



Zero
Carbon
Analytics

Decade of progress for renewable energy as global capacity triples and costs plunge

REPORT DECEMBER 2023

Decade of progress for renewable energy as global capacity triples and costs plunge

REPORT DECEMBER 2023

- Calls to triple global renewable capacity by 2030 have been strengthened in the lead up to COP28. Countries have already shown that a rapid scale up is possible – over half have at least tripled their renewable energy capacity in the past 10 years, and global capacity has tripled between 2014 and 2022.
- Growth is continuing – newly added renewable energy capacity in 2023 is anticipated to jump by up to 50% from 2022 levels, to over 500 GW.
- Since the signing of the Paris Agreement in 2015, global electricity generation from solar PV has increased by over 400%. In the EU, wind and solar generated enough electricity in 2022 to power about 85% of homes in the bloc.
- Since 2020, investment in clean energy has risen 40%, overtaking fossil energy. In the first half of 2023, global new investment in renewables jumped to USD 358 billion – the highest recorded figure for a six month period. In Asia Pacific, funding for renewable energy generation is poised to double to USD 1.3 trillion during the current decade to 2030.
- This investment has massively reduced the cost of clean energy technologies. The cost of solar PV, wind, heat pumps and batteries fell by an average of 80% between 2010 and 2022, despite inflation. The deployment of renewables has also enabled significant cost-savings globally, estimated at USD 521 billion in 2022 alone.
- Sales of electric cars have more than tripled globally in three years, and EVs made up 90% of total car sales in Norway in the second quarter of 2023. Sales of electric scooters and motorbikes in China increased by 77% to almost 35 million between 2015 and 2022.
- The amount of energy storage expected to be added in 2023 alone is equivalent to 94% of total prior global energy storage. This is boosted by developments in the US, where capacity for battery production is on track to exceed domestic demand. Global sales of heat pumps increased by 11% in 2022, marking a second year of double-digit growth and overtaking sales of gas boilers in European countries and the US.

We are at a pivotal moment in our response to climate change. We are off track, but meaningful action is happening, often faster than we think, and momentum is building towards an exponential shift in our energy systems. Some countries are getting ahead of the curve by taking significant steps towards decarbonisation, while at the same time building new industries, creating jobs, reducing dependence on energy imports and insulating consumers from volatile fossil fuel prices. This briefing presents evidence of where and how this is happening.

Policies drive change

Ambitious policies implemented by governments and businesses are driving huge progress in the global transition to clean energy. Net-zero emission pledges currently cover **more than 85% of global energy-related emissions** and nearly 90% of global gross domestic product (GDP), according to the International Energy Agency (IEA). In the last year alone, national plans for new wind and solar energy capacity up to 2050 have jumped by almost 50%, to at least 5,919 gigawatts (GW).¹ Key policies driving change include:

- **The US authorised an estimated USD 738 billion for energy and climate measures** through the **Inflation Reduction Act (IRA)**. Along with the **Bipartisan Infrastructure Law (BIL)**, it represents **the largest ever federal commitment** to modernise and decarbonise the US energy system.
- The **European Green Deal** aims to **restructure the entire EU economy**, to reduce emissions by 55% from 1990 levels by 2030 and reach carbon neutrality by 2050. Renewables supplied **22% of the EU's energy consumption in 2020**, exceeding its **20% target set in 2009**.
- **China is on track to meet its goal of renewables supplying 33% of its electricity consumption by 2025**, including 18% from non-hydro sources. The country also wants at least 50% of new electricity demand to come from renewable sources by 2025.
- **India has committed to reduce its cumulative emissions by one billion tonnes by 2030**. The country plans to increase its renewable energy capacity to 500 GW and supply 50% of its energy needs from renewables, primarily solar and wind, by 2030.
- The **United Arab Emirates (UAE) was the first country in the Middle East to commit to achieving net zero emissions by 2050**, and it plans to invest up to USD 54 billion in renewables over the next seven years to achieve this.
- **Chile has committed to renewables accounting for 70% of its total energy consumption by 2030**. In the last seven years, the share of electricity generated with renewables in the country **increased from 37% to 55%**.
- In **Tanzania, hydropower, wind and solar projects are set to more than double the country's renewable energy share to 54% in 2027 from 25% in 2022**.
- **Egypt has planned major wind farm developments** – including a 10 GW farm in the Gulf of Suez, which will be one of the world's largest – to meet its goal for renewables to **account for 42% of its energy mix by 2030**.

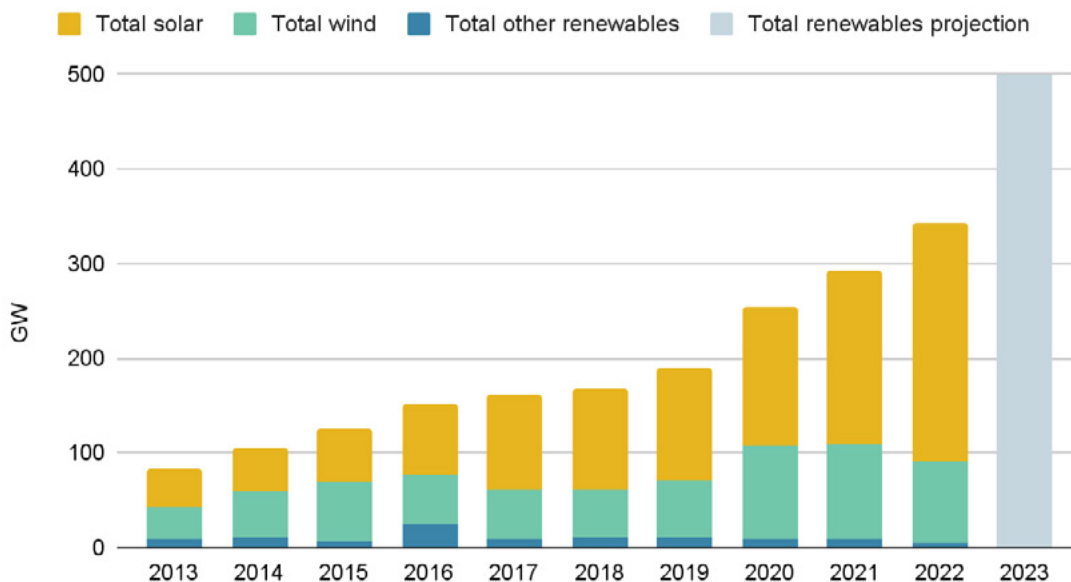
¹: This figure was derived by comparing the projections in the IEA's Announced Policy scenarios in its World Energy Outlook for 2022 and 2023. The 2022 edition projects 12,515 GW new wind and solar capacity between 2022 and 2050, while the 2023 edition projects 18,434 GW of new wind and solar capacity between 2023 and 2050.

Soaring renewable capacity

The International Renewable Energy Agency has called for the [tripling of global renewables capacity by 2030](#) – to reach 11,000 GW – as a vital step towards achieving net zero emissions in 2050. Progress towards this is already underway – globally, installed renewable capacity has tripled over the past nine years, and over half of countries around the world have at least tripled their capacity over the past 10 years.² Analysis by energy think tank Ember finds that 10 countries are [aiming to at least triple their renewable energy capacity by 2030](#). Additionally, 12 countries are deploying renewables faster in 2023 than their 2030 renewable energy target requires, and in 22 countries the amount of prospective solar and wind projects in the pipeline exceeds the capacity needed to meet 2030 renewables targets.

In 2022, capacity additions increased by 16% from 2021, and are set to continue growing by 50% in 2023 to exceed 500 GW. Solar has made up the majority of additions in recent years, comprising 73% of renewable additions in 2022 (Figure 1). Since the signing of the Paris Agreement in 2015, almost one terawatt of solar photovoltaic (PV) capacity has been added worldwide – around the entire installed electricity capacity of the EU. In 2022, 86 GW of wind capacity was added globally, and additions are expected to [exceed 100 GW in 2023](#) for the first time.

Fig. 1: Global renewable energy capacity additions



Source: BNEF Capacity & Generation Interactive Data Set, 2023 and IEA WEO, 2023.³

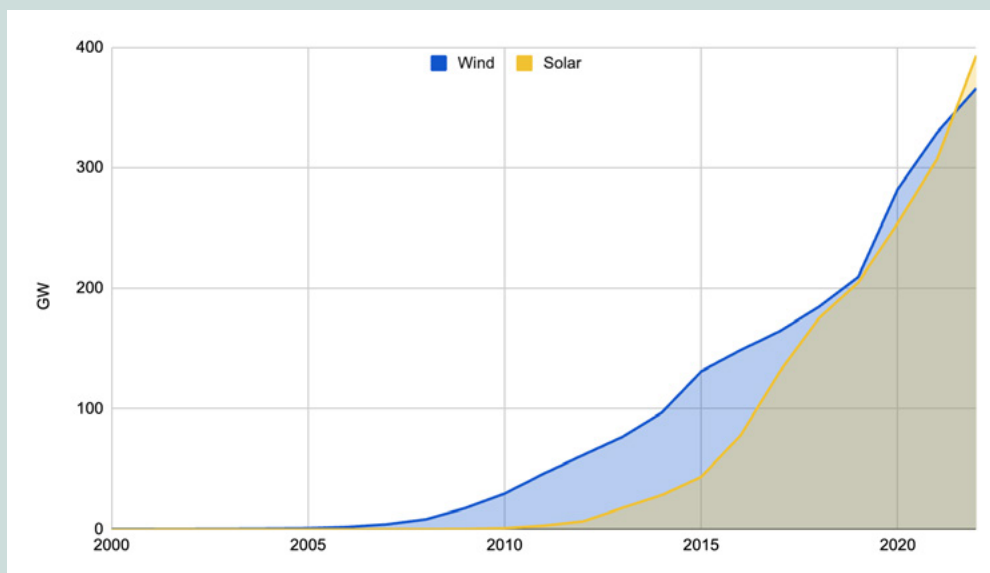
2: This is calculated using data from the BNEF Capacity & Generation Interactive Data Set between 2013 and 2022. Renewables include biomass, waste, geothermal, small hydro and marine.

3: Other renewables include biomass, waste, geothermal, small hydro and marine. Projections for renewable energy generation in 2023 come from the IEA WEO and include hydro, solar, wind, geothermal, biomass and waste.

Country spotlight: China's rapid expansion of wind and solar

China is home to almost 40% of the world's installed capacity of wind and solar and accounted for around half of new additions in 2022. China had the fastest growth in wind and solar deployment globally between 2000 and 2022, doubling its wind capacity about every 1.5 years and its solar capacity about every 2.5 years (Figure 2). The Asian country significantly increased capacity following the Paris Agreement, with wind capacity soaring by about 147% between 2016 and 2022, and solar capacity increasing by about 405%. This exponential growth is expected to continue and accelerate. The country's expansion of renewables led to a 17% reduction in the share of coal power in its electricity generation from 2000 to 2022.

Fig. 2: Wind and solar capacity in China



Source: Ember Electricity Data Explorer, 2023.

Capacity growth in Middle East

Renewable capacity in the Middle East jumped by 11% in 2022 from 2021, the second largest percentage gain of any region that year. Between 2015 and 2022, cumulative installed solar capacity increased 30 times in the region, compared to just 4.6 times globally. Over the same period, wind capacity saw a more modest increase of just over threefold. Oman, Qatar and Lebanon each introduced more renewable capacity in 2022 than they had installed over the previous decade.

The Middle East and North Africa is expected to triple its renewable capacity additions from 2022 to 2027, compared to the previous five years. Oman, for example, has over 18 GW of prospective solar projects announced, in development or construction, dwarfing the 0.3 GW of prospective oil and gas plants.

LatAm market to double

Between 2022 and 2027, BloombergNEF expects the wind and solar market in Latin America to double. Latin America has 319 GW of prospective new renewable energy projects. If all of them are realised, the region would increase its utility-scale solar and wind power capacity by 460% by 2030. Latin America would surpass the renewable goals set by the IEA to reach net-zero emissions by 2030, and the region's electrical capacity from all sources would grow by 70%.

Solar spreads in Africa

Renewables capacity in Africa doubled between 2012 and 2022 to 59 GW, with an average year-on-year growth rate of 8%. As of 2021, around 25% of installed capacity on the continent was renewables-based. Solar energy is the fastest-growing renewable energy resource in Africa, with an average year-on-year growth rate of 89% between 2011 and 2021. Wind energy capacity on the continent has also been steadily increasing over the last decade and is expected to rise by over 900% based on announced projects to date.

Wind displaces coal in EU

Nearly 90 GW of new wind and solar capacity was installed in the EU over 2020 and 2021, and another 60 GW is expected to come online in 2023, displacing around 20% of hard coal and gas-fired electricity generation. Wind capacity grew a record 18% in 2022, largely because of new projects in Sweden, Finland and Poland.

The EU is also rapidly developing its offshore wind industry and had 15,555 MW of capacity in 2022. Almost 50% came from Germany, which ranked third globally in cumulative offshore wind installations. BNEF predicts that offshore wind in Germany will grow exponentially, reaching 41 GW by 2035. France added the most new wind capacity in 2022, after its 480 MW wind project offshore Saint-Nazaire, which can supply enough electricity to power 400,000 homes, came online. The industry is likely to develop faster after new legislation to accelerate offshore wind deployment and improve access to finance is adopted in the EU.

Country spotlight: Solar sets records in US

In the US, 10 GW of new solar and 8 GW of new wind capacity was added in 2022. The US Energy Information Administration projects that 25 GW of solar PV will be added in 2023, and a record 33 GW in 2024. A record 31,679 kW of solar panels were shipped in 2022 – almost double shipments in 2019.⁴ The US government agency also expects 8 GW of new wind power to be added between September 2023 and the end of 2024.

The IEA forecasts that renewable energy capacity in the US will increase by 75% between 2022 and 2027. However, the impact of the IRA will only be seen after 2024, as projects which come online before then will have been developed under the previous tax regime.

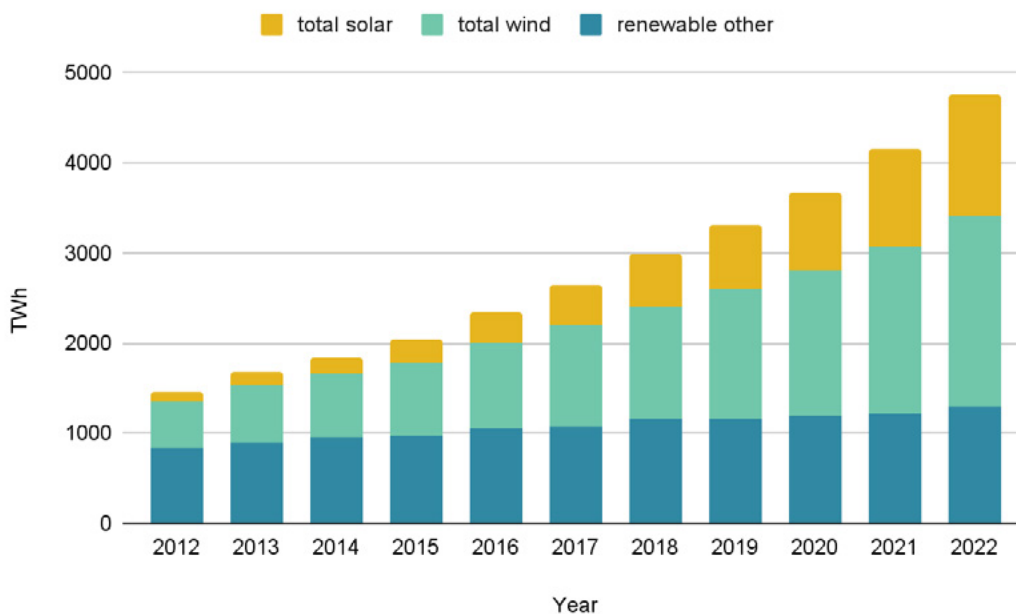
⁴: Solar panel shipments are tracked by the US government as a proxy for installations.

Green generation makes headway

In 2022, the total amount of energy generated from renewables increased by 15% compared to the previous year, due to 608 terawatt hours (TWh) of additional generation (Figure 3). The IEA estimates that renewable capacity will account for 35% of global power generation by 2025. Since 2015, cumulative wind generation has increased by 153% and solar by 412%.

This growth in wind and solar PV generation in 2022 led to the avoidance of 465 metric tons of carbon dioxide equivalent, compared to 2021. Due to renewables making up a larger proportion of the energy supply, electricity is cleaner than it has ever been – the emissions intensity of global electricity generation fell to a record low in 2022.⁵

Fig. 3: Cumulative global renewable energy generation



Source: BNEF Capacity & Generation Interactive Data Set, 2023.

Wind and solar power homes in US

Electricity generation from renewables surpassed both coal and nuclear in the US in 2022, and recent capacity growth means renewables are forecast to provide 22% of US electricity in 2023 and 25% in 2024. Wind generation is expected to increase from 434 TWh in 2022 to 458 TWh in 2024, enough to power more than 43 million households – around 35% of all homes in the US. The growth in solar PV generation is even more impressive, with 144 TWh supplied in 2022 and 233 TWh projected for 2024, an increase of around 61% in only two years.

⁵ Emission intensity of electricity refers to the amount of carbon dioxide emissions per kWh of electricity generated.

The expansion is set to continue. The US Department of Energy estimates that solar electricity generation will increase seven- to eight-fold by 2030 from 2022 levels, and wind will increase two- to three-fold. This growth is mainly driven by tax credit schemes in the IRA which give both project developers and generators certainty about returns on their investments. The US is also investing in battery technology to store excess generation from wind and solar plants.

Country spotlight: Speedy deployment in Uruguay

In the last decade, Uruguay invested over USD 8 billion in renewables, with the result that 98% of its electricity now comes from renewable sources. In 2021, wind and solar generated 47% of the country's electricity, the third highest percentage in the world, with the rest mainly provided by hydropower. Uruguay has achieved the quickest deployment of renewables in the world – increasing wind and solar electricity generation to 35% in 2018 from only 1% in 2013. Large-scale investments in renewables have already paid off for Uruguay, which exported USD 529 million worth of surplus wind and solar electricity to Brazil and Argentina in 2021.

Middle East boosts solar generation

The Middle East has doubled its cumulative solar generation every 1.5 years since 2013. From 2020 to 2021, solar generation grew 27% to 12,710 gigawatt hours (GWh), while cumulative wind generation increased by 12% to 2,374 GWh. In the IEA's Stated Policies Scenario, solar power generation in the Middle East rises ninefold by 2030 and its share of generation rises from 1% to nearly 10%.⁶

Country spotlight: Kenya's geothermal boom

Kenya is the world's eighth-largest producer of geothermal energy and currently has more geothermal capacity under construction than any other country in the world. It will soon become the fourth-largest producer of geothermal energy. Geothermal energy currently accounts for 45% of Kenya's electricity generation. The country is also expanding its use of other renewables, which powered 90% of electricity generation in 2020. The renewable electricity sector in Kenya has grown substantially over the last few years, with a compound annual growth rate of 13% from 2015 to 2020.

6: The Stated Policies Scenario (STEPS) is "a scenario which reflects current policy settings based on a sector-by-sector and country by country assessment of the specific policies that are in place, as well as those that have been announced by governments around the world." STEPS does not include Nationally Determined Contributions (NDCs) – country action plans to cut emissions and adapt to climate impacts.

Renewables could power 85% of EU homes

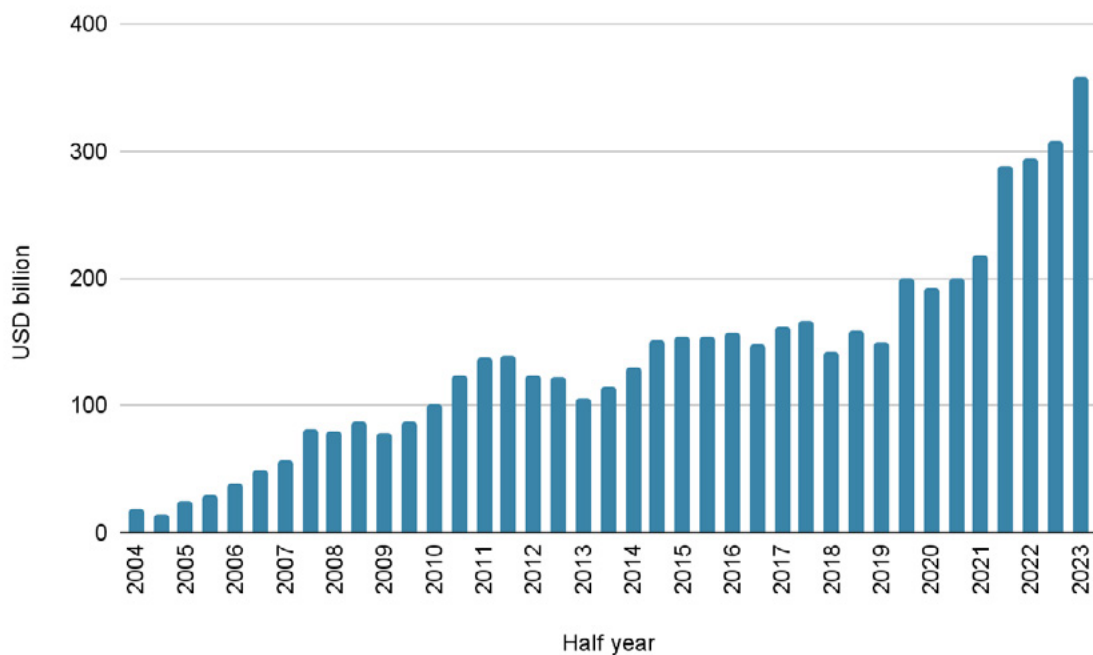
In the EU, wind and solar generated enough electricity in 2022 to power nearly 170 million homes, about 85% of all households.⁷ Solar PV provided 15% of electricity generated from renewables in 2021, and the amount of solar electricity increased by 29% in 2022, preliminary data shows. Wind accounted for 38% of electricity generated from renewable sources in 2021, and the amount of wind-powered electricity increased by nearly 9% in 2022.

7: EU households consumed 747,500 GWh of electricity in total in 2021. There are around 198 million households across the EU, meaning that the average household consumes around 3.7 MWh of electricity. Wind generated 421,264 GWh and solar 205,108 GWh in 2022, a combined total of 626,372 GWh. This means that wind and solar provided enough electricity to power more than 169 million average households.

Green funding outshines fossil fuels

New global investment in renewable energy jumped to USD 358 billion during the first half of 2023 – the highest-ever investment in a six-month period and a 22% rise compared to last year (Figure 4). Since 2020, investment in clean energy has risen 40%, significantly overtaking investment in fossil fuels. While only five years ago, investments were at similar levels, now, for every US dollar invested in fossil energy, USD 1.8 is invested in clean energy, according to the IEA. Additionally, since the Paris Agreement was signed in 2015, investment in fossil fuels has dropped by almost 30%. Investment in renewables is expected to increase further, averaging USD 813 billion per year between 2023 and 2030. Spending on energy research and development also increased by 25% between 2020 and 2022, to over USD 130 billion.

Fig. 4: Half-yearly investment in renewable energy (2004-2023)



Source: BloombergNEF Renewable Energy Investment Tracker, 2H 2023.

Investment in solar is driving this growth. Solar attracted USD 239 billion of funding in the first half of 2023, accounting for two-thirds of total renewable investment and representing a 43% increase from the first half of 2022. Currently, over USD 1 billion is spent on solar deployment every day globally.

While overall wind power has seen a drop in investment over the past year, financing for offshore wind increased by 47% in the first half of 2023, compared to the same period last year. Three times as much investment is going into new offshore wind projects than into new coal and gas-fired power plants, according to the IEA.

Asia finances the future

Asia is leading in renewables investment, accounting for 65% of global funding in 2022. Asia's investments in renewable energy have grown exponentially since 2004, reaching USD 345 billion in 2022, of which around 80% came from China.⁸ Renewables investment on the continent has risen by 23% on average each year. This growth is set to continue, with investments in renewable energy generation in the Asia Pacific (APAC) region poised to double to USD 1.3 trillion during the current decade to 2030, compared to the previous decade. Clean electricity investments have also surpassed fossil electricity investments in almost all countries in the region.

US attracts billions for renewables

The US IRA targets USD 30 billion for renewables, 11 times more than total direct government financing between 2013 and 2020.⁹ Between the passing of the IRA in 2022 and September 2023, private equity firms committed more than USD 100 billion for renewable energy investments eligible for tax credits, potentially resulting in more than 350 GW of new capacity over the next few years.

LatAm defies economic headwinds

In 2022, Latin America invested USD 19.2 billion in renewable energy. This momentum has been building over the past decade, with renewable investment increasing by around 10% each year on average.¹⁰ That amounts to over USD 15 billion of investments each year and almost USD 167 billion over the whole decade.

Investments have mainly been driven by wind and solar, which have seen an average annual increase in funding of 84%. BloombergNEF estimates that investment in the technologies will increase to USD 20 billion in 2023, “defying macroeconomic headwinds including inflation, rising interest rates and slowing GDP growth as pandemic-era stimulus terminates”. Brazil leads the way thanks to small-scale solar PV, which accounted for almost two-thirds of total Latin American renewable investment in 2022.

Independent producers top African investments

Africa holds 60% of the world's best solar resources and the technical potential for solar power on the continent is estimated to be 7,900 GW. Independent power producers are one of the top sources of investment on the continent. Of the private investments in energy during 2010–2020, 86% were directed at renewables in southern Africa, 82% in East Africa and 67% in North Africa. Renewable projects in Africa offer an attractive investment: general project default rates – the

8: Bloomberg refers to the APAC region, which includes countries outside of Asia. Additional research shows that Asia accounts for USD 345 billion of APAC's USD 356 billion investments in renewable energy.

9: Many subsidies in the IRA are not capped, so the ultimate cost depends on the degree to which they are taken up by manufacturers or producers of electricity.

10: Renewable energy includes: wind, solar, small hydro, biomass & waste, biofuels, and geothermal.

percentage of outstanding loans that are unpaid after a prolonged period – [are lower in Africa](#) compared to the rest of the world.

Gulf funds eye wind, solar

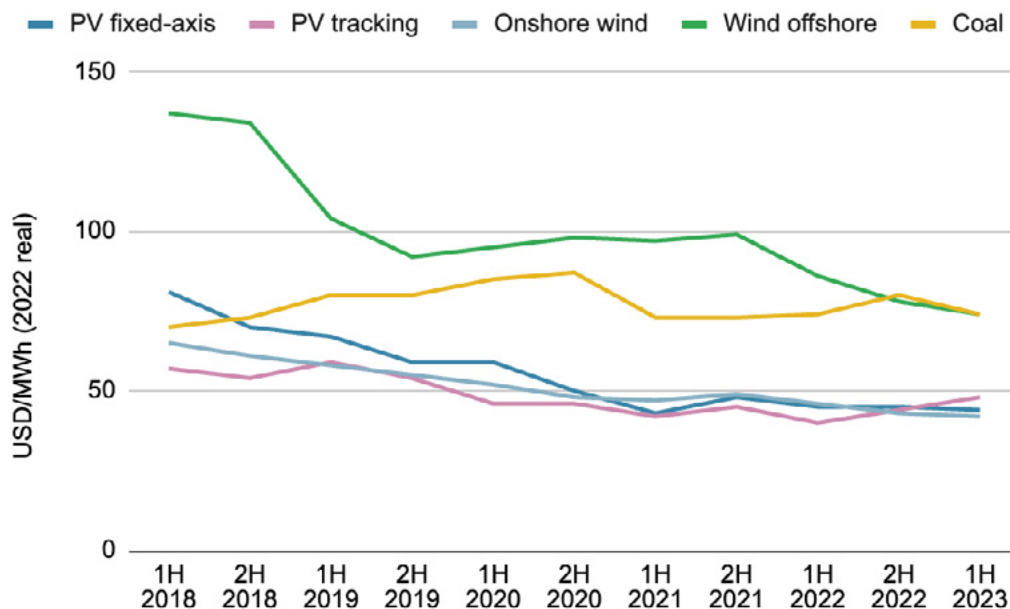
Gulf sovereign wealth funds (SWF), which are government-owned investment funds, collectively oversee USD 3.7 trillion in assets, a figure surpassing the UK's GDP. The top seven funds in the Arabian Gulf alone command about [40% of the world's SWF assets](#).

Gulf SWFs have recently turned their focus to renewables. In 2022, Abu Dhabi-owned SWF Mubadala [acquired a 50% stake in the world's largest private offshore wind energy developer](#) for USD 2.5 billion. Two companies owned by UAE and Saudi Arabian SWFs, Masdar and ACWA Power, act as developers, operators or owners in over [46 GW of prospective utility-scale solar and wind projects across 21 countries in the Global South](#), in addition to 14 GW of projects in their own countries.

Renewable costs drop globally

At the end of 2022, an important tipping point was reached, with renewable energy becoming more cost competitive than fossil fuels globally. While the Levelised Cost of Electricity (LCOE) for onshore wind and solar has been lower than coal since 2018, offshore wind generation is also now cheaper than coal (Figure 5).¹¹ The LCOE for renewable sources, including onshore wind, offshore wind and solar, has decreased by more than 60% over the past 10 years – even without financial support and despite cost inflation. This trend is expected to continue. In 2022 alone, global fossil fuel savings in the electricity sector from renewable power added from 2000 resulted in savings of USD 521 billion.

Fig. 5: Average global cost of energy generation by source (2018-2023)



Source: BloombergNEF LCOE Data Viewer, 2023.

Between 2010 and 2022, the cost of clean energy technologies, such as solar PV, wind, heat pumps and batteries, fell by an average of 80%. Solar PV, for example, cost 710% more than the cheapest fossil fuel-fired energy solutions in 2010 – while in 2022 it cost 29% less.

¹¹ The Levelised Cost of Electricity is the cost of electricity generation over the lifetime of a power plant, based on a calculation of the current value of the costs of building and operating a power plant. It allows a comparison of the costs of different technologies even if they have different fuel costs, life spans, capacities and financial profiles.

Asia drives cost reductions

The adoption of renewable energy in Asia is closely tied to significant [cost reductions](#) over the past few years, driven by technological advancements, economies of scale and more resilient supply chains. China was a [key driver](#) of the global drop in costs for solar PV and onshore wind in 2022. In Asia's electricity sector, renewable power deployment since 2000 led to [about USD 199 billion in fossil fuel cost savings in 2022](#), as renewables faced less price hikes and volatility. Clean electricity investments have also [surpassed fossil electricity investments in almost all countries in the region](#).

Low costs spur solar growth in Middle East

The Middle East's exponential solar PV growth has been driven by low costs. The region has some of the lowest solar PV costs worldwide. Out of the top 20 utility-scale solar PV markets, the UAE and Saudi Arabia saw the [greatest reduction in total installation costs in 2022](#), falling by 62% and 35% respectively. This was driven by the [falling costs of solar panels](#), low labour costs and low taxes. In 2022, the UAE's average total installed costs were 48% below the global average, at USD 568 per kilowatt.

The region [saved around USD 7 billion in electricity costs](#) in 2022 through renewable power generation deployed since 2000. Renewables could help the region protect itself against volatile fossil fuel prices, as well as improving its energy security and diversifying its electricity mix, which is currently dominated by oil and gas.

Mass cost savings in EU

Due to reduced costs, deployment of renewable energy has enabled huge cost-savings. The IEA estimates that [average wholesale electricity prices would be about 15% higher in the EU in 2023](#) if renewable capacity had not been built. New wind and solar capacity has saved the EU around EUR 100 billion since the start of the energy crisis.

Expanded energy access

Energy grids and related infrastructure are a critically important, but often less discussed part of the energy transition. Electricity grids have expanded at a rate of around **1 million km per year** in the past 50 years, enabling drastic improvements in global energy access. However, the IEA estimates that there are still **1,500 GW of new renewables** waiting to be connected globally – five times the amount of solar PV and wind capacity added worldwide last year.

New solutions

In Sub-Saharan Africa, off-grid renewable systems offer a solution to the challenge of limited electricity access, particularly in rural areas where grid expansion is not possible. Stand-alone off-grid solar systems – such as solar lights, home solar systems and mini-grids – have improved access to electricity on the continent. Globally, **70% of investments in the off-grid sector** between 2010 and 2020 went to Africa, totalling USD 1.7 billion. These investments grew at a compound annual growth rate of 83% during this time.

Country spotlight: South Africans take energy security into own hands

The electricity crisis in South Africa, caused by an ageing coal fleet, has resulted in **near-daily scheduled power outages** – known as ‘load shedding’. According to Ember, **South Africans have responded by importing more than 5 GW of solar panels** from China since the beginning of 2022. This is enough to meet around 3% of South Africa’s annual energy demand. Growth is continuing, and imports in the first six months of 2023 increased by 438% compared to the same time last year. Once installed, the energy generated from residential rooftop solar **will exceed the solar energy** the government has procured over the last decade.¹² The power generated from solar panel imports in 2023 at peak production matches **the generation capacity of some of South Africa’s coal-fired plants**.¹³

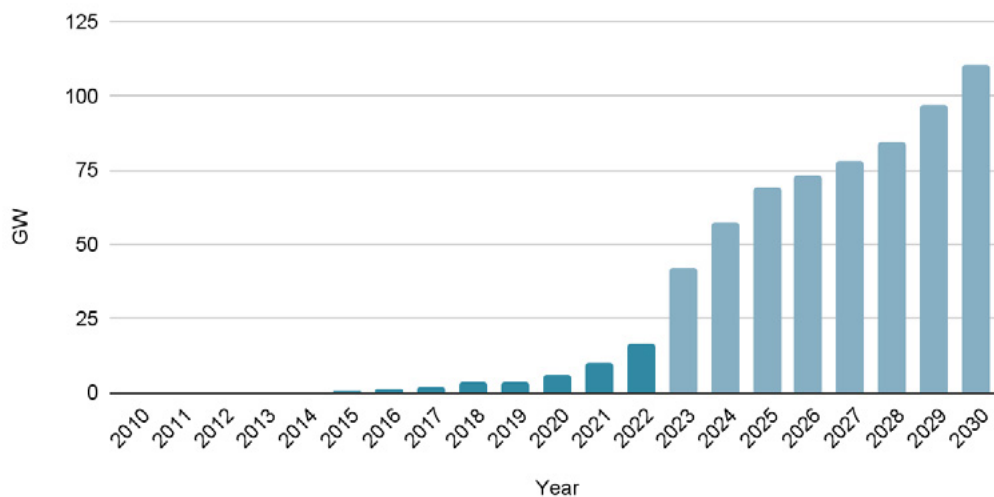
12: Renewable energy in South Africa is procured by the government through independent power producers in the private sector.

13: For example, Eskom’s Duvha or Matla power stations.

Record energy storage

BNEF estimates that a record 42 GW of energy storage will be added in 2023 – making up almost half of total global energy storage (Figure 6). This is spurred by policy developments such as the US IRA, the European Green Deal and China’s commitment to peaking emissions by 2030. Global energy storage additions are expected to increase 27% each year to reach 110 GW in 2030 – equivalent to 2.6 times the expected additions in 2023. By 2030, 15 times more energy storage will be available than 2022.

Fig. 6: Global energy storage capacity additions (projections to 2030)

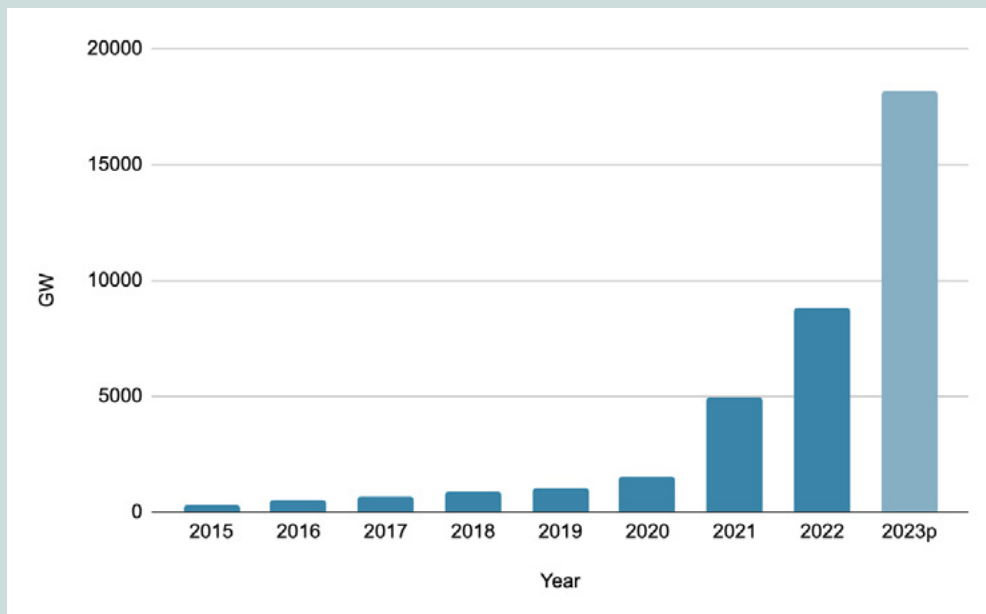


Source: BloombergNEF 2H 2023 Energy Storage Market Outlook, 2023.

Country spotlight: US policy drives battery investments

The emphasis on domestically sourced components in the IRA has led to a surge in announced investments in energy transition technology since the bill was passed.¹⁴ About 65% of the **USD 84 billion in announced investments** will be spent on battery manufacturing, including cell and battery components, while about 19% will be invested in electric vehicle (EV) manufacturing technologies. Batteries play a **vital role in the energy transition**, as they are used in both EVs and stationary energy storage. Battery storage facilitates **the integration of various renewables** in electricity systems, providing flexibility and security of supply in the long term. In the US, new projects currently under construction mean that battery capacity **will more than double in 2023 to 18,200 MW** (Figure 7). The country's capacity for producing battery cells will also **exceed domestic demand** if the announced factories are realised.¹⁵

Fig. 7: Cumulative US battery capacity 2015-2023 (GW)



Source: EIA, 2023.

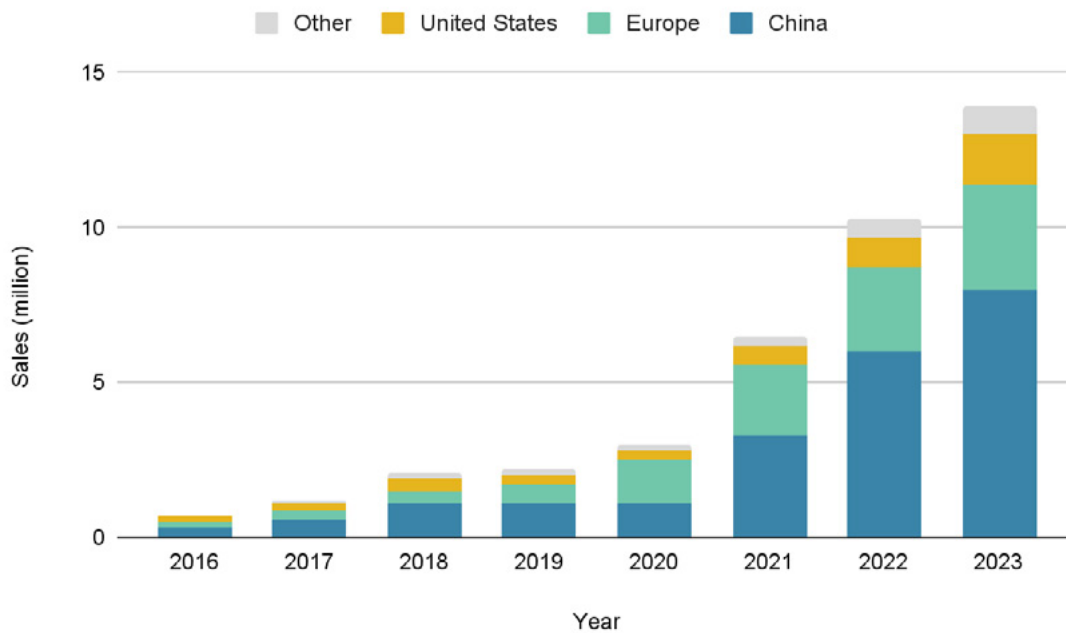
14: The refers to batteries (cathodes, anodes, electrolytes, separators and cells), solar (wafers, cells and modules), battery metal refining and wind (nacelle, blades, towers and gearboxes) as manufacturing technologies for the energy transition.

15: 2030 demand refers to BNEF's forecast for demand, including stationary energy storage and EV segments for batteries.

Electric vehicle sales

Global sales of EVs have more than tripled in three years, exceeding 10 million in 2022. In 2023, one in five cars sold worldwide was electric, up from one in 25 in 2020, according to the IEA. More than 75% of all EVs on roads globally have been sold since 2021 (Figure 8).

Fig. 8: Sales of electric vehicles



Source: IEA, *Electric Vehicles*, 2023.

Electric motorbikes boom in Asia

China is the world's leading exporter of electric two-wheelers, such as scooters and motorbikes. Electric two-wheeler sales increased by 77% to almost 35 million between 2015 and 2022, while the number of electric motorbikes and scooters on Chinese roads rose by 61% to 201 million. The growth is set to continue, with sales expected to increase by 13% to 39 million by 2030, and the number of vehicles expected to grow by 50% to about 301 million.

In India, the government has said that the automotive industry will be key to the country's transition towards cleaner energy, and it is already an important driver of economic growth. India's EV market is projected to grow by 49% from 2022 to 2030, with estimated annual sales of 10 million cars, making it one of the fastest-growing EV markets in the world.¹⁶ In 2021, India was the leading manufacturer of electric two-wheelers, which are set to play a major role in the global EV market. Between 2015 and 2022, sales of electric motorbikes and scooters in India surged by over 3,000% to 760,777. India had 4 million electric two-wheelers on its roads in 2022, with the number expected to grow to 28 million by 2030.

¹⁶: 49% growth is based on the compound annual growth rate.

Surging EV sales in US

In recent years, the US EV market has grown rapidly. Sales of EVs surged by 38% year-on-year in 2021 as the US began to recover from the Covid-19 pandemic, and growth has continued into 2023.¹⁷ In the second quarter of this year, the country achieved record-high sales of over 361,000 passenger EVs – a 49% increase compared to the previous year. Almost 80% were battery electric vehicles (BEVs), highlighting a shift to fully electric cars. Tesla dominated the market, accounting for 48% of BEVs sold. The adoption of the IRA and BIL means zero-emission light duty vehicles will account for **between 49% and 65% of the passenger vehicle market by 2030**. Without the bills, the projected market share is just 29%, demonstrating their potentially transformative effect.¹⁸

Country spotlight: Norway leads Europe's EV adoption

Europe has the **second highest EV sales globally after China**, and sold 784,000 passenger EVs in the second quarter of 2023, a 31% increase YoY.¹⁹ Germany, France and the UK accounted for 51% of total EV sales. However, the Nordic countries have the highest share of EVs, accounting for 90% of total passenger vehicle sales in Norway, 60% in Sweden, and 52% in Finland and Iceland. Norway achieved **rapid adoption of EVs** through a blend of financial incentives and infrastructure, including tax cuts that have made EVs **more cost-effective than traditional vehicles** and an **extensive charging network of over 13,000 EV charging points**.

17: EV sales include BEVs and plug-in hybrid vehicles.

18: According to the US Department of Energy, zero emission light-duty vehicles (ZEVs) include vehicles powered exclusively by electricity or hydrogen. If state agencies are unable to acquire ZEVs, a plug-in hybrid electric vehicle may be purchased instead.

19: The following EV sales data for Europe includes EU27 countries plus Norway, Switzerland, Iceland and the UK.

Heat pump sales surpass gas boilers in US, Europe

Global sales of heat pumps increased by 11% in 2022, marking a second year of double-digit growth, according to the IEA. Sales of gas boilers have been declining and have been overtaken by sales of heat pumps in many countries in Europe and in the US.

Rapid growth in US

Over 17 million US households had heat pumps in 2020, 40% more than in 2015. Sales of air-to-air heat pumps grew by about 11% in 2022, exceeding gas boiler sales for the first time. The US government plans tax credits for heat pump manufacturing and installation, and the US Climate Alliance, made up of 25 bipartisan governors, committed to install a further 20 million heat pumps in their states by 2030. This would quadruple the number of heat pumps, currently 4.8 million, operating in those states.

Record sales in Europe

In Europe, a record 3 million heat pumps were sold in 2022, an increase of 38% from 2021. The total number of heat pumps in operation reached 20 million, leading to the avoidance of 52.5 megatons of carbon dioxide emissions per year, around the annual total of Greece. France, Italy, Germany, Sweden and Poland sold the largest number of heat pumps in 2022.

The EU leads in global electrified heat investments, contributing over 25% of global funding in 2022. Under the EU's RePowerEU plan, which aims to end the bloc's reliance on fossil fuels and speed up the transition to clean energy, 30 million additional heat pumps will be deployed by 2030, taking the EU total to 60 million. Heat pumps can use 50% less electricity than traditional electric heaters, while providing the same level of heat.