Guinness Sustainable Energy

Investment Commentary – August 2025

RISK

This is a marketing communication. Please refer to the Prospectus, Supplement and KID/KIID for the Funds (available on our website), which contain detailed information on their characteristics and objectives and full information on the risks, 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. The Funds invest at least 80% in companies in the sustainable energy sector and can be volatile. Past performance does not predict future returns.

ABOUT THE STRATEGY

Launch	19.12.2007
Index	MSCI World
Sector	IA Commodity/Natural Resources
Managers	Will Riley Jonathan Waghorn
EU Domiciled	Guinness Sustainable Energy Fund Guinness Sustainable Energy UCITS ETF
UK Domiciled	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 demand growth, improving economics and both public and private support, offering attractive investment opportunities. The Funds are actively managed and use the MSCI World Index as a comparator benchmark only.

CONTENTS

COMMENTARY

THE FUTURE FOR THE NUCLEAR INDUSTRY

Nuclear power has risen to prominence in both policy-making and public discourse over the last 12 months in response to rising electricity demand, the need for stable zero-emission baseload, and technological innovation. This month, we summarise the state of nuclear energy in 2025, the outlook for the traditional nuclear sector, and disruption from new technology, and present a number of routes to invest in the nuclear end market.

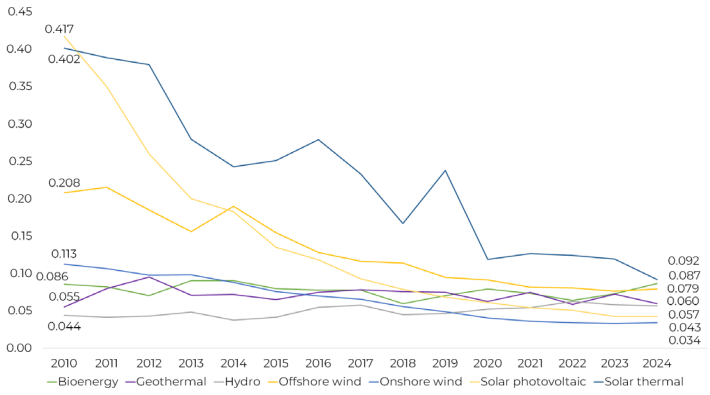
EQUITIES

The Guinness Sustainable Energy Fund (Class Y) delivered a return of 3.6% (in USD) in July, outperforming the MSCI World which returned 1.3%. Among the fund's top performers were names such as LG Chem and Vestas which benefited from clarity on the Inflation Reduction Act (IRA) and improved global trade relations. Enphase was the fund's weakest performer, having been impacted by adjustments to the IRA as part of the Republican's Big Beautiful Bill Act.

CHART OF THE MONTH: RENEWABLES LCOEs

A report from the International Renewable Energy Agency (IRENA) has found that on a levelised cost of electricity (LCOE) basis, around 91% of utility-scale renewable projects commissioned in 2024 were more cost effective than fossil fuel alternatives. Improvements in technology, competitive supply chains and economies of scale have driven significant declines in almost all renewable technologies. Cost reductions have also extended to enabling technologies such as battery energy storage systems, which have seen total installed costs decline 93% since 2010.

Weighted-average renewable LCOEs (USD/KWh)



Source: IRENA, 2025

PRI Principles for Responsible Investment

JULY 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
Global electric vehicle (EV) sales rose 28% year-on-year in the first half of 2025, according to research house Rho Motion. China remains the dominant force, accounting for 60% of global EV sales, with momentum supported by a combination of strong domestic demand, expanding export markets, and ongoing price competition among local brands. Europe saw 26% year-on-year growth, aided by falling vehicle prices and sustained support in key markets like the UK, Germany and Spain, which has seen 85% sales growth year-to-date. In contrast, North American EV sales grew just 3%, as the market continues to face consumer affordability concerns and declining policy support.	Electric Vehicle Sales	
In July, Google signed the largest corporate hydroelectricity power purchase agreement (PPA) in a 20-year deal with Brookfield Asset Management. Google has agreed to secure up to 3 GW of hydropower from Brookfield's two hydropower facilities in Pennsylvania in a $3 billion deal that will provide the company with reliable and carbon-free baseload generation to power its expanding data centre network. This deal follows similar agreements signed by Google last year to secure carbon-free geothermal and advanced nuclear generation capacity and comes amid calls from the UN Secretary General António Guterres to build out data centres with 100% renewable energy by 2030.	Renewable PPAs	
In July, the Scottish government granted approval for Berwick Bank, the country's largest offshore wind farm to date. Developed by SSE Renewables, the project will have a capacity of up to 4.1 GW, enough to power up to 6 million homes, and will be located in the North Sea off the coast of East Lothian. Berwick Bank represents a major milestone in the UK's push to scale renewable energy, contributing significantly to its 50 GW offshore wind target by 2030 and bolstering domestic energy security through one of Europe's most ambitious clean energy projects.	UK Offshore Wind	
The Chinese government is preparing actions to address chronic industrial overcapacity and disorderly price competition in the country's solar industry. Government intervention is needed to restore profitability to the sector which has been impacted by aggressive price competition and unconstrained capacity growth. Reports have emerged that the largest polysilicon producers are in talks to create a 50-billion-yuan fund to acquire and shut down roughly a third of existing production capacity. China has previously implemented successful supply-side reforms across industries such as cement, steel, glass and coal, in order to curb production and rationalize capacity.	Chinese Solar PV	
China has officially begun construction of what will be the world's largest hydropower dam on the Yarlung Zangbo River in Tibet. Once completed, the dam will have the capacity to generate 300 billion KWh of electricity per year, equivalent to the UK's annual consumption. The hydropower project is China's most ambitious since it completed the Three Gorges Dam in 2006 and reaffirms the country's commitment to low-carbon generation. Given the long construction timeline and potential for delays, the Dam is expected to come online sometime in the 2030s.	China Hydroelectric	

MANAGERS' COMMENTS

Nuclear power has risen to prominence in both policy-making and public discourse over the last 12 months in response to rising electricity demand, the need for stable zero-emission baseload, and technological innovation. In this note, we present the state of nuclear energy globally in 2025 and outline the moderate increase in its expected contribution to global electricity output by 2050. We summarize the issues with newbuild nuclear deployment and make the case for life extension as an increasingly viable option for asset owners. Emergent technologies (including small modular reactors) present an appealing solution but remain uncommercial. We conclude by presenting a number of routes to invest in the nuclear end market.

The state of nuclear in 2025

The International Energy Agency (IEA) reports that there were 410 nuclear reactors in operation globally with a combined capacity of 416 GW at the end of 2023, satisfying 9% of global electricity demand. Although spread across 30 countries, nuclear generation capacity is concentrated in the hands of the top five players: the USA (24%), France (15%), China (14%), Russia (7%) and South Korea (6%). While our June 2023 commentary focused on the technology, distribution and economics of nuclear generation, this report will provide a refreshed outlook for the nuclear industry.

Nuclear capacity has remained almost stagnant over much of the last decade, growing around 0.5% per annum. In context, global electricity capacity has grown by around 4.7% per annum over the same period, with solar and wind materially outgrowing this global average. This loss of share for nuclear has been the consequence of a cooling of regulatory and public support for the technology following the Fukushima incident in Japan, coupled with the legacy fleet of reactors in developed markets being withdrawn from service on reaching retirement age (35-40 years old).

However, the outlook for nuclear has somewhat brightened in 2024 and 2025 owing to a greater demand outlook for electricity, improving sentiment on the part of policymakers and the public, and technology innovation. Total deployment is expected to reach 650GW by 2050 under the IEA's STEPS scenario, which represents the latest stated policy ambitions. While this growth rate of 1.8% per annum will still lag that of total electricity growth (2.8% per annum), it represents a significant step up from the stagnation of the previous decade and invites us to consider its drivers.

A refreshed case for nuclear: low-emission, uninterruptible power to satisfy rising power demand

Three factors are causing the improved outlook for nuclear capacity deployment.

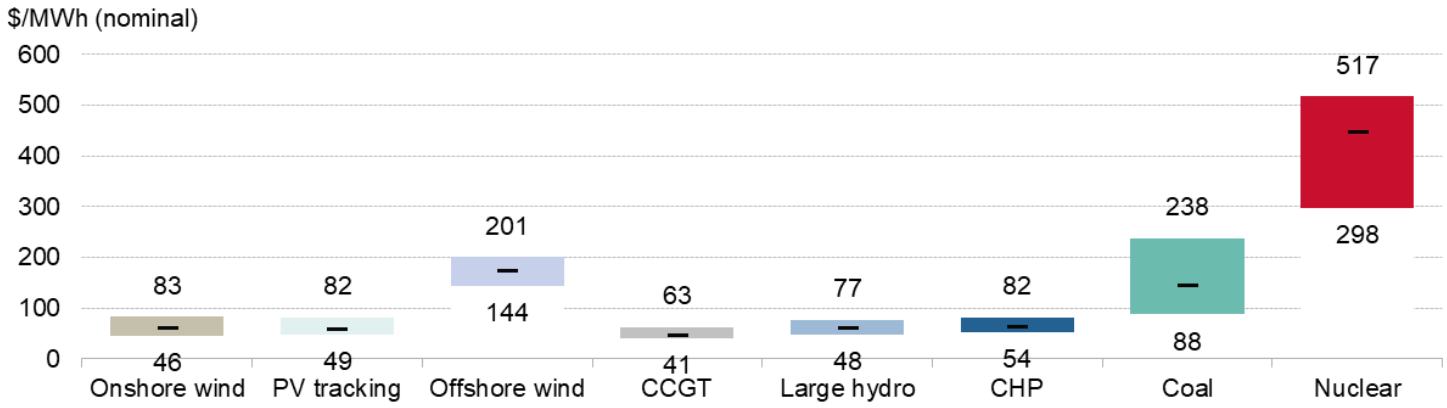
- The first is the sharp **acceleration in demand** for electricity which has occurred in the last 12-24 months. This has been driven by innovation in AI, with data centres demanding significant incremental power volumes. Global electricity demand growth expectations have grown to around 4% per annum between 2025-27, a marked increase from the 2.8% growth demanded between 2000 and 2023.
- The second driver is the ongoing shift towards **cleaner power**, as countries seek lower-emission alternatives such as renewables with battery storage to meet their decarbonization targets. Nuclear is equally capable of delivering zero-emission power and is the second largest source of emission-free generation after hydropower. Its return to favour among policymakers follows a decade of introspection following the Fukushima incident (2011) and is driven by a desire to seek sources of zero-emission *baseload* power, which wind and solar cannot provide.
- This leads to a natural third driver, which is the **continual delivery** of nuclear power. Once a reactor is operational, it will continue to produce power for the duration of its asset life. This makes it not only a viable candidate for baseload, as mentioned, but also in specialized applications such as powering data centres.

New traditional nuclear plants remain costly; extending existing assets is an increasingly appealing option

Traditional nuclear plants (with over 1GW capacity) have been notoriously difficult to deploy in large volumes globally, owing to two rigidities. The first is **build time**, with most taking 6-12 years to construct in developed markets (excluding the time taken to select sites and gain regulatory approval). The lack of newbuild nuclear activity has materially eroded the supply chain in the developed world, meaning that there has been little, if any, efficiency gain in newbuild construction over the last 20-30 years. Moreover, the long build times often face unplanned delays, bringing financing difficulties (as financiers desire interest payments during construction) and significant power price risk and volatility.

The second issue is the **sheer economic cost** of nuclear power, which remains largely uncompetitive versus alternative technologies. In the US, for example, the levelised cost of electricity (LCOE) of nuclear is at least five times that of onshore wind and solar, and more than two and half that of offshore wind.

Traditional nuclear remains uncompetitive on LCOE cost metrics



Source: BloombergNEF, 2025

In spite of these hurdles we note that new reactors are being sanctioned and there are 61 currently under construction. This fleet is set to come online between 2025-32, with nearly half of these located in China. We note that remarkably few are being built in developed markets; with only two in the UK (Hinkley C, 1 & 2), and one in Japan. There are a further 85 reactors in the planning stage around the globe, again, with the vast majority of these located in Asia. While we do not expect this entire planning pipeline to materialize, the under-construction and planned opportunity set represents 15-35% of the installed base of 410 reactors today.

Newbuilds must be considered in the context of the ageing of the existing fleet, of which 180 (43%) are above the age of 40 years and are therefore reaching the end of their lifespan intended at the time of construction. Although many of these reactors will be retired, we note that regulators are increasingly approving the 'life extension' of reactors. Extending an existing nuclear asset's life removes the two hurdles of traditional newbuild nuclear mentioned above, 'time to power' and poor economics. The IEA estimates that on an LCOE basis, nuclear lifespan extension is akin to that of utility solar / onshore wind; thus substantially more economical than newbuild.

During the past five years, lifetime extensions have been announced for 64 reactors in 13 countries, with a total capacity of about 65 GW (15% of current global nuclear fleet capacity). The most notable of these are summarized by country below. Further, we have seen some evidence of technology firms issuing purchase power agreements (PPAs) to dormant nuclear facilities, to encourage their restart and secure power offtake. Two such examples are Microsoft's PPA with Constellation Energy for the restart of the Three Mile Island plant and Amazon Web Services' plan to sign a PPA with Talen Energy for life extension and potential capacity expansion at its Susquehanna plant.

Country	Policy programme	Total operating capacity (GW)	Recently extended capacity (GW)
United States	The Inflation Reduction Act provided a production tax credit to the existing fleet, increased under OBBB. 22 reactors granted life extension licenses (20 years) in the last 5 years.	102.4	22.7
France	The lifetime of all 1,300 MW reactors will be extended to beyond 40 years under the "Grand Carenage" programme.	64.0	27.4
Japan	The Electricity Business Act was revised in 2023 to extend working life to 60 years of operation in some cases by excluding periods when reactors were suspended for safety reasons.	13.3	3.5

Belgium	The operational lifespans of the Doel 4 and Tihange 3 reactors will be extended by ten years, up to 2035.	4.1	2.2
Czech Republic	Dukovany's four reactors are set for 20-year lifetime extensions, operating until 2045–2047.	4.2	2.0
Hungary	Parliament has approved plans to extend the lifetime of the of the four module Paks plant by 20 years	2.0	2.0

Source: IEA, 2025

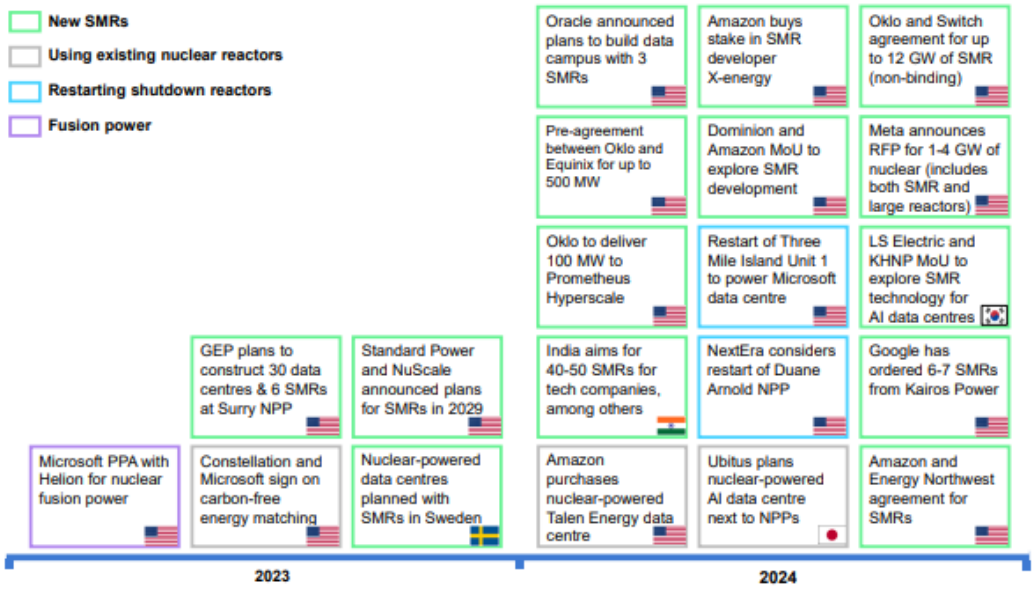
Small Modular Reactors are a fledgling technology, attracting interest from tech firms

Small modular reactors (SMRs) are an emerging technology that holds the potential to overcome the build time and cost hurdles of traditional new nuclear plants. The goal of SMRs is simple: make nuclear plants smaller, standardised, quicker and cheaper to build. Promoters of SMRs make the following claims:

- **Smaller –** Smaller reactors would be between 50-500MW compared to conventional reactors at 800-1,000MW or more. At this size, SMRs could be built on brownfield sites to replace decommissioned coal-fired plants, 90% of which are under 500MW.
- **Standardised –** Manufacturing standardised components should allow SMR construction to be more predictable than bespoke conventional projects, thereby reducing the risk of delays and projects overruns.
- **Quicker –** Modular units are built in one location and can be shipped by rail or road and assembled on site. This could help reduce commissioning times to around four years versus seven years for conventional nuclear, four years for thermal plants and two to three years for renewables projects.
- **Cheaper –** Modular units are smaller than conventional reactors, reducing the upfront capital expenditure. Making modular equipment should allow for cost reductions over time; for example, Rolls-Royce expects its first five SMRs to cost £2.2bn each, falling to £1.8bn for subsequent units.

SMRs remain pre-commercial, with only two such reactors operating: China's HTR-PM (210MWe, 2023) and Russia's KLT-40S (35Mwe, 2019). Although this technology remains nascent, it has attracted substantial interest from technology firms seeking to secure stable, uninterrupted power for data centre operations. Around 25 GW of planned SMR capacity has been announced globally to date (dominated by the US) to supply the data centre sector. The maturity and certainty of these contracts remain in question, with SMRs unlikely to reach commercial deployment until the early part of next decade. Further, the incubation of SMR technology has been fraught with delay and interruption. NuScale Power, a US SMR developer, has seen several of its projects fail to meet first power deadlines in recent years.

Recent nuclear energy procurements for data centres are mainly focused in the US, and use SMR technology



Source: IEA, 2025

Routes to investment in nuclear

We see a number of ways to invest in the growth of nuclear.

- **Traditional reactor operators**: Utilities or independent power producers (IPPs) operating traditional (+1GW) nuclear reactors. We see this as a compelling opportunity, with existing, legacy facilities benefiting from higher power prices, and increasingly from data centre PPAs, while leveraging assets constructed before 1970. These opportunities are well represented in the Guinness Sustainable Energy portfolio, through names like NextEra (NEE US), the US's sixth largest nuclear fleet operator, and Iberdrola (IBE SM) in Europe.
- **Capital Goods**: Equipment suppliers to newbuild and life-extension projects. These companies supply key equipment to nuclear facilities. We note that these are seldom pure-plays, and nuclear often comprises a minor part of these diversified capital goods enterprises.
- **Life extension enablers**: Companies providing construction or consultancy services to life extension. These businesses are niche and are typically units within larger enterprises. They provide expert design, engineering and labour. SPIE (SPIE FP), a portfolio holding, is a prominent example, and has been awarded the master electrical engineering contract on EDF's "Grand Carenage" project, the life extension of c.27GW of capacity.
- **SMR:** Manufacturers and Operators of SMRs. This set of businesses is comprised of pure-plays and conglomerates. The pure-plays include one listed name, NuScale Power (SMR US) and a number of privates; TerraPower, X-Energy, Westinghouse and Kairos Power.
- **Fuel Supply**: Companies mining, milling, converting or enriching Uranium. In principle, the attraction of these businesses is their leverage to nuclear demand, with revenues a function of uranium price. Names in this segment include Cameco (CCJ US), Denison Mines (DNN US), NexGen Energy (NXE US) and Centrus Energy (LEU US).

Conclusion

Nuclear power deployment is set to increase following decades of stagnation, a consequence of the inexorable growth in demand for power, the need for stable zero-emission baseload, and shifting policy and public perceptions of the viability and safety of nuclear. The costs and timescales involved in new nuclear construction will remain an impediment to breakout growth, and we see the most significant opportunity within this space to be the life extension of existing facilities. Although we note new technologies like SMRs, we remain cautious on their economic viability, and recognize that they are yet to be commercially delivered in spite of the wave of interest that they have generated from data centre operators and technology firms.

PERFORMANCE

Past performance does not predict future returns.

The **Guinness Sustainable Energy Fund** (Class Y, 0.68% OCF) delivered a return of 3.6% in the month, while the MSCI World Index (net return) delivered 1.3% (all in USD terms).

Guinness Sustainable Energy Fund	Ytd	1 Yr	3 Yrs	5 Yrs	10 Yrs*
Fund (Class Y)	15.7%	1.9%	0.2%	51.1%	91.7%
MSCI World NR Index	10.9%	15.7%	55.4%	90.7%	174.0%
Out/Underperformance	*4.8%*	*-13.8%*	*-55.2%*	*-39.6%*	*-82.3%*

	2024	2023	2022	2021	2020
Fund (Class Y)	-11.8%	-0.4%	-12.5%	10.4%	84.1%
MSCI World NR Index	18.7%	23.8%	-18.1%	21.8%	15.9%
Out/Underperformance	*-30.4%*	*-24.2%*	*5.6%*	*-11.4%*	*68.2%*

	2019	2018*	2017*	2016*	2015*
Fund (Class Y)	31.4%	-15.2%	20.2%	-15.4%	-12.0%
MSCI World NR Index	27.7%	-8.7%	22.4%	7.5%	-0.9%
Out/Underperformance	*3.7%*	*-6.5%*	*-2.2%*	*-23.0%*	*-11.2%*

*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%. On 31/12/2018, the benchmark became the MSCI World NR. Prior to this, the benchmark was the Wilderhill Clean Energy Index (ECO Index).*

The **WS Guinness Sustainable Energy Fund** (Class Y, 0.67% OCF) delivered a return of 8.5% in the month in GBP, while the MSCI World Index (net return) delivered 4.9%.

WS Guinness Sustainable Energy Fund	Ytd	1 Yr
Fund (Class Y, 0.67% OCF)	10.6%	1.9%
MSCI World NR Index	4.9%	12.3%
Out/Underperformance	*5.7%*	*-10.5%*

	2024	2023
Fund (Class Y, 0.67% OCF)	-10.4%	-5.8%
MSCI World NR Index	20.8%	16.8%
Out/Underperformance	*-31.2%*	*-22.6%*

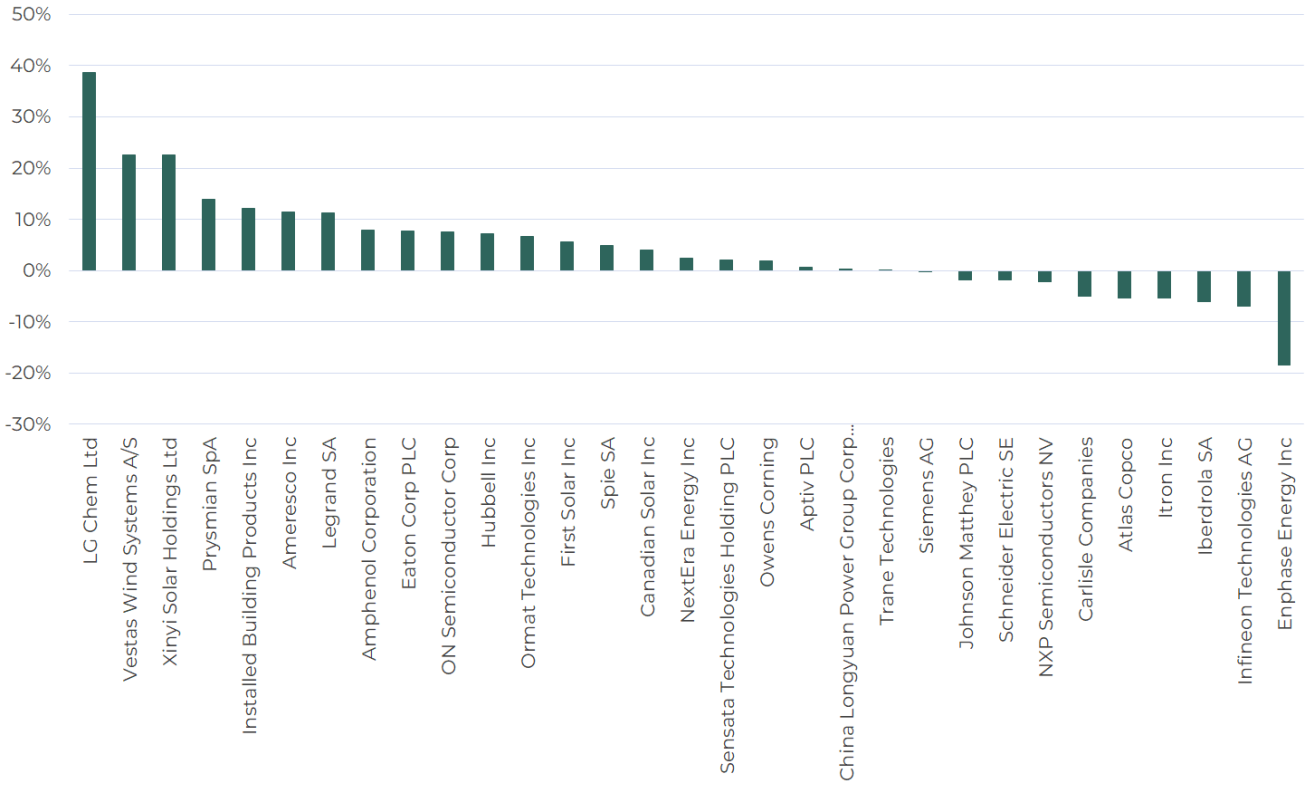
The Fund was launched on 30.12.2022.

Data as of 31.07.2025. Source: FE fundinfo, bid to bid, total return net of fees. 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). The performance shown has been reduced by the current OCF shown. Returns for share classes with different OCFs will vary accordingly. Transaction costs also apply and are incurred when a Fund buys or sells holdings.

Guinness Global Investors has been the investment manager of the **Guinness Sustainable Energy Fund UCITS ETF** since 25 July 2024. We will include performance data for this vehicle in due course.

Within the Fund, the strongest performers were LG Chem Ltd, Vestas Wind Systems A/S, Xinyi Solar Holdings Ltd, Prysmian SpA and Installed Building Products Inc while the weakest performers were Enphase Energy Inc, Infineon Technologies AG, Iberdrola SA, Itron Inc and Atlas Copco.

Stock by Stock performance over the month, in USD

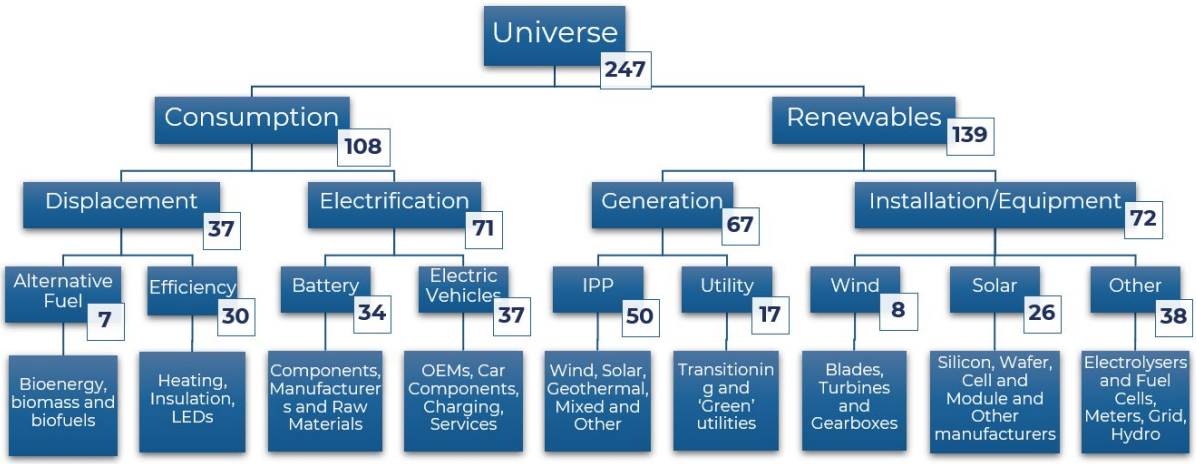


Source: Bloomberg. As of 31st July 2025

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. We do not limit ourselves to 'pure plays', opening our universe up to some companies with existing hydrocarbon-based fuel exposure, but this must be allied with a commitment to transitioning their business models towards sustainable energy sources. 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



Source: Guinness Global Investors; data as of 31.12.2024

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.

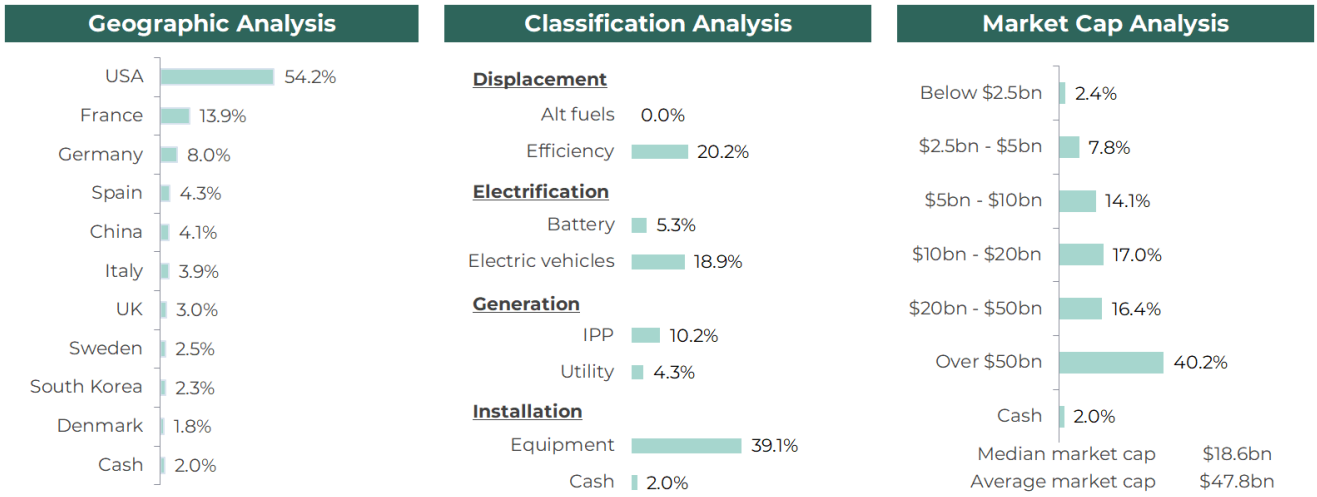
Guinness Global Investors is a signatory of the United Nations Principles for Responsible Investment. The Guinness Sustainable Energy Fund prioritises returns whilst delivering concentrated exposure to companies playing a key role in global decarbonisation. The Fund's holdings align most closely with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

Signatory of:
PRI Principles for Responsible Investment

Buys/Sells

There were no buys/sells in the month, but the portfolio was actively rebalanced.

Portfolio structure analysis



Data as of 31.07.2025. Source: Guinness Global Investors. Portfolio holdings are subject to change.

Portfolio sector breakdown

The following table shows the asset allocation of the Fund at 31st July and at previous year ends.

Asset allocation as %NAV	Current	*Change*	Year end	Previous year ends					
	Jul-25		*Dec-24*	Dec-23	Dec-22	Dec-21	Dec-20	Dec-19	Dec-18
Consumption	**44.4%**	***2.8%***	***41.6%***	**43.9%**	**44.9%**	**43.4%**	**36.7%**	**41.7%**	**26.5%**
Displacement	20.2%	*2.2%*	*17.9%*	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%*	*0.0%*	*3.9%*
Efficiency	*20.2%*	*2.2%*	*17.9%*	*15.3%*	*15.0%*	*11.8%*	*9.9%*	*13.4%*	*12.5%*
Electrification	24.2%	*0.6%*	*23.6%*	28.5%	29.9%	31.6%	26.8%	28.2%	10.1%
Batteries	*5.3%*	*-1.3%*	*6.6%*	*10.2%*	*11.6%*	*8.9%*	*10.8%*	*12.6%*	*3.9%*
Electric vehicles	*18.9%*	*1.9%*	*17.0%*	*18.4%*	*18.2%*	*22.8%*	*16.0%*	*15.7%*	*6.2%*
Renewables	**53.6%**	***-4.1%***	***57.7%***	**51.9%**	**49.3%**	**51.3%**	**60.4%**	**54.1%**	**69.7%**
Generation	14.5%	*-6.0%*	*20.5%*	19.5%	17.7%	23.1%	24.6%	22.2%	27.3%
IPP	*10.2%*	*-5.1%*	*15.4%*	*10.9%*	*8.7%*	*14.5%*	*17.0%*	*18.9%*	*26.7%*
Utility	*4.3%*	*-0.9%*	*5.2%*	*8.6%*	*9.0%*	*8.6%*	*7.6%*	*3.2%*	*0.6%*
Installation	39.1%	*1.9%*	*37.2%*	32.4%	31.6%	28.2%	35.8%	32.0%	42.5%
Equipment	*39.1%*	*1.9%*	*37.2%*	*32.4%*	*31.6%*	*28.2%*	*35.8%*	*32.0%*	*42.5%*
Cash	2.0%	*1.3%*	*0.7%*	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 31 July 2025	PE			EV/EBITDA			Dividend Yield		EPS Growth (%pa)		CFROI	
	2024	2025E	2026E	2024	2025E	2026E	2025E	2026E	2019-24	2024-27	2025E	2026E
Guinness Sustainable Energy Fund	20.7x	19.0x	16.0x	12.4x	11.6x	10.1x	1.5%	1.9%	7.7%	13.9%	10.9%	11.2%
MSCI World Index	22.8x	21.3x	19.1x	13.8x	12.8x	11.6x	1.8%	1.9%	6.8%	9.7%	9.7%	10.3%
Fund Premium/(Discount)	*-9%*	*-11%*	*-16%*	*-10%*	*-10%*	*-13%*						

*2024 P/E = Latest month-end price / 2024 earnings; Portfolio = median CFROI; Index data = HOLT MSCI World ETF median CFROI, EPS derived from consensus, adjusted for Canadian Solar

Source: Guinness Global Investors, Bloomberg

Portfolio holdings as at end July 2025

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

We hold a 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 (c.5%) or the electrification of transportation (c.19% weight), while we have c.20% weight to those companies involved in either displacing existing energy sources or improving overall energy efficiency.

We hold one lithium-ion battery manufacturer, LG Chem, which is a Korean chemicals company and one of the largest lithium-ion battery manufacturers in the world.

The portfolio holds six 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, Infineon and NXP Semi are providers of power semiconductors and microcontrollers that are a necessity for higher-voltage electric vehicles to become competitive with ICE (internal combustion engine) vehicles, while Aptiv and Sensata are component manufacturers and service providers that should benefit from the ever-increasing amount of electronics present in electric vehicles. Amphenol supplies connectors, sensors and high voltage interconnect solutions that are vital for EVs and EV charging infrastructure.

Our displacement holdings provide pure-play quality exposure to heating industries (Trane Technologies), insulation (Installed Building Products, Owens Corning, Carlisle Companies), energy efficient electrical equipment and services (Hubbell, Atlas Copco) 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 c.15% weight to companies involved in the generation of sustainable energy and 38% weight to those exposed to the installation of or equipment used in the process of sustainable energy generation.

China Longyuan is a pure-play Chinese wind power producer and represents one of our six generation holdings. The remaining exposure comes in the form of geothermal (Ormat), plus broad-based wind/solar renewable energy generation through 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 Enphase manufactures 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

Our remaining exposure to installation (Itron, Eaton, Legrand, Siemens, SPIE, Prysmian 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 July 2025

	Theme	Example holdings	Weighting (%)
1	Electrification of the energy mix		27.9%
2	Modernising the power grid		12.0%
3	Rise of the electric vehicle and auto efficiency		10.8%
4	Power semiconductors		9.0%
5	Wind & solar: equipment manufacturing		8.2%
6	Low carbon power generation: regulated producers		8.3%
7	Low carbon power generation: independent producers		7.4%
8	Building and Industrial efficiency		14.4%
9	Other (inc cash)		2.0%

Portfolio at end June 2025 (one month in arrears for compliance reasons)

Guinness Sustainable Energy Fund (30 June 2025)			P/E			EV/EBITDA			Price/Book			Dividend Yield		
Stock	**ISIN**	**% of NAV**	**2024**	**2025E**	**2026E**	**2024**	**2025E**	**2026E**	**2024**	**2025E**	**2026E**	**2024**	**2025E**	**2026E**
Displacement/Efficiency														
Hubbell Inc	US4435106079	4.5%	27.3x	23.4x	21.6x	17.3x	17.3x	16.0x	6.7x	5.9x	5.2x	1.2%	1.3%	1.4%
Trane Technologies	IE00BK9ZQ967	4.7%	38.6x	33.8x	30.2x	24.8x	23.6x	21.5x	13.2x	11.7x	10.2x	0.8%	0.8%	0.9%
Installed Building Products Inc	US45780R1014	2.5%	19.5x	18.8x	17.3x	10.6x	12.4x	11.6x	7.1x	1.0x	0.9x	1.7%	1.6%	1.4%
Carlisle Companies	US1423391002	2.7%	20.4x	17.1x	15.1x	13.1x	12.8x	11.9x	6.7x	7.3x	5.7x	1.0%	1.1%	1.2%
Owens Corning	US6907421019	2.2%	7.9x	10.2x	9.4x	6.3x	7.1x	6.9x	2.3x	2.2x	1.9x	1.8%	2.0%	2.0%
Ameresco Inc	US02361E1082	1.1%	21.4x	18.7x	13.3x	13.7x	11.1x	9.5x	0.8x	0.7x	0.7x	0.0%	n.m.	n.m.
Atlas Copco	SE0017486889	2.7%	27.6x	26.4x	24.4x	17.3x	16.3x	15.2x	7.6x	5.9x	5.3x	1.8%	2.0%	2.2%
		20.3%												
Electrification/Battery														
LG Chem Ltd	KR7051910008	1.7%	n.m.	30.3x	8.8x	9.0x	6.7x	4.9x	0.5x	0.5x	0.5x	0.5%	0.6%	1.6%
Johnson Matthey PLC	GB00BZ4BQC70	3.1%	115.6x	21.9x	10.7x	12.1x	6.4x	6.9x	1.5x	1.3x	1.2x	4.1%	4.6%	13.0%
		4.9%												
Electrification/Electric Vehicles														
Aptiv PLC	JE00BTDN8H13	3.0%	8.1x	9.6x	8.6x	7.3x	7.3x	6.9x	1.8x	1.6x	1.4x	0.0%	0.0%	0.1%
Amphenol Corporation	US0320951017	4.2%	49.7x	36.9x	33.4x	29.0x	22.0x	20.3x	12.2x	10.0x	8.4x	0.6%	0.7%	0.7%
ON Semiconductor Corp	US6821891057	2.5%	13.3x	22.9x	17.0x	8.5x	14.4x	11.5x	2.5x	2.6x	2.4x	0.0%	0.0%	0.0%
Infineon Technologies AG	DE0006231004	3.8%	22.2x	26.4x	19.5x	11.6x	11.7x	9.9x	3.1x	2.6x	2.4x	0.9%	1.0%	1.0%
NXP Semiconductors NV	NL0009538784	3.1%	19.0x	18.9x	15.9x	13.1x	13.8x	12.0x	6.1x	5.7x	5.2x	1.9%	1.9%	2.1%
Sensata Technologies Holding PLC	GB00BFMBMT84	2.6%	7.5x	9.4x	8.8x	5.9x	8.3x	8.1x	1.6x	1.5x	1.3x	1.6%	1.6%	1.7%
		19.3%												
Generation/IPP														
China Longyuan Power Group Corp Ltd	CNE100000HD4	2.6%	8.3x	7.8x	7.2x	10.2x	9.5x	8.9x	0.8x	0.7x	0.6x	3.5%	3.7%	4.1%
Ormat Technologies Inc	US6866881021	3.6%	38.1x	38.8x	34.0x	17.0x	13.2x	11.8x	2.1x	1.9x	1.8x	0.6%	0.6%	0.6%
NextEra Energy Inc	US65339F1012	4.1%	21.5x	18.9x	17.7x	18.7x	14.4x	12.6x	2.9x	2.5x	2.4x	3.0%	3.3%	3.6%
		10.2%												
Generation/Utility														
Iberdrola SA	ES0144580Y14	4.8%	20.0x	17.1x	16.5x	11.7x	10.7x	10.1x	2.4x	2.0x	2.0x	3.3%	4.1%	4.3%
		4.8%												
Installation/Equipment														
Schneider Electric SE	FR0000121972	4.7%	31.3x	25.0x	22.4x	18.1x	15.8x	14.4x	4.8x	3.9x	3.6x	1.6%	1.9%	2.1%
Legrand SA	FR0010307819	4.9%	26.6x	22.9x	21.4x	16.7x	15.0x	14.1x	4.5x	3.7x	3.4x	1.7%	2.1%	2.2%
Eaton Corp PLC	IE00B8KQN827	4.8%	35.8x	29.7x	26.4x	24.7x	22.9x	20.6x	7.6x	7.2x	6.7x	1.1%	1.1%	1.2%
Siemens AG	DE0007236101	4.7%	23.8x	18.7x	19.1x	14.0x	11.9x	10.7x	3.5x	3.0x	2.8x	2.2%	2.5%	2.6%
Itron Inc	US4657411066	3.8%	25.1x	24.1x	22.0x	18.7x	19.4x	17.2x	4.3x	3.7x	3.2x	0.0%	n.m.	n.m.
Spie SA	FR0012757854	4.1%	22.0x	17.0x	15.4x	10.5x	9.4x	8.8x	4.4x	3.4x	3.1x	1.9%	2.4%	2.6%
Prysmian SpA	IT0004176001	3.5%	21.3x	16.3x	13.9x	13.5x	9.9x	8.9x	3.8x	3.0x	2.6x	1.2%	1.5%	1.7%
Xinyi Solar Holdings Ltd	KYG9829N1025	1.3%	16.9x	13.8x	8.3x	7.9x	8.3x	6.5x	0.8x	0.7x	0.7x	4.0%	3.5%	4.7%
Enphase Energy Inc	US29355A1079	0.9%	39.9x	16.1x	13.6x	24.8x	12.9x	10.9x	6.3x	5.6x	3.9x	0.0%	0.0%	0.0%
First Solar Inc	US3364331070	2.8%	13.1x	11.0x	7.3x	9.1x	7.9x	5.5x	2.2x	1.9x	1.6x	0.0%	0.0%	0.0%
Canadian Solar Inc	CA1366351098	1.3%	4.3x	315.4x	10.7x	8.7x	8.5x	6.1x	0.3x	0.2x	0.2x	0.0%	0.0%	0.0%
Vestas Wind Systems A/S	DK0061539921	1.5%	30.8x	17.1x	11.9x	8.6x	6.1x	5.0x	4.1x	3.2x	2.6x	4.0%	1.6%	2.3%
		38.3%												
Cash	Cash	**2.2%**												

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 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

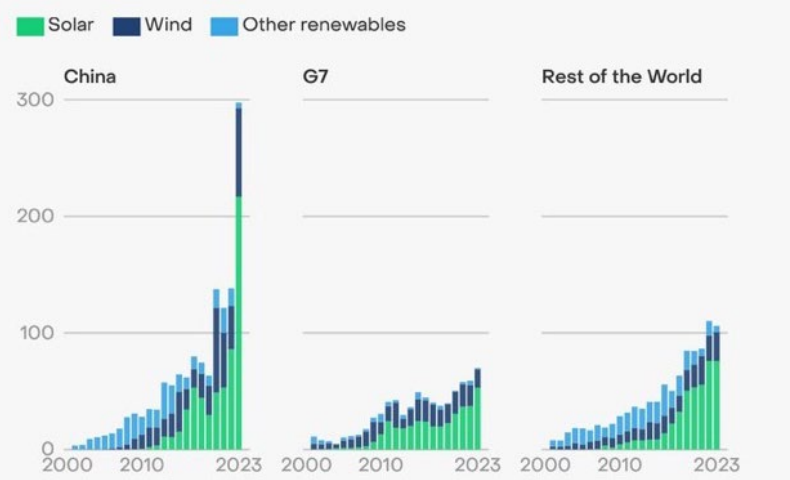
Sustainable energy policy in the **United States** has been dominated by the re-election of Donald Trump. His term will be a backward step for the energy transition and will bring a shift in US energy policy as he targets reduced energy costs, "energy dominance", and improved competitiveness for US industry via the removal of environmental regulations. The Inflation Reduction Act (IRA) – the key Democrat-led legislation providing $369bn of tax credits for clean energy investment – has been partially unwound as part of the President's plans to raise funds to support tax cuts elsewhere.

Trump's One Big Beautiful Bill eliminates electric vehicle and residential solar tax credits and speeds up the phasing out of utility solar and wind ITC and PTC tax credits, relative to initial IRA timelines. On the positive side, manufacturing tax credits for battery and solar equipment will last until 2032 (beyond previous expectations) with wind credits set to end in 2027. While the new bill is less favourable for clean energy, its passing will provide project developers with the certainty needed to plan and proceed. Our dialogue with OEMs and developers indicate that the planning scenario for many following the Trump election was for a full repeal of the IRA and that little activity would occur whilst the bill was under consideration. With this hurdle now cleared, we expect to see a resumption of activity in the US, from what we see as an encouraging base level of activity, unabated by recent policy headwinds.

Other areas of focus for Trump have included a broader reach of the Foreign Entity of Concern (FEOC) designation (beyond the electric vehicle industry), a slow down in the awards of new offshore wind permits (since there is federal involvement in offshore wind), a departure from the Paris Agreement, a removal of the liquefied natural gas (LNG) export pause and a roll back of environmental restrictions.

China continued to reap benefits from decades of investment in sustainable energy technologies, building nearly twice as much wind and solar capacity as the rest of the world combined in 2024, delivering the lowest clean energy costs globally (with onshore wind being the cheapest) and supplying over 60% of the world's demand for electric vehicles. We will likely look back and see that China achieved its target of 1,200 GW in wind and solar installations in mid-2024, around six years ahead of schedule. We view China's ability to offer comprehensive, long-term demand-side and supply-side policy support as a key differentiator, allowing it to increasingly dominate the global clean tech environment. We expect this rapid growth to continue as renewable energy (alongside grid modernisation) was again listed among the "strategic industries" whose development is expected to be supported by policymakers.

Annual renewable capacity additions by region 2000-23 (GW)



Source: Ember, 2024

In contrast, there seemed to be little real progress from **Europe** around commitment and investment as part of the Net Zero Industrial Act. Amendments to the European Climate Law (which targets net zero greenhouse emissions by 2050) were made to reduce the EU's net greenhouse gas emissions by 90% by 2040 (relative to 1990). This new interim target was designed to accelerate the transition and put the EU on a path towards a healthier and safer future, to avoid wasted investments in fossil fuels, boost the competitiveness of Europe's businesses and to make Europe more resilient.

As has often been the case in Europe, we found the bloc to be 'long' on targets but 'short' on actual support to help establish the supply chains and domestic manufacturing to allow the targets to be achieved. The Green Deal Industrial Plan, the Net Zero Industry Act and Critical Raw Materials Act (all passed in 2023) do not yet appear to be catalysing investment in the EU as little new central funding was announced to support these ambitions. However, we're optimistic that 2025 marks a shift in tone and substance, with the Clean Industrial Deal and Germany's debt brake reform offering substantial funding to enable Europe's green ambitions, unlocking up to €1 trn for broader defence, infrastructure and energy transition projects over the coming decade.

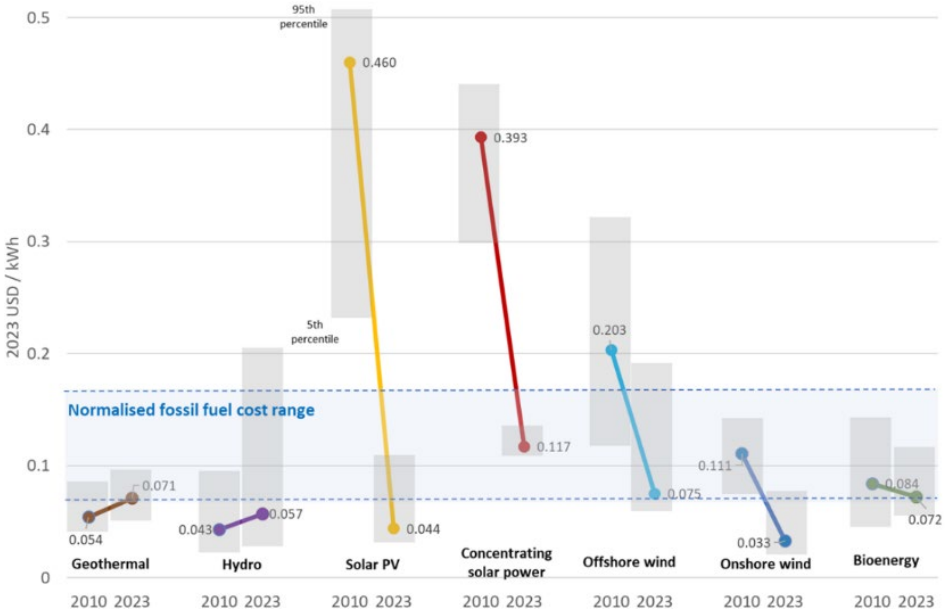
Compared with previous events, **COP 29** in November in Azerbaijan was lightly attended and appeared to do little to progress broader decarbonisation goals. Notable wins included Mexico setting a 2050 net zero target, Indonesia (operator of the fifth largest coal fleet in the world) announcing a 2040 coal phase-out target (16 years earlier than the prior target) and progress was also made towards a global carbon credit platform. The COP was billed in advance as having a particular focus on climate finance, but the ultimate agreement that developed nations pay $300bn per year to developing nations was seen by many as being insufficient.

On a positive note, **global investment in clean technologies** grew, reaching $2 trn in 2024 according to the IEA – almost twice the spend on coal, oil and gas in the year, and up from $1.7 trn in 2023. Higher-than-anticipated borrowing costs have been offset by easing supply chain pressures and falling prices, especially for solar PV and battery technologies. The greater investment means that clean energy is becoming a greater share of global GDP growth (having averaged 10% in 2023) with the number of clean energy jobs growing and accounting for more than half of employment in the global energy sector

Renewable electricity is the cheapest form of new electricity supply in most situations. According to Levelized Cost of Electricity (LCOE) estimates from the International Renewable Energy Agency (IRENA), the cost of wind and solar projects commissioned in 2023 ranged from $0.03-0.11/kWh, well below the fossil fuel cost range of $0.08-0.17/kWh. Despite increases in project financing costs and inflation across the broader economy, the LCOE of solar and onshore wind projects fell by 12% and 3% respectively, vs 2022. This illustrates that renewables remain cost competitive and this keeps the long-term driver of renewables adoption intact.

Global LCOE of newly commissioned utility-scale renewable power generation technologies (2010–2023)

LCOE = levelized cost of electricity



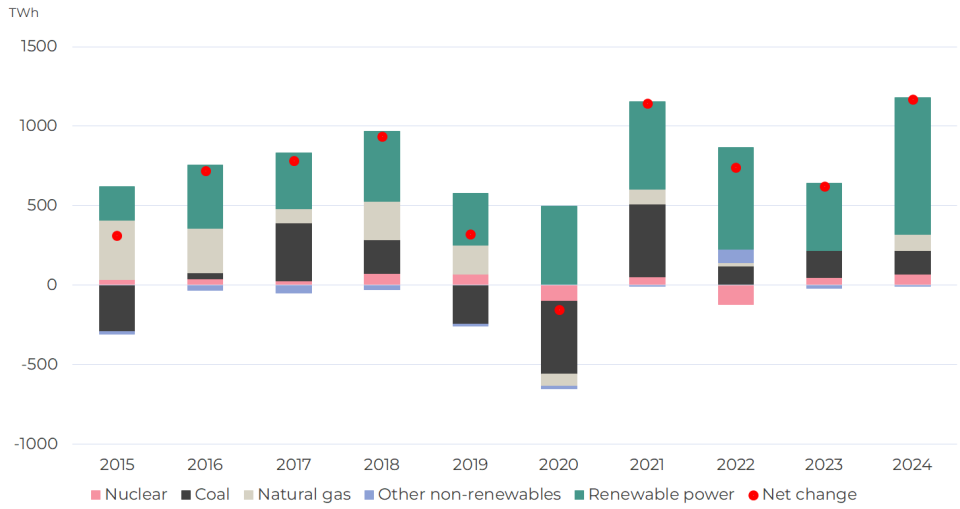
Source: IRENA; Guinness Global Investors, December 2024

Installations and power generation

Around 580 GW of **new renewable generation capacity** was installed in 2024, 100 GW higher than the record installations in 2023 and more than triple the 185 GW installed pre-COVID in 2019. At over 400 GW, solar represented around three quarters of the new capacity additions. Wind came next, at just over 100 GW, followed by hydropower, then bioenergy.

Renewable electricity generation in 2024 increased by 858 TWh (around 10%), reaching over 9,800 TWh and outpacing global electricity demand (1,170 TWh or 4% growth in 2024). Most of the rise in renewable power generation can be attributed to the increase in installed solar and wind capacity, although it was also boosted by a strong recovery in hydro output after drought conditions in various regions the year before.

Change in electricity generation (TWh) 2015-2024E



Sources: IEA; Ember; Guinness Global Investors

More than half of the electricity demand growth in 2024 came from five technologies: electric vehicles (EVs), heat pumps, electrolysers, air conditioning and datacentres. The spread of these technologies is accelerating the growth in electricity demand, but overall energy demand is not growing as fast, since electrification is more efficient than fossil fuels.

Energy displacement: efficiency and alternative fuels

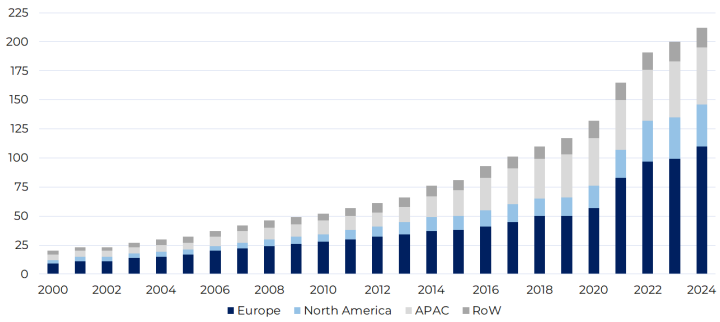
It is a common misconception that achieving rapid growth in renewable power generation will be enough to deliver government targets for pollution, energy security and decarbonisation. Renewable power generation is a key part of the solution, but we see the displacement and more efficient use of existing 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

It is hard to understate the importance of **energy efficiency**. Energy efficiency and energy security raced up the political agenda following the spike in energy prices following the Russian invasion of Ukraine in 2022.

National policies in force targeting building efficiency



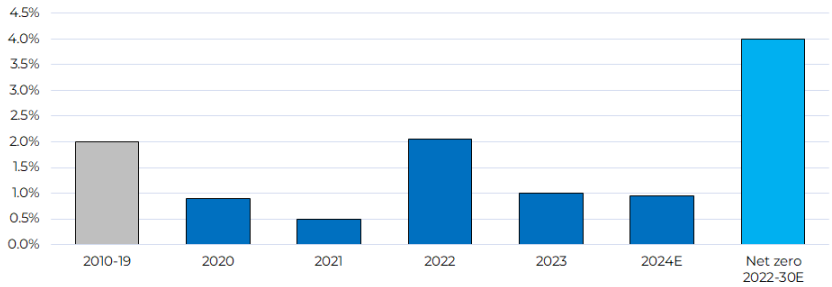
Source: IEA, Guinness Global Investors, December 2024

The increase was most pronounced in Europe, where the REPower EU plan aimed to rapidly reduce dependence on Russian natural gas imports and fast-track the green transition. In 2024, the EU set new goals to achieve 100% zero-emission buildings by 2050, adding to existing targets to install 10 million heat pumps by 2027 and reduce final energy consumption by 13% by 2030.

Elevated energy prices drove three years of double-digit growth in global efficiency spending from 2020 to 2022. Investment then retreated 7% in 2023 as higher interest rates weighed on housebuilders and renovation activity and a 16% decline in Chinese construction significantly impacting the delivery of green buildings globally. In 2024, despite continued headwinds, spending remained resilient, falling just 3% to $270bn, 35-40% higher than 2019 levels.

We believe that Europe's decision to end its reliance on Russian gas is likely to lead to structurally higher natural gas (and therefore electricity) prices in Europe and Asia. Higher energy prices should support efficiency project economics, ultimately providing a tailwind to the COP28 goal to double the global average annual rate of energy efficiency improvements from around 2% to over 4% every year until 2030.

Global annual improvement in primary energy intensity



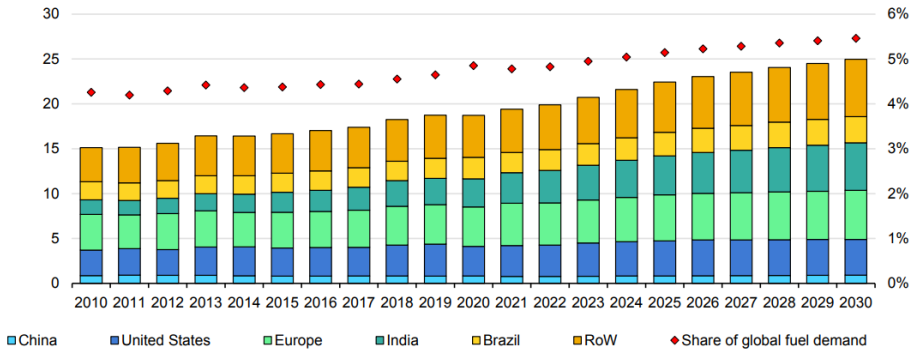
Source: IEA, Guinness Global Investors, December 2024

Alternative Fuels

Alternative (or renewable) fuels are set to play an important role in tackling emissions in carbon-intensive, hard-to-abate sectors. Global demand for these fuels in 2024 was around 21.5 exajoules (EJ) across industry, buildings and transportation, satisfying around 5% of their energy needs. Solid biofuels were the most prominent, making up 75% of alternative fuel consumption globally, followed by liquid biofuels at 20%, and biogas trailing at 5%. Four countries – the United States, India, Brazil, and China – represented over 50% of global demand.

Alternative fuel consumption is expected to grow steadily at around 2.5% per year out to 2030, reaching 25EJ, with over 65% of demand growth coming from India, China, Brazil, the US and Europe. Solid bioenergy contributes over 60% of the total demand growth with liquid biofuels, used predominantly in transportation, representing around 25% of the total growth.

Global renewable fuel demand (EJ)



Source: IEA (incl. estimates), December 2024

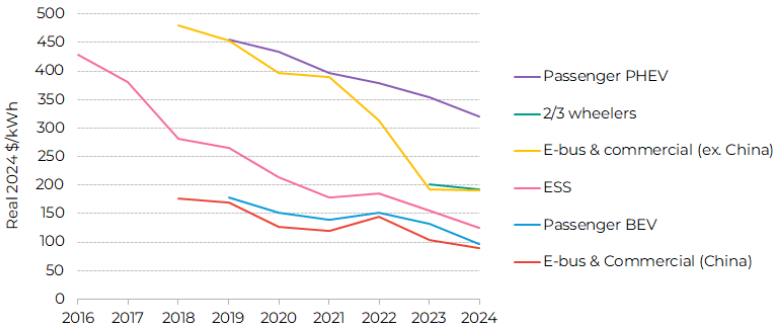
It is important to remember that alternative fuels broadly remain more expensive than their fossil fuel counterparts, meaning that policy support is key to underpinning future growth. For example, the $2/litre cost of producing biojet (often known as Sustainable Aviation Fuel, SAF) is nearly three times as much as the $0.75/litre cost of producing traditional jet fuel. Blending targets will still be needed to encourage the uptake of liquid biofuels while limiting the financial impact to consumers.

Electrification: batteries and electric vehicles

Global **battery demand** reached 1.2TWh in 2024, up 25% year-on-year and up nearly 500% since 2020. Battery prices (across all applications) fell a further 20% to $115/kWh in 2024, due to rapid growth of lower-cost Chinese manufacturing. Assuming a continuation of the 18% historic learning rate, Bloomberg New Energy Finance forecasts battery prices could fall to around $70/kWh by 2030.

The battery market is primarily driven by passenger electric vehicles (EVs), representing 70% of demand, with energy stationary storage (ESS) a distant second at 14%. Looking ahead, we expect passenger vehicles to remain the dominant driver, with emergent demand from commercial vehicles acting as a tailwind, resulting in an average annual growth in battery demand of around 20% per year out to 2030. The price of batteries for EVs fell below $100/kWh for the first time in 2024, driven by economies of scale and an increase in the adoption of lithium iron phosphate (LFP) chemistries. Thanks to its greater stability and lower cost, LFP's share of the global cathode mix has grown from 17% in 2020 to 44% in 2024. China now boasts the lowest battery pack prices globally at $94/kWh, 20-30% lower than the US and Europe, and is the only region to see average prices below $100/kWh.

Historical volume-weighted average pack prices by sector

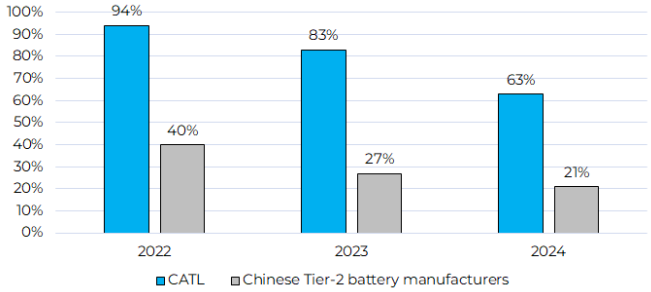


Source: BNEF, Guinness Global Investors, December 2024

Weaker-than-expected EV demand in 2024 led to falling battery manufacturing utilisation rates across the industry, falling as low as 21% for tier 2 manufacturers in China compared to 63% for industry leader CATL. Smaller players facing persistently low utilization and weak profitability are starting to respond by curtailing investment or exiting the industry entirely.

Benchmark Minerals noted that at least 25 gigafactory projects across China and Europe were cancelled or postponed in 2024, leading to downward revisions to long-term supply estimates. With EV penetration due to accelerate across the West in 2025 and 2026, we expect utilization rates at tier 1 manufacturers to inflect positively, helping to boost margins and profitability.

Chinese battery capacity utilization

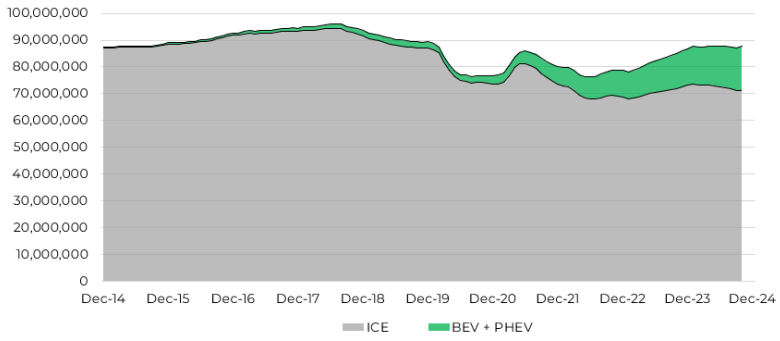


Source: Bernstein, Guinness Global Investors, December 2024

2024 saw rising trade tensions after the Biden administration more than tripled tariffs on Chinese imports of lithium-ion batteries (7.5% to 25%) and quadrupled tariffs on Chinese EVs (25% to 100%) in an attempt to shield domestic manufacturers from China's "unfair economic practices". Since taking office, President Trump has signed a flurry of executive orders, including the revocation of President Biden's 2021 EV targets, and implemented tariffs with key trade partners. Although uncertainty around auto tariffs persists, the announcement of a temporary pause provided markets with some near-term clarity. Subsequently, attention shifted towards the Republican's first budget (the One Big Beautiful Bill) and its implications for the scaling back of the Inflation Reduction Act. As had been widely expected, the revised bill eliminated electric vehicle tax credits post 2025, but crucially, support for battery manufacturing in the US is set to last until 2032, a positive development that was beyond previous expectations.

Electric vehicles continued to gain popularity in 2024, growing 20% year-over-year to 17 million units (a 20% penetration rate). Meanwhile, internal combustion engines (ICEs) continue to lose share, with sales having fallen by around 25% since their peak in 2017.

Rolling 12-month light vehicle sales by drivetrain



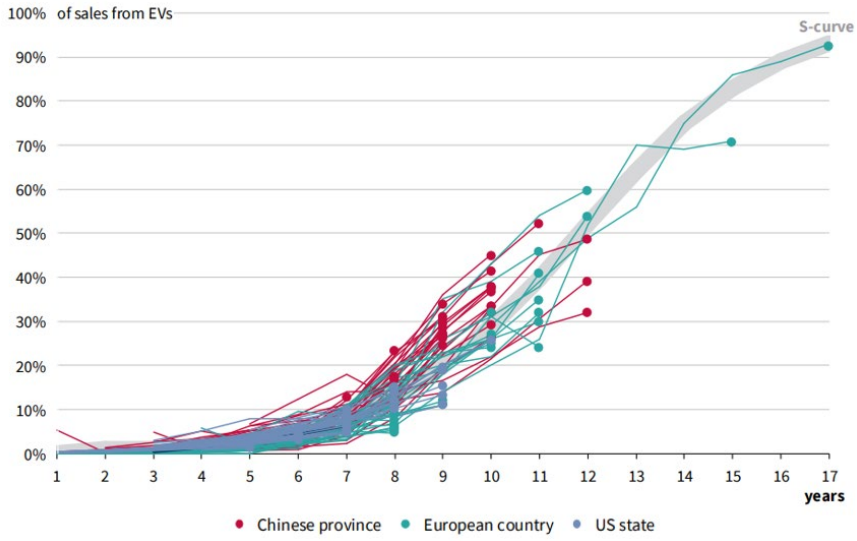
Source: LMC, Cleantechnica, Guinness Global Investors, December 2024

Slowing EV sales growth was largely attributable to higher financing costs, a post-COVID inflationary spike in vehicle prices and a weakening macroeconomic environment. Lower interest rates and cheaper batteries will improve EV affordability and should act as further positive catalysts for the sector.

We take confidence from Norway, which has banned ICE vehicle sales this year after seeing EV penetration rise from just 10% in 2013 to over 90% in 2024. While Norway is a small high-income country, it is interesting that its EV adoption curve is being tracked very closely by China, which achieved EV penetration rates of over 50% in the second half of 2024. Indeed, RMI analysis covering over 110 countries, states, and provinces across Europe, the US, and China found a universal S-curve pattern

in EV deployment, with EV sales taking six years to get to 5%, and only another six years to get to 50%. If growth continues along these S-curves, RMI estimates that electric vehicles will make up over 80% of new vehicle sales in China and Europe by 2030 with the United States reaching that level by 2035.

EV share of car sales



Source: RMI, December 2024

Ultimately, we believe EVs will be cheaper to buy, cheaper to run and cheaper to maintain, driving the journey towards 50% global EV sales penetration in 2030 and over 90% sales penetration in 2040. Whilst regulatory and policy-based initiatives have been necessary to grow the EV industry to critical size, EVs can ultimately offer better technology (Chinese battery manufacturers CATL and BYD have both developed batteries capable of offering ~500km range on just a 5-minute charge), better efficiency (EVs convert over 85% of energy stored into motion, compared to less than 40% for ICE vehicles) and better economics (60% of all EVs sold in China in 2023 were cheaper than the ICE equivalent) that will allow them to dominate.

Renewable installations: solar, wind, power grids and nuclear

Solar

Solar deployments grew significantly again in 2024, with global installations of around 600 GW, up around four times (40% per year) since 2020 and nearly double the 22% annual growth achieved between 2014 and 2019. The rapid uptake is undoubtedly due to the vast improvements in both solar technology and solar economics, with module prices continuing to tumble, falling by 90% over the past 10 years to a record low of just 9 cents per watt in 2024. The profitability of module manufacturers suffered as oversupply caused modules prices to fall below the cash cost of manufacturing at times.

Solar continues to become more efficient. Around 20 years ago, solar modules were 5% efficient, 10 years ago they were 15% efficient, current modules are around 25% efficient and current research suggests that we may achieve 50% efficiency over the longer term. This could open the door to solar power costs falling 50-75% to as little as 1-3 cents per kilowatt hour (c/kWh), thereby cementing its position at the bottom of the electricity cost curve.

In 2025, we expect growth across all major geographies to result in full-year global installations of around 670 GW. China will continue to dominate, making up approximately 50% of the global market as it attempts to decarbonize its power grid and achieve peak emissions before 2030. Growth should remain robust in North America driven by hyperscalers looking to lock in solar power purchase agreements which offer zero-carbon electricity with long-term price visibility and one of the fastest times to power. Datacentres also provide a tailwind in Europe, which is expected to grow at a more restrained pace after more than doubling over the previous three years.

Global solar module installations, 2010-2025E (GW)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025E
OECD solar installations (annual)																
North America	1	2	4	6	7	8	15	12	12	15	22	26	26	40	48	53
Germany	7	7	8	3	2	1	1	2	4	4	5	6	7	15	15	16
Spain	0	0	0	0	0	0	0	0	0	5	4	6	9	9	8	9
Rest of Europe	3	4	5	5	5	8	5	7	9	14	15	21	28	46	55	56
Australia	0	1	1	1	1	1	1	1	4	3	4	6	4	6	4	5
South Korea	0	0	0	1	1	1	1	1	2	4	6	4	3	3	3	4
Japan	1	1	2	7	10	11	8	7	7	7	9	6	6	5	4	5
Total OECD	**17**	**23**	**24**	**24**	**25**	**31**	**32**	**31**	**39**	**53**	**65**	**75**	**86**	**128**	**141**	**152**
Change	*10*	*7*	*0*	*0*	*2*	*5*	*1*	*0*	*7*	*14*	*12*	*10*	*18*	*42*	*55*	*25*
Non-OECD solar installations (annual)																
China	0	3	3	14	13	19	30	53	44	33	52	69	107	260	309	330
India	0	0	1	1	1	2	5	10	11	11	4	13	19	14	27	29
Rest of non-OECD	1	3	3	4	6	4	8	7	12	21	29	26	40	42	123	156
Total Non-OECD	**2**	**5**	**8**	**18**	**21**	**27**	**46**	**72**	**67**	**65**	**85**	**107**	**172**	**316**	**458**	**515**
Change	*1*	*3*	*2*	*11*	*2*	*6*	*19*	*26*	*-5*	*-2*	*20*	*22*	*58*	*144*	*286*	*198*
Total solar installations (annual)	**19**	**29**	**31**	**42**	**46**	**56**	**75**	**101**	**106**	**118**	**150**	**182**	**252**	**444**	**599**	**667**
Change	*11*	*10*	*2*	*11*	*4*	*10*	*19*	*26*	*5*	*12*	*32*	*32*	*76*	*192*	*347*	*223*

Source: BP, BloombergNEF, PV InfoLink, IEA and Guinness Global Investors estimates, December 2024

Thinking longer-term, solar power sits at the bottom end of the power generation cost curve, and significant increases in solar power generation are inevitable and necessary in a low-carbon energy system. Record-low module prices will only improve the volume outlook and the down cycle in pricing will end, providing opportunities for manufacturers to regain normalised profitability levels. To offset the intermittency, we will need to see solar & storage projects being more broadly economic in order to displace new build fossil fuel power generation. Storage project costs have dropped by around 90% since 2010 meaning that, over the last couple of years, the cheapest solar & storage projects (LCOEs in the range of 4.6-6.0 c/kWh) are already competitive with the cheapest new gas/coal-fired power projects (LCOEs in the range of 3.9-4.5 c/kWh and 6.8-6.9 c/kWh respectively). Higher-cost projects still require subsidy and incentives but costs are likely to fall.

Wind

Turning to the **wind industry**, manufacturing capacity grew by 21 GW in 2024, vs 12 GW in 2023. Total installations grew to a record 122 GW as manufacturers continued to recover from supply chain bottlenecks, raw material and labour market cost inflation and onerous non-profitable contracts that were priced before inflationary conditions hit in 2021. Wind operators also saw greater stabilisation in 2024 with no new significant project cancellations as the interest rate easing cycle started to improve project economics. In addition, power purchase agreements (PPAs) for wind reached record highs in the US ($68/MWh in Q4 2024 according to Levelten) and remain near all-time highs in Europe (€90/MWh). This sustained pricing, as interest rates started to decline, shored up new project economics and provided much-needed certainty to operators who have sat on the sidelines for the last two or three years.

Looking into 2025, we estimate a record level around 145 GW of new installations, an increase of around 21 GW versus 2024. Encouragingly, well over half of that increase is ex-China, suggesting a material ramp in growth in the sector in the key North American and European regions.

Global wind installations, 2010-2025E (GW)

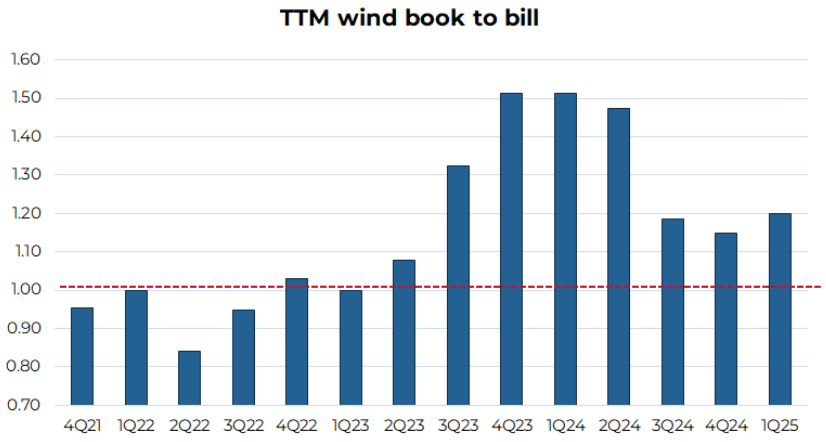
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025E
Onshore wind installations (annual)																
North America	6	8	15	2	7	10	9	8	8	10	17	14	10	8	8	10
Latin America	0	0	0	0	5	3	3	3	4	3	3	6	4	6	6	4
Europe	9	10	12	11	11	11	12	13	8	9	14	14	15	16	11	18
China	17	18	14	15	21	29	22	17	19	26	54	42	44	54	77	81
India	1	1	2	2	2	3	4	4	2	2	1	2	2	3	3	5
RoW	3	4	4	3	4	5	5	5	4	4	4	8	5	4	5	8
Total onshore	**35**	**40**	**46**	**33**	**49**	**61**	**55**	**49**	**46**	**55**	**93**	**84**	**79**	**91**	**110**	**126**
Change	*-3*	*5*	*6*	*-14*	*17*	*11*	*-6*	*-6*	*-3*	*9*	*38*	*-9*	*-5*	*12*	*19*	*16*
World ex China	*18*	*22*	*32*	*18*	*29*	*32*	*33*	*32*	*27*	*29*	*40*	*43*	*36*	*38*	*33*	*45*
Offshore wind installations (annual)																
China	0	0	0	0	0	1	1	1	2	3	4	14	5	8	7	12
UK	1	0	1	1	0	1	0	1	2	2	1	1	3	1	0	3
Germany	0	0	0	0	0	2	0	2	0	2	0	1	0	1	1	1
RoW	0	0	0	1	0	0	0	1	0	1	2	1	1	2	6	3
Total offshore	**1**	**0**	**2**	**2**	**1**	**4**	**1**	**4**	**4**	**8**	**7**	**17**	**9**	**12**	**14**	**19**
Change	*1*	*-1*	*1*	*1*	*-1*	*4*	*-4*	*3*	*0*	*3*	*-1*	*10*	*-8*	*3*	*2*	*5*
World ex China	1	0	1	2	1	3	0	4	3	5	3	3	4	4	7	6
Total wind installations	**36**	**40**	**48**	**35**	**50**	**65**	**56**	**53**	**50**	**63**	**100**	**101**	**88**	**103**	**124**	**145**
Change	*-2*	*4*	*8*	*-13*	*16*	*15*	*-9*	*-3*	*-2*	*12*	*38*	*1*	*-13*	*15*	*21*	*21*

Source: BP, IEA, BNEF, Guinness Global Investors estimates, December 2024

We see a near 60% increase in installations to around 200 GW by the end of the decade, with onshore growing at 6% pa and offshore growing at 20% pa. The starting point for the industry is healthy, with industry-level book to bill (the ratio of new orders to existing sales) having been comfortably above 1.0x on a trailing 12-month basis for the last eight quarters. This suggests that the industry has a strong pipeline of work.

We finally remain encouraged by the potential of the Offshore sector to drive growth in the wind industry, as we enter the second half of the decade. Within Europe alone, there is c.26 GW of awarded and approved capacity set to come on-stream by 2030, the equivalent of 2-3 years of onshore growth globally. We would expect this to grow and note that there are 9.2 GW of projects tendered offshore France in November 2024 that will soon join this backlog.

Trailing 12-month European wind book to bill



Source: company data, Guinness Global Investors estimates, June 2025

Global power grids

Global power grids will have to be substantially upgraded and extended to cope with higher wind and solar generation as electricity demand inflects upwards. This includes high-voltage transmission (covering large distances), medium-voltage distribution (covering shorter distances) and low-voltage equipment (used within buildings). Within high and medium-voltage applications, we continue to see strong growth in transmission and distribution (T&D) spending. The Edison Electric Institute calculated US T&D investment at $95bn in 2024, up 9% versus 2023. We expect a healthy outlook for US grid investment, averaging 8-10% growth per year to 2030, as network owners and operators look to replace and upgrade ageing infrastructure (typically 30-50 years old or over), harden the grid against extreme weather and build out new capacity.

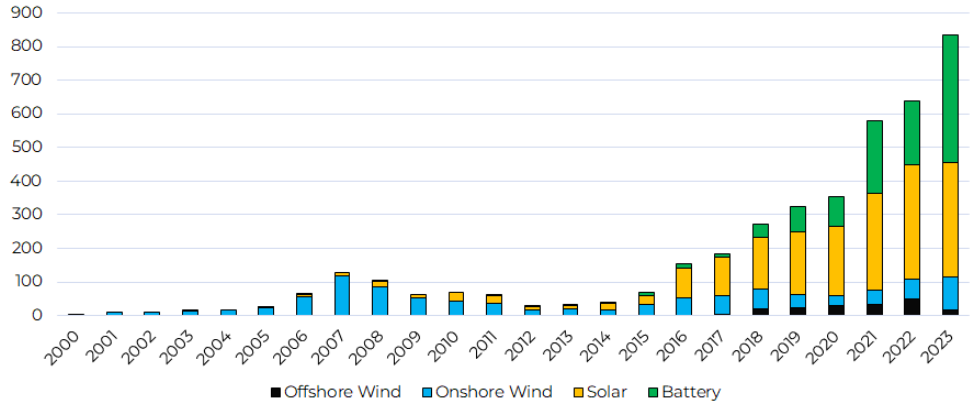
After 20 years of flat electricity consumption, we see demand growth of around 2-3% per year due to datacentres, AI querying, reindustrialization and electrification. Political support will be required to make this happen and we stress that the outlook here is very robust despite President Trump's cuts to the IRA. The inflection started in 2024 in the US, but we expect pressure in Europe as well, where – despite the region being 12-24 months behind the US – data centre capacity is still forecast to grow at 20% per year to reach 35 GW in 2030. Three meaningful bottlenecks to this growth exist, relevant both in a US and a global context, and provide opportunities for companies to make superior margins:

- **Labour:** Bernstein estimates that the US will need 50% more linemen by 2035, forecasting a 12,000-worker shortage if the industry continues to grow at its historic rate. Experienced engineers are in short supply.

- **Transformers:** The average US transformer is 35-40 years old and the US imports around 80% of its large transformers. Supply chains are stretched with prices up 60-80% since early 2020 and lead times tripling to c.150 weeks since 2021. Electrical equipment manufacturers, especially US domestic manufacturers, are well placed.

- **Permitting:** The Lawrence Berkley National Laboratory sees the US interconnection queue at its highest level on record, while WoodMac expects that permit applications from as far back as 2020 will not be approved until later this decade. The opportunity for superior margins could last for a few years.

US cumulative interconnection queue



Source: Generation, Lawrence Berkeley National Laboratory, December 2024

These are long-term trends that will require multi-year investment programmes and it is therefore not surprising that **nuclear power** came back into consideration in the US as concerns grew about grid stability. While not necessarily considered to be a 'renewable' power source, and despite its chequered past, nuclear power will play a role in the global energy transition and there is no credible net zero scenario which doesn't forecast growth in 'carbon-free' nuclear. The 2024 nuclear renaissance saw hyperscalers sign deals to restart old reactors, support small modular reactors (SMRs) and invest in start-up companies developing nuclear fusion technologies.

A key focus remains SMRs, which are frequently touted as a solution to provide baseload low-carbon power generation. However, as far as we are aware, only two SMRs are currently in operation globally: one in Russia (in a maritime setup) and the other in China. With limited information about either, the development schedule and the underlying economics of both are unclear. From what we know, we think SMRs in the US will not be cheaper than gas or renewables-based power

generation. In late 2023, NuScale cancelled its planned SMR Carbon Free Power Project (CFPP) in Utah as its costs escalated (requiring 9 c/kWh to be economic, after a 3 c/kWh IRA subsidy) and its start date slipped (back to 2029, from an original plan of 2026). While carbon-free baseload power at $9 c/kWh could certainly be considered 'economic', we would expect project delays and cost overruns to take this substantially higher.

So, beyond restarting idled nuclear plants, nuclear power does not appear to be set for meaningful growth. We expect the first power from new SMR facilities to come after 2032, but even then, it is unlikely that SMRs have any meaningful impact until the late 2030s, in our opinion. This leads to a situation where global power grids will need to be extended and strengthened in order to cope with higher levels of variable renewable power.

IMPLICATIONS OF A NET ZERO SCENARIO

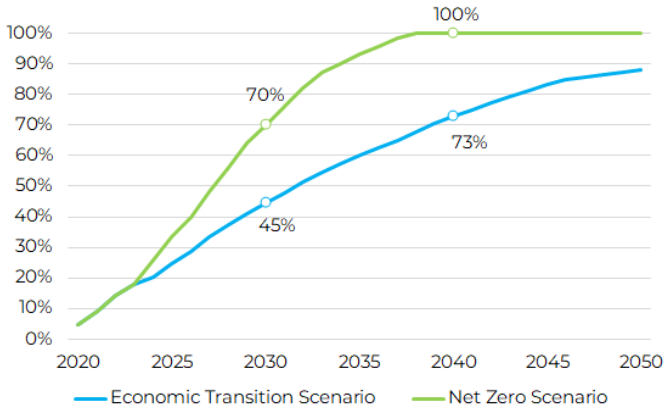
Throughout this document, we refer to our base-case energy transition scenario that reflects our understanding of the industry's current capacity and plans to provide decarbonisation solutions. This scenario is not consistent with net zero and we highlight the following changes across our subsectors that would be required to deliver a net zero transition:

- Within **efficiency**, annual improvements in energy intensity would need to quadruple from 1% in 2024 to average 4% per year out to 2030 globally. For buildings, this translates into efficiency, electrification and end-use investment increasing to around $850bn per year this decade (from $340bn today). For industry, investment must step up from $50bn in 2024 to $125bn per year out to 2030. It is worth noting that our base case scenario already assumes significant energy efficiency gains with world energy demand forecast to grow at 1% per year, half the historic rate of 2% per year.

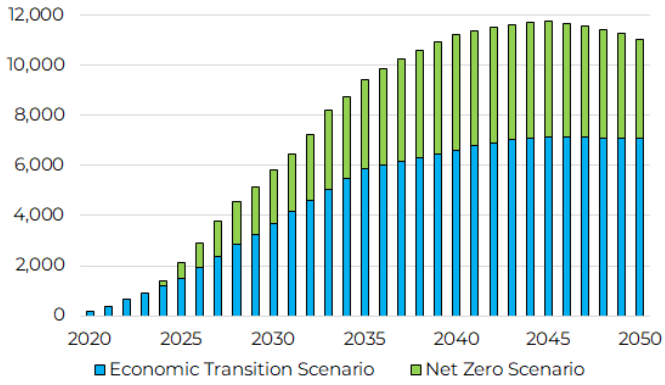
- **Alternative fuel** production growth would need to more than double by 2030 from 2023 levels (implying 11% per year growth) and then double again by 2050. SAF would have to grow from 0.3% of global jet fuel in 2024 to around 10% in 2030 (substantially higher than our base case 2030 estimate of around 2%).

- For **electric vehicles** and **batteries**, BNEF estimate that in a net zero scenario, global EV penetration rates must hit 70% by 2030 with 100% of vehicles sold being electric by 2040 (versus their current 'base case' economic transition estimates of 45% and 73% respectively). This translates into global battery demand of 5.8 TWh in 2030 compared to 1.2 TWh today, almost 60% higher than their base case assumptions, which themselves imply an annual growth rate of 20% per year from current levels.

EV sales penetration forecasts (%)



Lithium-ion battery demand forecasts (GWh)



Source: BNEF, Guinness Global Investors, December 2024

- **Solar** and **wind** generation by 2050 would need to be more than double the levels anticipated under our base case scenario, which already assumes a 4x increase in the wind generation base and a 10x increase in the solar base.

- For **power grids**, net zero would require global grid investment to grow at around 14% per year to the end of the decade, more than doubling from around $370bn today to over $800bn by 2030, 50% higher than our base case estimate.

- Under a net zero scenario, **nuclear** power capacity needs to expand by around 15 GW every year to the end of the decade, reaching 545 GW by 2030. Despite this only constituting 30% growth from current levels, new installations must outpace a wall of retirements from power plants installed in the 1970s and 1980s which are now coming to the end of their useful lives.

- According to McKinsey, annual **investment** on low-emissions technologies would need to increase from about $1.5trn to around $7trn over the next three decades, while annual investment in renewable capacity in 2025-2030 would need to be triple the 2023 levels in order to achieve 16%pa renewable growth required near term to achieve a NZE trajectory.

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The documentation needed to make an investment, including the Prospectus, Supplement, the Key Investor Information Document (KIID), Key Information Document (KID) and the Application Form, is available in English from www.guinnessgi.com or free of charge from the Manager: Waystone Management Company (IE) Limited 2nd Floor 35 Shelbourne Road, Ballsbridge, Dublin DO4 A4E0, Ireland; or the Promoter and Investment Manager: Guinness Asset Management Ltd, 18 Smith Square, London SW1P 3HZ.

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General Enquiries: 0345 922 0044
E-Mail: wtas-investorservices@waystone.com.

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GUINNESS SUSTAINABLE ENERGY UCITS ETF

Documentation
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