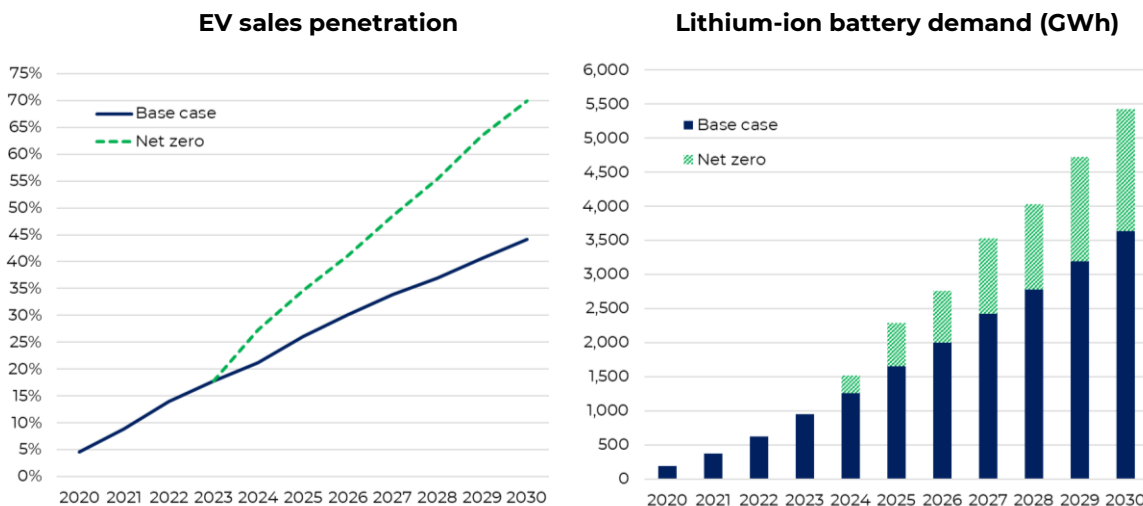
Our base case assumes that annual grid investment grows by around 4% pa, twice the historic rate, rising from \$300bn in 2022 to over \$800bn pa in the 2040s. Around two-thirds of this will be spent on distribution and one-third on transmission, with a rising share of this being digital. Around c.40% will be spent on replacing ageing assets, c.40% reinforcing the network to improve reliability and efficiency and c.20% extending the existing grid to new generation facilities.

Greater residential adoption of heat pumps and electric vehicles leads us to expect that **distribution** will attract a higher proportion of the investment than transmission. Heat pumps and EVs increase residential electricity demand by c.90% and c.50% respectively. Moreover, the addition of EVs requires modernisation and digitisation of the distribution grid to facilitate bidirectional charging and allow EV batteries to help balance the grid. Bernstein estimate that to ensure grid reliability, US utilities will need to spend nearly \$1,600 on transmission and distribution infrastructure for each electric vehicle on the road.

- The continued adoption of renewables, characterised by smaller and more distributed power plants, will drive demand for more **transmission** lines. We see transmission investment enjoying a further tailwind from the building of more interconnectors to facilitate the international trade of electricity. We think these will be vital for ensuring energy security by allowing regional renewable energy surpluses and deficits to be equalised.
- We see investments in **digitalisation** of the grid increasing from c.19% in 2020 to 42% in 2050. Integrating the physical grid into computer-based systems through the use of smart meters and sensors, communication networks and data analytics can help identify outages faster, automate grid performance, and improve uptime and efficiency. For network operators, data insights allow them to reduce maintenance costs through predictive maintenance. For consumers, smart meters can help reduce energy bills by enabling smart charging of electric vehicles at off-peak tariffs.

### Implications of a net zero scenario on our electrification and grid outlook

For **electric vehicles**, BNEF estimate that in a net zero scenario, global EV penetration rates must hit 35% by 2025 and 70% by 2030 (versus their current base case estimates of 26% and 44% respectively). This translates into global battery demand of 2.3 TWh in 2025 and 5.5 TWh in 2030 compared to 0.95 TWh today. This is 40-50% higher than their 'base case' economic transition assumptions for each year, which themselves still imply annual growth rates of 20-30% pa from current levels.

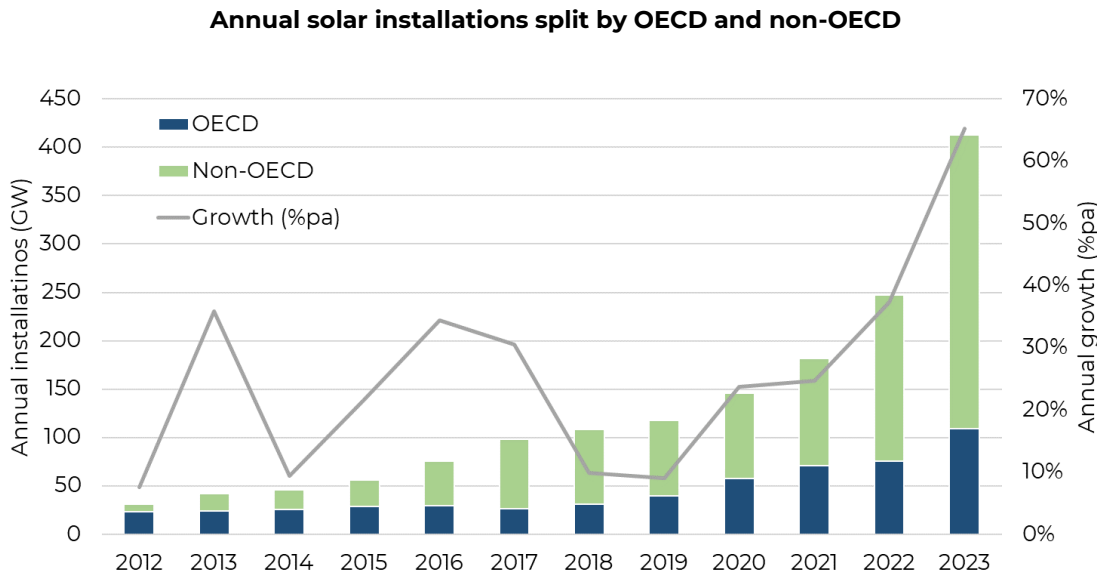


Source: BNEF, Guinness Global Investors, December 2023

For **grids**, the IEA net zero scenario requires investment to nearly double from the current \$300bn to around \$580bn pa for the remainder of this decade and to more than double again to around \$1.4tn per annum in the 2040s (nearly double the investment levels implied by their base case).

The solar sector

The solar industry has grown rapidly in 2023, with installations likely to have exceeded 415GW for the full year (up tenfold over the last decade and 65% higher than 2022). This is materially ahead of our prior 2023 expectation of 310GW and will represent the fastest annual growth rate since 2010 (following several years of robust (20%+) growth). The non-OECD continues to dominate the global market.



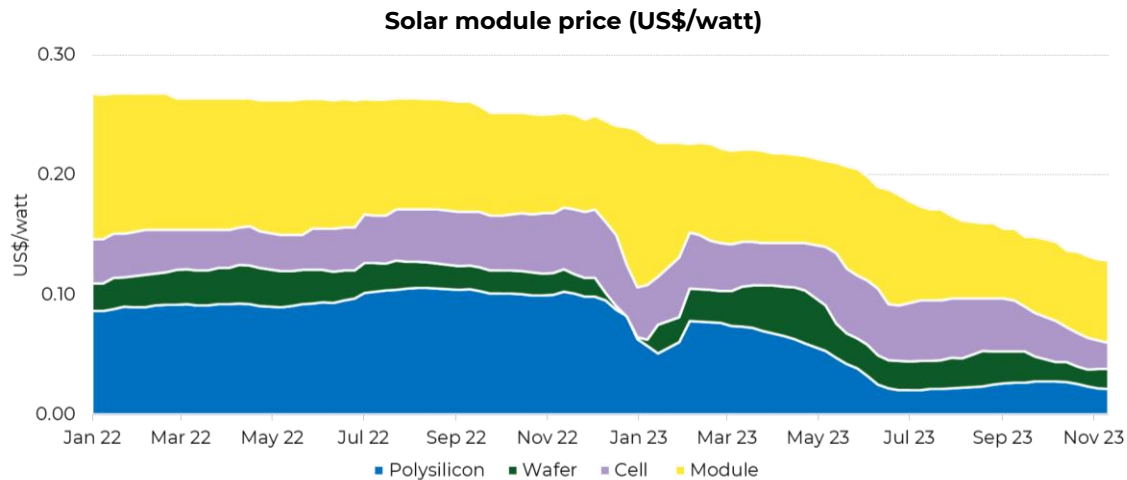
Source: BP, BNEF, PV InfoLink, IEA and Guinness Global Investors estimates, December 2023

On a regional basis, the key driver of the industry continues to be China – accounting for nearly 60% of all installations and 80% of the year-on-year growth. This has been largely driven by utility-scale “megabase” projects, where the government allocates huge areas of land for multi-gigawatt projects, thereby avoiding many of the permitting pitfalls seen in the US and Europe.

Outside China, there has a more mixed picture. Commercial and Utility solar (which account for c.80% of the market) continue to grow apace, with installations hitting record highs. Offsetting this, however, is the residential market, which has seen pockets of weakness in both the US and Europe as a function of higher interest rates, changing regulation and the waning impact of the war in Ukraine. Taken in aggregate, however, both geographies are expected to grow well in excess of 30% in 2023 and account for 8% and 13% of global installations respectively.

Underpinning much of this growth has been the ever-improving economics of solar relative to fossil fuel-based options and current wholesale electricity prices. Over the year, the cost of solar modules declined by more than 50%, driven by a normalisation of global supply chains and material growth in polysilicon supply. According to BNEF, the global capacity for solar-grade polysilicon increased to 2.4m tons during the year, more than double what is required for current PV installation levels. The consequent deflationary impact on the polysilicon price has reverberated throughout the solar supply chain meaning that solar module prices now sit at a **record low level** of \$0.13/watt.

## Guinness Sustainable Energy



Source: BNEF, Guinness Global Investors estimates, December 2023

Looking to 2024, we expect these improved economics to continue to spur growth in all major geographies with full-year global installations likely topping 500 GW. In China, we see a continued tailwind from a second and third round of “megabase” auctions as the government seek to achieve 1,200 GW of installed capacity by 2030. In Europe and the US, the lagged benefits (and increased clarity) of policy support coupled with robust utility capital expenditure should serve to drive utility installations to new highs. This will be somewhat tempered by continuing sluggishness in the residential market, but this should begin to clear in the second half. All in, we expect European and US solar demand to rise to 70 GW and 39 GW respectively.

### Global solar module installations, 2010-2024E (GW)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024E
<b>OECD solar installations (annual)</b>															
North America	1	2	4	6	7	8	14	11	10	11	19	25	24	34	39
Germany	7	7	8	3	2	1	2	2	4	4	5	6	7	13	15
Spain	0	0	0	0	0	0	0	0	0	5	3	5	7	8	9
Rest of Europe	3	4	5	5	5	6	4	3	4	6	12	19	21	36	42
Australia	0	1	1	1	1	1	1	2	4	4	4	5	4	5	5
South Korea	0	0	0	1	1	1	1	1	2	3	6	4	3	3	3
Japan	1	1	2	7	10	11	8	8	7	7	9	6	6	6	5
<b>Total OECD</b>	<b>17</b>	<b>23</b>	<b>24</b>	<b>24</b>	<b>25</b>	<b>29</b>	<b>29</b>	<b>26</b>	<b>31</b>	<b>40</b>	<b>58</b>	<b>71</b>	<b>76</b>	<b>109</b>	<b>122</b>
Change	10	7	0	0	2	4	0	-3	5	9	18	13	18	33	13
<b>Non-OECD solar installations (annual)</b>															
China	0	3	3	14	13	19	30	53	44	33	52	69	107	240	256
India	0	0	1	1	1	2	5	10	11	12	4	12	18	15	18
Rest of non-OECD	1	3	3	4	6	6	11	9	22	34	32	30	47	49	105
<b>Total Non-OECD</b>	<b>2</b>	<b>5</b>	<b>8</b>	<b>18</b>	<b>21</b>	<b>27</b>	<b>46</b>	<b>72</b>	<b>77</b>	<b>78</b>	<b>88</b>	<b>111</b>	<b>172</b>	<b>304</b>	<b>379</b>
Change	1	3	2	11	2	6	19	26	5	1	10	23	58	132	75
<b>Total solar installations (annual)</b>	<b>19</b>	<b>29</b>	<b>31</b>	<b>42</b>	<b>46</b>	<b>56</b>	<b>75</b>	<b>98</b>	<b>108</b>	<b>118</b>	<b>146</b>	<b>182</b>	<b>250</b>	<b>413</b>	<b>501</b>
Change	11	10	2	11	4	10	19	23	10	10	28	36	76	163	88

Source: BP, BNEF, PV InfoLink, IEA and Guinness Global Investors estimates, December 2023

## The wind sector

Despite a return to growth in 2023, the wind industry continues to experience a bumpy recovery. On the one hand, it is having to navigate the near-term impact of supply chain disruptions and increased financing costs, while on the other hand it has a very favourable long-term outlook driven by relative economics and supportive policy. Despite the cross-currents, the industry globally is likely to have installed **a new record of around 103 GW of new capacity**, up 15 GW on 2022 levels.

## Guinness Sustainable Energy

In 2022 the key issue for the sector was high raw material prices which adversely impacted the economics of the supply chain and pushed margins for all the major turbine producers into negligible or negative territory. In 2023 the issue passed to the developers as turbine manufacturers looked to pass on cost increases, while at the same time financing costs increased in line with global interest rates. This issue was particularly acute within the offshore wind sector, where the lag between securing projects and locking in costs is far longer, prompting high-profile project cancellations from the likes of Orsted, Shell and Vattenfall.

Despite these headwinds we continue to expect a positive outlook for the global wind sector – both on and offshore – with the industry likely to deliver record installations again in 2024. In the medium term, we take confidence from the book-to-bill ratio for turbine manufacturers – a key leading indicator for growth in the sector – continuing to inflect positively.

Beyond 2025 we see many of the current bottlenecks dissipating and supportive policy from all key regions in the world prompting a near 70% increase in installations by the end of the decade, reaching around 170 GW. We detail some of these drivers, both positive and negative, individually for the onshore and offshore industries below.

### Global onshore and offshore wind installations (GW)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024E
<b>Onshore wind installations (annual)</b>															
North America	6	8	15	2	7	10	9	8	8	10	17	14	10	8	10
Latin America	0	0	0	0	5	3	3	3	4	3	3	6	4	6	5
Europe	9	10	12	11	11	11	12	13	8	9	14	14	15	16	13
China	17	18	14	15	21	29	22	17	19	26	54	42	44	54	57
India	1	1	2	2	2	3	4	4	2	2	1	2	2	3	4
RoW	3	4	4	3	4	5	5	5	4	4	4	8	5	4	6
<b>Total onshore</b>	<b>35</b>	<b>40</b>	<b>46</b>	<b>33</b>	<b>49</b>	<b>61</b>	<b>55</b>	<b>49</b>	<b>46</b>	<b>55</b>	<b>93</b>	<b>84</b>	<b>79</b>	<b>91</b>	<b>95</b>
<i>Change</i>	-3	5	6	-14	17	11	-6	-6	-3	9	38	-9	-5	12	3
<i>World ex China</i>	18	22	32	18	29	32	33	32	27	29	40	43	36	38	38
<b>Offshore wind installations (annual)</b>															
China	0	0	0	0	0	1	1	1	2	3	4	14	5	8	12
UK	1	0	1	1	0	1	0	1	2	2	1	1	3	1	2
Germany	0	0	0	0	0	2	0	2	0	2	0	1	0	1	1
RoW	0	0	0	1	0	0	0	1	0	1	2	1	1	2	6
<b>Total offshore</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>4</b>	<b>1</b>	<b>4</b>	<b>4</b>	<b>8</b>	<b>7</b>	<b>17</b>	<b>9</b>	<b>12</b>	<b>21</b>
<i>Change</i>	1	-1	1	1	-1	4	-4	3	0	3	-1	10	-8	3	9
<i>World ex China</i>	1	0	1	2	1	3	0	4	3	5	3	3	4	4	9
<b>Total wind installations</b>	<b>36</b>	<b>40</b>	<b>48</b>	<b>35</b>	<b>50</b>	<b>65</b>	<b>56</b>	<b>53</b>	<b>50</b>	<b>63</b>	<b>100</b>	<b>101</b>	<b>88</b>	<b>103</b>	<b>115</b>
<i>Change</i>	-2	4	8	-13	16	15	-9	-3	-2	12	38	1	-13	15	12

Source: BP, IEA, BNEF, Guinness Global Investors estimates, December 2023

## Onshore wind

The onshore wind sector is likely to have delivered 91 GW of new installations in 2023, with China accounting for 60% of the total and nearly 90% of the year-on-year growth. As with solar, the key driver here is the latest set of centrally-planned megaprojects – generally located in windy parts of northern China. The first set of such projects (40GW) was announced in 2021, with commissioning set for end 2023. This is to be followed by both a second and third wave of projects spanning 2024 and 2025. The combination of this, coupled with new state directives on repowering (the process of swapping older turbines with new, more efficient ones) should see installations average more than 55GW out to the end of the decade.

In Europe, the 16 GW of installations we expect this year represents a record. However, installations may flatline in the near term as the impact of permitting and grid constraints coupled with poorly designed auction processes temporarily stalls progress. For example, the latest 1,500 MW onshore auction in Spain saw just 45MW of capacity awarded as developers shied away from a price cap which failed to reflect the current cost environment. Ultimately, such auctions are highly likely to be redesigned and will be offset by other factors (such as more countries implementing the EU's new permitting recommendations which, in the case of Germany, have seen close to a 40% jump in permitting year-over-year).

## Guinness Sustainable Energy

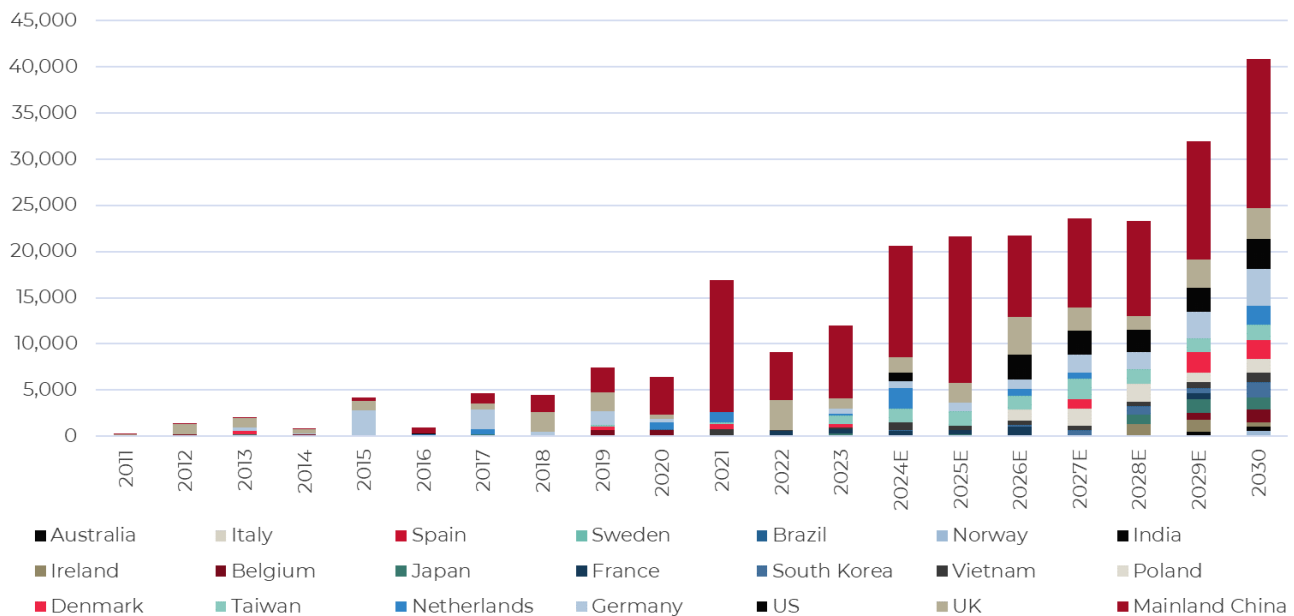
In the US, the combination of cost pressures and the lack of clarity on the IRA tax credits has caused a temporary lull in activity meaning installations are likely to be down in 2023. That said, the US Treasury has now provided finalised guidance for the wind industry, and we are beginning to see rising project pipelines as a consequence. This will lead to increased activity in 2024, but will really begin to impact from 2025 onwards, when, coupled with large new transmission lines being commissioned in the Midcontinent and the Southwest, we expect to see installation activity grow at over 10% a year.

### Offshore wind

The offshore industry remains a small and presently troubled segment of the market but it is critical to the overall growth of the wind market out to 2030. Installations in 2023 are likely to have reached 12GW, led heavily by China, but this figure is set to grow to 40GW by 2030 – a 20% pa growth rate. This means that despite accounting for just 12% of the overall market in 2023, offshore wind will account for over 40% of the expected growth in total global wind installations to 2030.

Despite negative recent headlines, the fundamental attractions of the offshore wind industry remain the same: in addition to generally experiencing higher wind speeds, offshore wind installations tend to be easier to permit, allowing for bigger turbines close to large urban centres. Recent project cancellations, particularly in the US, have raised concerns about the viability of offshore wind in general, but we view these issues to be largely transitory and US-specific. Unlike the key offshore wind centres, the US has not yet built out its supply chain, making it more vulnerable to disruption. Furthermore, unlike the rest of the world, most legacy US contracts did not include mechanisms to account for inflation. While this has wreaked havoc on a certain era of offshore projects, we don't expect it to repeat in the future and thus don't think it appropriate to extrapolate to the whole industry or indeed future US projects. Instead, we see robust state level commitment to offshore wind targets, project economics underpinned by structurally higher global electricity prices (ex-US) and the proliferation of offshore wind technology beyond the handful of existing core geographies.

**Offshore wind installations (MW)**



*Source: BNEF, Guinness Global Investors estimates, December 2023*

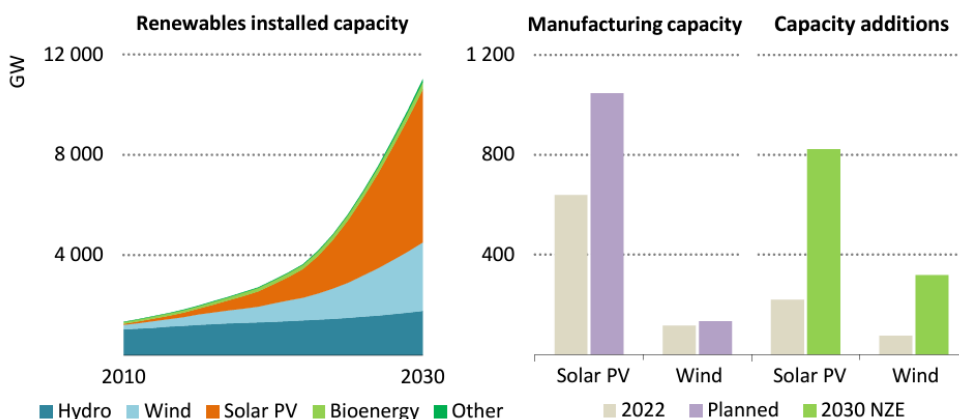
**Implications of a net zero scenario on our solar and wind outlook**

The IEA net zero scenario envisages that renewables have a 60% share of global electricity generation in 2030, up from 30% in 2022. Solar and wind generation dominate, with their combined shares increasing from 12% in 2022 to 40% in 2030 thereby accounting for over 90% of the overall increase in renewables capacity to 2030 and 85% of the increase in renewable electricity generation.

In terms of new installations, global **solar** capacity additions increase from 220GW in 2022 to 820GW in 2030 while **wind** installations rise from 75GW in 2022 to 320GW in 2030. Offshore wind accounts for around one-third of the total installations in 2030.

The solar industry is clearly targeting very high levels of growth and is arguably positioned to deliver sufficient manufacturing capacity to satisfy the net zero scenario. However, the wind industry appears to be lagging substantially and therefore much more in need of policy support to achieve the required manufacturing capacity.

**Global renewables installed capacity and solar/ wind manufacturing capacity in a net zero scenario, 2022 and 2030**



Source: IEA, December 2023

## IMPORTANT INFORMATION

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

This report is primarily designed to inform you about the Guinness Sustainable Energy Fund and the WS Guinness Sustainable Energy Fund. It may provide information about the Funds' portfolios, including recent activity and performance. It contains facts relating to the equity markets 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 Funds or to buy or sell individual securities, nor does it constitute an offer for sale. OCFs for all share classes are available on [www.guinnessgi.com](http://www.guinnessgi.com).

### GUINNESS SUSTAINABLE ENERGY FUND

#### Documentation

The documentation needed to make an investment, including the Prospectus, the Key Investor Information Document (KIID), Key Information Document (KID) and the Application Form, is available in English from [www.guinnessgi.com](http://www.guinnessgi.com) or free of charge from the Manager: Waystone Management Company (IE) Limited 2nd Floor 35 Shelbourne Road, Ballsbridge, Dublin D04 A4E0, Ireland; or the Promoter and Investment Manager: Guinness Asset Management Ltd, 18 Smith Square, London SW1P 3HZ.

Waystone IE is a company incorporated under the laws of Ireland having its registered office at 35 Shelbourne Rd, Ballsbridge, Dublin, D04 A4E0 Ireland, which is authorised by the Central Bank of Ireland, has appointed Guinness Asset Management Ltd as Investment Manager to this fund, and as Manager 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.waystone.com/waystone-policies/>

#### Residency

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

#### Structure & regulation

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

#### Switzerland

This is an advertising document. The prospectus and KID 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](http://www.carnegie-fund-services.ch). The paying agent is Banque Cantonale de Genève, 17 Quai de l'Île, 1204 Geneva, Switzerland.

#### Singapore

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

### WS GUINNESS SUSTAINABLE ENERGY FUND

#### 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.waystone.com/our-funds/waystone-fund-services-uk-limited/](http://www.waystone.com/our-funds/waystone-fund-services-uk-limited/) or free of charge from Waystone Fund Services (UK) Limited, 64 St James's Street, Nottingham, NG1 6FJ. General enquiries: 0115 988 8200. Dealing Line: 0115 988 8285. E-Mail: [clientservices@waystonefs.co.uk](mailto:clientservices@waystonefs.co.uk)

Waystone Fund Services (UK) Limited is authorised and regulated by the Financial Conduct Authority.

#### Residency

In countries where the Fund is not registered for sale or in any other circumstances where its distribution is not authorised or is unlawful, the Fund should not be distributed to resident Retail Clients.

#### Structure & regulation

The Fund is a sub-fund of WS Guinness Investment Funds, an investment company with variable capital incorporated with limited liability and registered by the Financial Conduct Authority.

Telephone calls will be recorded and monitored.