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Boosting industry competitiveness

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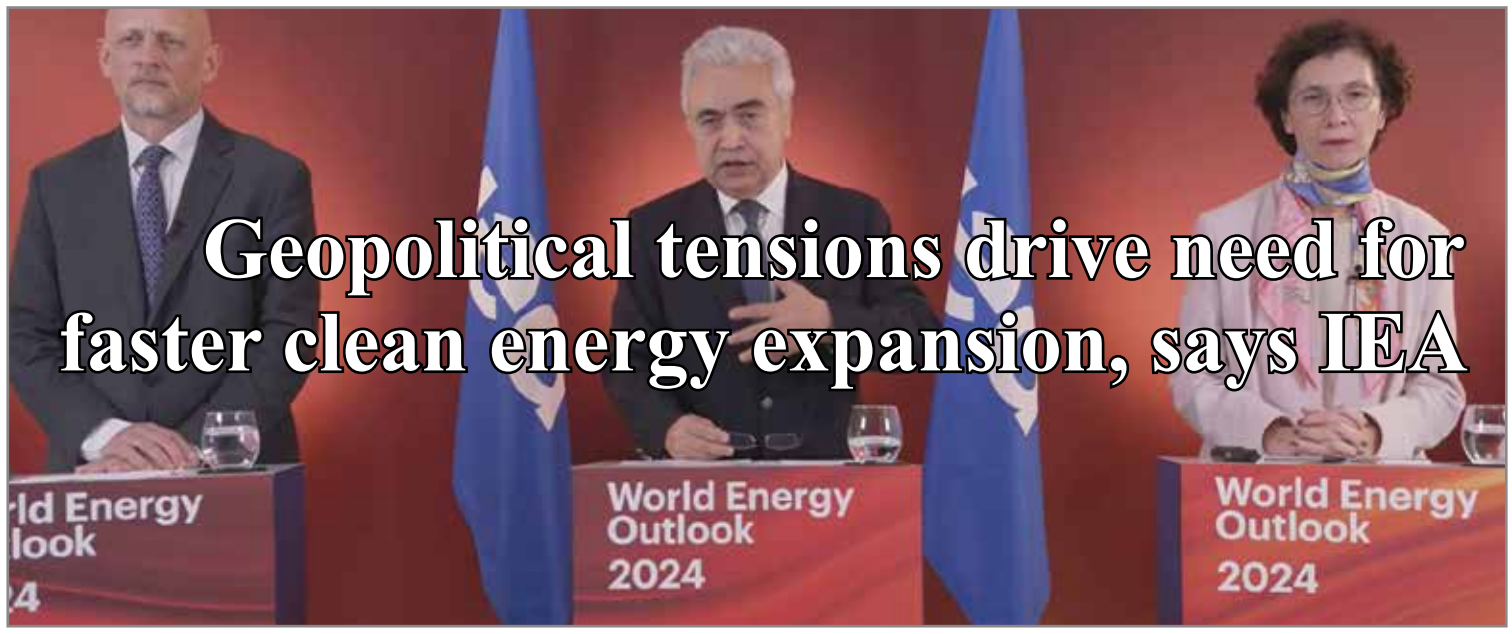

Geopolitical tensions drive need for faster clean energy expansion, says IEA

As the world moves towards the "Age of Electricity", the International Energy Agency's latest World Energy Outlook highlights the risks to energy security and the looming threat of climate change. **Junior Isles**

Regional conflicts and geopolitical strains are highlighting the fragile state of the global energy system, underlining the need for stronger policies and greater investments to accelerate and expand the transition to cleaner and more secure technologies, according to the International Energy Agency's (IEA) new 'World Energy Outlook 2024'.

The latest edition of the Paris-based annual agency's flagship publication examines how shifting market trends, evolving geopolitical uncertainties, emerging technologies, advancing clean energy transitions and growing climate change impacts are changing what it means to have secure energy systems. In particular, the new report underscores that today's geopolitical tensions and fragmentation are creating major risks both for energy security and for global action on reducing greenhouse gas emissions.

The report's projections based on today's policy settings indicate that the world is set to enter "a new energy market context" in the coming years, marked by continued geopolitical hazards but also by relatively abundant supply of multiple fuels and technologies. This includes an overhang of oil and liquefied natural gas (LNG) supply from the second half of the 2020s, alongside a large surplus of manufacturing capacity for some key clean energy technologies, notably solar PV and batteries.

"In the second half of this decade, the prospect of more ample – or even surplus – supplies of oil and natural gas, depending on how geopolitical tensions evolve, would move us into a very different energy world from the one we have experienced in recent years during the global energy crisis," said IEA Executive Director Fatih Birol. "It implies downward pressure on prices, providing some relief for consumers that have been hit hard by price spikes. The breathing space from fuel price pressures can provide policymakers with room to focus on stepping up investments in clean energy transitions and removing inefficient fossil fuel subsidies. This means government policies and consumer choices will have huge consequences for the future of the energy sector and for tackling climate change."

Based on today's policy settings, the report finds that low-emissions sources are set to generate more than half of the world's electricity before 2030 – and demand for all three fossil fuels – coal, oil and gas – is still projected to peak by the end of the decade. Clean energy is entering the energy system at an unprecedented rate, but deployment is far from uniform across technologies and markets.

In this context, the WEO-2024 also shows that the outlines of a new, more electrified energy system are coming into focus as global electricity demand soars. Global electricity demand growth is set to accelerate further in the years ahead, adding the equivalent of Japanese demand to global electricity use each year in a scenario based on today's policy settings – and rising even more quickly in scenarios that

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EU ministers back nuclear in green transition

EU ministers have voiced their support for nuclear energy for the first time as part of the bloc's mandate for the upcoming UN climate summit.

Rifts between France and Germany have held up the discussions over the EU's negotiating stance for the COP29 gathering in Baku, Azerbaijan, but EU countries have now agreed that they should call to accelerate "low-emissions technologies" in line with a deal made at the previous COP28 summit that included nuclear power.

A group of mostly eastern European countries and France also published a paper calling for Brussels to recognise the "pivotal role" of nuclear energy and ensure it is "duly integrated" in new proposals for EU energy regulation.

The text agreed last month sets out the EU's negotiating mandate for the UN climate summit and is intended to establish the EU as one of the most ambitious negotiating parties.

The Dutch and French governments also signed an agreement to increase co-operation on nuclear energy and push for more "institutional support" for nuclear power.

But several EU countries, including Germany, Austria and Denmark, fear that too much focus on nuclear could draw funds away from renewable energy as a cheaper, cleaner and faster way to cut the greenhouse gas emissions behind climate change.

"We see that nuclear has been kept alive by enormous amounts of public money without having an economically viable business model, while at the same time we see renewables costs decrease enormously," said Leonore Gewessler, Austria's climate minister. "Let's put money where the most cost-efficient solution is – and that's renewables."

In a joint communiqué to the European Commission, 12 EU member states said sluggish approval processes must be addressed to advance the transition to greener energy in Europe.

"We need to accelerate the approval procedures to ensure that we can further stimulate the ongoing wave of investment in solar and wind energy," said German Economy and Climate Action Ministry State Secretary Sven Giegold.

Further, Giegold added that the European energy market must be interconnected, "so that in the future everyone can benefit from cheap solar and affordable wind energy". He stated that investments in renewable energy are the backbone of the plan to end Europe's energy dependency on Russia following its invasion of Ukraine.

Minsters also said that the Commission should develop tools for member states to better manage the integration of volatile production from wind and solar.

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meet national and global goals for achieving net zero emissions.

"In previous World Energy Outlooks, the IEA made it clear that the future of the global energy system is electric – and now it is visible to everyone," said Dr Birol. "In energy history, we've witnessed the 'Age of Coal' and the 'Age of Oil' – and we're now moving at speed into the 'Age of Electricity', which will define the global energy system going forward and increasingly be based on clean sources of electricity."

Worryingly, the report finds that despite the ongoing transformation, the world is still off-track in the battle against climate change. Based on today's policy settings, global carbon dioxide emissions are set to peak imminently, but the absence of a sharp decline after that means the world is on course for a rise of 2.4 °C in global average temperatures by the end of the century, well above the Paris Agreement goal of limiting global warming to 1.5°C. The report underlines the inextricable links between risks of energy security and climate change. In many areas of the world, extreme weather events, intensified by decades of high emissions, are already posing profound challenges for the secure and reliable operation of energy systems, including increasingly severe heatwaves, droughts, floods and storms.

To address the evolving energy challenges faced by countries around the world, the IEA is convening an International Summit on the Future of Energy Security in the second quarter of 2025. Hosted by the UK government in London, the summit will assess the existing and emerging risks facing the global energy system, focusing on solutions and opportunities.

Dr Birol: the definition of energy security is evolving

Commenting on the aim of the London Summit, Dr Birol said: "Our core mandate is energy security… [but] the definition of energy security, the threats and risks, are evolving. When the IEA was formed in 1974, oil security was its one and only pre-occupation. Now, as seen two and a half years ago, we went through major challenges with natural gas security. So traditional risks in energy security will be one topic.

"There are also some emerging new challenges. The green energy transition is moving very fast, which means the clean energy supply chain has to be secure. Critical minerals, which are very important for the transition, need to be available to all parties – governments and companies around the world. Extreme weather events are another threat to energy security… So we thank the UK government for its cooperation in organising this international energy security summit and look forward to seeing governments and companies coming together to understand these future energy security challenges."

World is "playing with fire" warns UN chief

- World on course for a temperature increase of 2.6-3.1°C
- Nations must commit to cutting annual greenhouse gas emissions 42 per cent by 2030

Junior Isles

The world is "playing with fire" is the stark warning from the UN following the publication of its latest 'Emissions Gap report'.

The UN Environment Programme (UNEP) 'Emissions Gap Report 2024: No more hot air… please!' finds that a failure to increase ambition in Nationally Determined Contributions (NDCs) would put the world on course for a temperature increase of 2.6-3.1°C over the course of this century, bringing "debilitating impacts to people, planet and economies".

UNEP said that nations must collectively commit to cutting 42 per cent off annual greenhouse gas emissions by 2030 and 57 per cent by 2035 in the next round of NDCs – and back this up with rapid action – or the Paris Agreement's 1.5°C goal will be gone within a few years.

"The emissions gap is not an abstract notion," said António Guterres, UN Secretary-General, in a video message on the report. "There is a direct link between increasing emissions and increasingly frequent and intense climate disasters.

"Today's Emissions Gap report is clear: we're playing with fire; but there can be no more playing for time. We're out of time. Closing the emissions gap means closing the ambition gap, the implementation gap, and the finance gap. Starting at COP29."

Inger Andersen, Executive Director of UNEP, added: "Climate crunch time is here. We need global mobilisation on a scale and pace never seen before – starting right now, before the next round of climate pledges – or the 1.5°C goal will soon be dead, and 'well below 2°C' will take its place in the intensive care unit. I urge every nation: no more hot air, please. Use the upcoming COP29 talks in Baku, Azerbaijan, to increase action now, set the stage for stronger NDCs, and then go all-out to get on a 1.5°C pathway."

A separate report published by DNV two weeks earlier said that emissions are set to almost halve by 2050 but said that this is a long way short of requirements of the Paris Agreement. DNV's Energy Transition Outlook forecasts the planet will warm by 2.2 °C by the end of the century. It also said 2024 will go down as the year of peak energy emission.

The peaking of emissions is largely due to plunging costs of solar and batteries which are accelerating the exit of coal from the energy mix and stunting the growth of oil. Annual solar installations increased 80 per cent last year as it beat coal on cost in many regions. Cheaper batteries, which dropped 14 per cent in cost last year, are also making around the clock delivery of solar power and electric vehicles more affordable.

This trend is accelerating the uptake of renewables beyond developed countries. A new study conducted by energy consultancy RMI revealed that renewables in many emerging markets are now achieving lift-off. Solar and wind power, measured both by energy generated and as a share of total electricity generation, is growing faster in the global south than in the global north.

Over the past five years, renewable energy generation has grown at a compound annual rate of 23 per cent in the global south, versus 11 per cent in the world's richest economies. RMI defines the global south as Africa, Latin America, south and southeast Asia, and excludes China and the major fossil fuel exporters in Eurasia and the Middle East.

Importantly, these findings compare rates of growth, not total generation capacity installed. While the global south is not yet adding more renewable power than rich economies in absolute terms, RMI expects that trend to flip by the end of this decade, largely due to the drastic cost decline in renewable technology.

Overcoming the NDC implementation gap critical to COP29

A ministerial pre-COP29 meeting has concluded that overcoming the Nationally Determined Contributions (NDCs) implementation gap will be critical for the next round of submissions due early next year.

NDCs are at the heart of the Paris Agreement, the legally binding international treaty on climate change adopted at COP21. They outline and communicate countries' post-2020 climate actions and are to be submitted every five years to the UNFCCC secretariat.

The next round, known as NDCs 3.0 are required by February 2025, and are to be informed by the outcome of the first Global Stocktake (GST), which concluded in Dubai last year at COP28.

The GST found that whilst progress has been made towards the Paris Agreement's goals, these efforts are insufficient to meet the long-term goals set out.

Current NDCs are estimated to reduce global emissions by around 8 per cent by 2030 from 2019 levels, far off the 43 per cent needed according to the Intergovernmental Panel on Climate Change (IPCC). They account for around 49 per cent of global emissions, however there is a clear implementation gap, which significantly hinders their efficacy.

NDCs 3.0 may be the last opportunity to put the world on track with a 1.5°C trajectory. They need to be progressive and more ambitious than current NDCs.

A key outcome of COP28 was ambition to triple renewable energy capacity by 2030. The 'Renewables 2024' report, the IEA's flagship annual publication on the sector, finds that the world is set to add more than 5500 GW of new renewable energy capacity between 2024 and 2030 – almost three times the increase seen between 2017 and 2023.

Although impressive, recent research by the International Institute for Sustainable Development (IISD) has revealed that G20 governments are still spending three times as much on fossil fuels as renewables.

To meet a global goal to triple renewable energy capacity by 2030, the International Energy Agency estimates that investment in the sector needs to double from current levels of around $1.1 trillion per year.

Assuming the relationship between public and private investment remains consistent, G20 governments may need to double their financial support to facilitate this.

In the first inventory of its kind, IISD tracked the public financial support G20 governments delivered to renewable power, grids, and storage over the past four years. In 2023, that renewable support was at least $168 billion, compared to an estimated $535 billion in fossil fuel subsidies.

To close the investment gap for renewables, G20 governments can align national targets for renewable deployment with the global tripling pledge, backed by implementation plans, and include those plans in the next round of NDCs.

Current NDCs are estimated to reduce global emissions by around 8 per cent by 2030 from 2019 levels, far off the 43 per cent needed according to the Intergovernmental Panel on Climate Change (IPCC).

EU looks to tighten controls on Russian fossil fuel imports

European governments are looking at fresh measures to reduce imports of Russian fossil fuels to remove the bloc's dependency.

The news came as new data from the Institute for Energy Economics and Financial Analysis (IEEFA) showed that gas imports from Russia increased 11 per cent year-on-year in the first half of 2024, despite EU efforts to wean itself off Russian fossil fuels.

France, along with nine other countries, including Austria and the Czech Republic, circulated a paper ahead of an EU energy ministers' meeting in October calling for the European Commission to require suppliers of Russian liquefied natural gas (LNG) to identify themselves clearly when cargoes are unloaded at EU ports and to improve transparency on the volume of imports.

Some gas suppliers that booked capacity to import Russian LNG at EU ports "are currently not properly identified", the paper said.

French Energy Minister Agnès Pannier-Runacher said that the "highest level of transparency regarding flows of [LNG]" was needed to "remove this dependency".

France, Spain and Belgium accounted for 87 per cent of Europe's Russian LNG imports during that period, with imports to France more than doubling, while those to Belgium decreased 16 per cent, the IEEFA said.

Belgium, which has long called for EU sanctions on Russian LNG, said in a separate paper that it was already working on a mechanism to trace the origin of LNG, "making it possible to track and restrict Russian LNG molecules if necessary".

Sven Giegold, Germany's state secretary for economic affairs and climate action, said that it was "worrying" to see the uptick in Russian fuel imports and that the commission should present "a road map… to bring imports from Russia in all fuels down to zero".

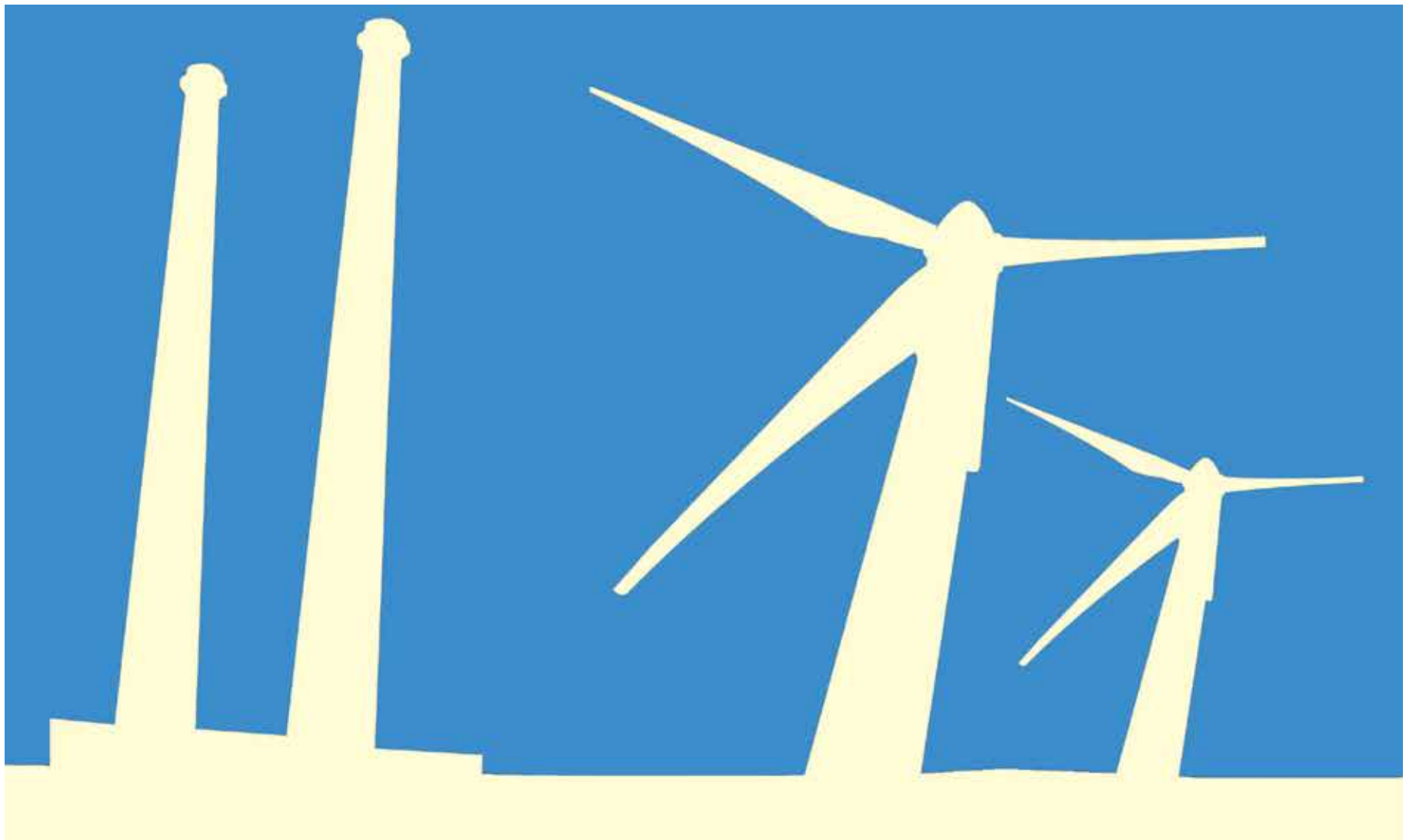
The concern comes after the EU took a first step towards restricting Russian LNG by placing sanctions on transshipments – re-exports of Russian fuel to third countries – from EU ports in June.

Meanwhile, last month Ukraine's Prime Minister Denys Shmyhal confirmed Kyiv would not renew a transit contract between Naftogaz, Ukraine's energy company, and Russia's Gazprom that expires at the end of this year.

Mario Holzner, Director of the Vienna Institute for International Economic Studies, a think-tank, said: "Europe will start the winter with its gas storage [units] pretty much full, but a cut-off by Ukraine would clearly create more of a problem for the landlocked countries of central Europe."

EU countries increased gas consumption by 3.3 per cent year-on-year in September, despite a 13 per cent fall in gas consumption in the electricity generation sector, according to a report by the Gas Exporting Countries Forum (GECF).

- In late October, European gas prices climbed to their highest level of the year, as a production outage in key supplier Norway exacerbated market concerns over tensions in the Middle East.



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Halt on US Clean Power Plan may have wider implications

Renewables show fastest growth but shale is here to stay

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Data centre operators boost new nuclear businesses

- Google, Amazon, Microsoft look to nuclear
- US government offers development funding

Janet Wood

Recent announcements by tech companies around investment in new nuclear power units, as they rush to source low-carbon sources for energy-hungry data centres, have boosted the nuclear industry.

Google announced orders for 'six to seven' small modular reactors (SMRs) from California-based Kairos Power. Google said it has partnered with the company to "pioneer a transformative approach to clean energy", saying it is aiming to power its AI-driven data centres using SMRs by 2030.

Amazon announced several nuclear initiatives recently. It signed an agreement to pay for the development of an SMR, as Dominion Energy explores building one at its North Anna nuclear power site in Virginia. Amazon also announced an agreement with Energy Northwest to invest in building an SMR in the state of Washington.

"There's a ton that we need to do between here and there, and there's a lot of work that needs to go into this, but this is a really important milestone that we're celebrating today," Matt Garman, Chief Executive of Amazon Web Services, said at the announcement.

Amazon will also invest in X-energy, which said recently that Amazon had agreed to anchor a $500 million fundraising to help it finance the development and licensing of its SMR technology, to support over 5 GW of nuclear projects. X-energy did not disclose the size of the stake Amazon had bought but said the technology group would take two seats on the company's board of directors.

Garman said: "Nuclear is a safe source of carbon-free energy that can help power our operations and meet the growing demands of our customers, while helping us progress toward our Climate Pledge commitment to be net zero carbon across our operations by 2040."

Microsoft announced recently that it had signed a 20-year power supply deal with Constellation Energy, which will lead to the reopening of the Three Mile Island nuclear plant in Pennsylvania.

The raft of announcements lifted nuclear company share prices across the market. The share prices of US-listed SMR developers Oklo Inc and NuScale Power rose 99 per cent and 37 per cent, respectively. Shares in Constellation, which operates the largest fleet of conventional reactors in the US, have more than doubled since the start of the year.

Meanwhile, applications are due in January for up to $900 million to support the domestic deployment of SMRs, the US Department of Energy said recently.

"Next-generation nuclear energy will play an important role in building the clean power sector of the future," John Podesta, Senior Advisor to the President for International Climate Policy, said in a statement.

US gas fired generation grows as coal production and use shrinks

Gas fired generation is growing in the USA, with the total up nearly 5 per cent on 2023, and at the highest since at least 2021.

Evergy, Inc recently announced plans for two new 705 MW combined cycle natural gas plants in Kansas, expected to begin operating in 2029 and 2030.

David Campbell, Evergy Chairman, President and Chief Executive Officer said: "Dispatchable natural gas is an important resource within Evergy's growing and diverse energy portfolio, complementing our planned investment in wind and solar resources and supporting our commitment to affordable, reliable and sustainable electricity."

The US Energy Information Administration said recently that average US construction costs for gas fired electricity generators decreased 11 per cent year-on-year, while solar and wind costs had remained steady. The EIA separately said that coal's share of US electricity generation is expected to shrink to an all-time low at 16.1 per cent in 2024, due to lower utilisation rates and ongoing capacity retirements.

The EIA also said US coal production was expected to fall 14.2 per cent between 2023 and 2004, and it was projected to fall another 5 per cent in 2025.

EIT said: "With US coal production falling more quickly than coal consumption, we expect that coal will be consumed from inventories next year."

Cuba restores power after blackout but supplies are rationed

Cuba has returned its electricity system to operation from a so-called 'black start' – a total collapse of the national energy system.

The collapse was caused by a breakdown at the Antonio Guiteras power plant and it took four days for Cuban engineers to return the system to operation. State-owned power company Cuban Electric Union (UNE), under the management of the Ministry of Energy and Mines, announced that the national electricity system was synchronised days after the blackout.

During the blackout, UNE said it had used distributed generation to provide power to some areas. It said that in some provinces such as Pinar del Río, Artemisa, Havana, Mayabeque, Las Tunas and Holguín most users had already had electricity restored.

The ministry's General Director of Electricity, Lázaro Guerra, warned on Cuban state television that the resynchronisation does not imply that there will be stable electricity flow and that the blackouts will be overcome, because of longstanding limitations in generating capacity.

"There is not going to be generation capacity for the demand," Guerra explained, adding that UNE will have to return to "manage the loads because not all the demand can be supplied".

The energy shortages experienced by Cubans include blackouts of up to eight hours a day in some places.

Brazil's wind generators lead call for grid expansion

- On and offshore wind projects face grid barriers
- Hydrogen support framework signed into law

Janet Wood

The Brazilian wind energy sector has demanded that the government invests in expanding the country's electricity network, saying that it expects losses of up to $184 million this year due to grid constraints. The constraint coincides with severe drought, which has reduced the energy available from hydroelectric resources.

Francisco Silva, Technical Regulatory Director of the Brazilian Wind Energy Association, warned that "transmission is a huge problem, it's a bottleneck". The wind sector currently supplies around 15 per cent of Brazil's energy. The sector is planning large scale expansion, especially in offshore wind, where Silva said 270 GW of projects need to be "unlocked", but it is also waiting for Congress to approve a regulatory framework for the development of offshore plants.

One advance came from the Ocean Winds consortium (which includes Engie and EDP), which recently signed an agreement with Brazil's Electrobras to explore offshore wind opportunities. In a statement Ocean Winds said Brazil was a strategic market, due to its "significant potential" to meet the country's need for renewable energy.

The company has already registered its interest with the Brazilian Institute for the Environment and Renewable Natural Resources (IBAMA) to develop up to 15 GW in Rio de Janeiro, Piauí, Rio Grande do Norte and Rio Grande do Sul.

Leonardo Soares Walter, from Electrobras, said his company will "allocate its capital appropriately to develop clean energy projects, contributing to the energy transition in Brazil and the world". The company already sources 97 per cent of its energy from renewable sources and wants to sell its thermal power plants to reach 100 per cent renewables.

Meanwhile President Luiz Inácio Lula da Silva has signed a new law that provides tax credits for producing and buying green hydrogen in Brazil. Congress has already passed a bill to create a Low Carbon Hydrogen Development Programme, but the President had vetoed the sections that created the tax incentives, on the grounds of financial and budgetary problems.

A second bill was required to provide tax credits between 2028 and 2032, if the hydrogen is made from renewable energy. The support will be allocated via by a competitive procedure to be defined at a later date.

"The passing of this law is a fundamental step towards strengthening the green hydrogen market in Brazil. We have the opportunity to lead the production and export of this essential energy vector for the global energy transition," said Fernanda Delgado, Executive Director of the Brazilian Green Hydrogen Industry Association.

US Supreme Court declines to halt new carbon emissions rule

The US Supreme Court has rejected "emergency applications" aiming to place a stay on a new rule from the Environmental Protection Agency (EPA) that limits carbon emissions from power plants. Utilities and generators asked for the stay while the rule is being contested in another court.

Under the new rule, issued in April, coal fired and new gas fired power plants will be required to meet a carbon dioxide emissions standard equal to installing a carbon capture and storage (CCS) system and running it at 90 per cent. Rule compliance begins in 2032 for all plants that will operate beyond 2039.

Michelle Bloodworth, President and CEO of America's Power said that her company considers the new rules to be an illegal overreach, one that would "undermine the reliability of the electrical grid".

Bloodworth said: "By forcing the premature retirement of coal plants, the EPA would reduce needed sources of electricity at the same time electricity demand is exploding."

Some utilities supported the new rule and Keri Powell, Senior Attorney and Leader of Sothern Environmental Law Centre's Air Program said: "We are encouraged by the Court's decision to block attempts to undermine EPA's limits on harmful air pollution and the benefits for public health, a shift toward cleaner energy options, and action to address the climate crisis that come with it."

Southeast Asia's role in global energy system set to grow strongly

- Electricity demand set to grow at annual rate of 4 per cent
- Clean energy projected to meet more than a third of energy demand growth by 2035

Southeast Asia's role in the global energy system is set to grow strongly over the next decade, according to a new International Energy Agency report, posing challenges for the region's energy security and efforts to achieve national climate goals.

As rapid economic, population and manufacturing expansions drive up consumption, the region, based on today's policy settings, the region is on course to account for 25 per cent of global energy demand growth between now and 2035, second only to India over the period and more than double the region's share of growth since 2010. By mid-century, energy demand in Southeast Asia overtakes that of the European Union.

Growth is led by the electricity sector. Electricity demand in Southeast Asia is set to grow at an annual rate of 4 per cent, the report projects, with growing use of air conditioning amid more frequent heatwaves being a big driver of increased electricity consumption.

According to the report, clean energy sources such as wind and solar, alongside modern bioenergy and geothermal, are projected to meet more than a third of the growth in energy demand in the region by 2035. This is a step-up compared with the past but not enough to rein in the region's energy-related carbon dioxide emissions, which are set to increase by 35 per cent between now and mid-century.

To turn this around, a major push is required to align with the outcomes of the COP28 climate change conference and meet the national goals that have been set in the region, all of which would mean halving today's emissions by 2050, the report finds. Today, of the 10 member economies of the Association of Southeast Asian Nations (ASEAN), which are among the world's fastest growing, eight have net zero emissions goals.

"Southeast Asia is one of the most economically dynamic regions of the world and is set to account for a quarter of the growth in global energy demand over the next decade as its population, prosperity and industries expand," said IEA Executive Director Fatih Birol. "Countries in the region have a diverse mix of energy sources including highly competitive renewables. But clean energy technologies are not expanding quickly enough and the continued heavy reliance on fossil fuel imports is leaving countries highly exposed to future risks. Southeast Asia has made great progress on issues such as energy access, clean cooking and developing clean energy manufacturing, but now it must ramp up efforts to deploy those technologies at home. Access to finance and investment for the region's fast-growing economies will play a pivotal role in strengthening their energy security and delivering on their emissions reduction goals."

Scaling up clean energy investments is crucial for Southeast Asia to reduce emissions, the report highlights. The current level of investment will require a five-fold increase – with $190 billion needed in 2035 – to put the region on a pathway consistent with achieving its announced energy and climate goals.

Scaling up clean energy investment needs to be accompanied by strategies to reduce emissions from the region's relatively young fleet of coal fired plants, which are less than 15 years old on average.

India will see strong near-term clean energy growth

The Indian government has said that its wind energy sector is expected to add 4.5 to 5 GW of capacity this year, with potential annual installations reaching 10 GW starting in 2026. This growth comes despite headwinds including land acquisition issues, transmission infrastructure limitations, and a shortage of skilled labour.

The National Institute of Wind Energy estimates that India has over 1100 GW of wind energy potential, of which only 47 GW has been harnessed. This indicates substantial room for growth, even with slight reductions in wind speed at certain sites.

"Our goal is to achieve 100 GW of wind power by 2030, and we are confident we can reach it," said Lalit Bohra, Joint Secretary of the Union Ministry of New and Renewable Energy (MNRE), at the Windergy India 2024 conference.

The country's green energy goals were boosted last month with news that Tamil Nadu will add 30 GW of renewable energy capacity in the next six years.

Speaking on the sidelines of the conference, Aneesh Sekhar, Managing Director, Tamil Nadu Green Energy Corporation Ltd, commented: "Wind energy will play a big role in the State's energy transition. The MNRE has estimated Tamil Nadu's wind potential to be 75 GW. We have an offshore wind potential of 35 GW."

Sekhar said the key to energy transition is execution. He also said the state had come out with a re-powering policy for the wind sector, noting that the state received five proposals for repowering and is expecting more.

"We are expecting about 1400 MW of projects to come up for re-powering initially. The challenge to be addressed is the infirm nature of wind energy and storage is one option which is being looked at to make it a firm power," he added.

Philippines may rely on coal as gas reserves shrink

The Philippines could use more coal in the next few years as gas fired power generation declines due to the depletion of Malampaya's gas reserves, according to UK-based think-tank BMI Country Risk and Industry Research, a Fitch Solutions company, said coal-fired power is expected to peak at 60 per cent of the country's power mix by 2025.

The think-tank noted that the depletion of the Malampaya gas reserves will make it difficult to supply the expected 343.51 per cent increase in natural gas consumption between 2022 and 2033.

"As the market deals with the depletion of gas reserves over [the] short-term, we expect the ramping up of coal fired power generation to be the likely solution to make up for the shortfall in gas fired power generation," BMI said.

"This will result in coal fired power generation's share of the power mix to peak at above 60 per cent for 2023 to 2025, before dropping below 60 per cent for the years after 2025," it added.

BMI noted that the Philippines was self-sufficient in natural gas until 2022. But in 2023 the country has become reliant on liquefied natural gas (LNG) imports.

However, BMI said gas fired power generation is expected to recover due to LNG imports. These imports will be fuelled by the completion of two LNG terminals last year.

BMI noted that while the government is looking to diversify its power mix into other power types, such as the emergence of nuclear and offshore wind, these only have the potential to address energy security concerns in the longer term.

In October Manila Electric Co. (Meralco) formed a partnership with Doosan Enerbility Co. Ltd. to launch several initiatives, including looking into the possible revival of the Bataan Nuclear Power Plant (BNPP).

The announcement came just two days after the Philippines and South Korea had inked an agreement to pursue a feasibility study about the mothballed facility.

Australia boosts plan for capacity investment scheme

The next two tenders under Australia's Capacity Investment Scheme (CIS) will be for 4 GW of dispatchable power and 6 GW of renewable generation – up from original plans for 2 GW of dispatchable renewable power and 4 GW of renewable energy generation.

Chris Bowen, Australia's Minister for Climate Change and Energy said the 10 GW of total new energy will be tendered over the coming months and delivered by December 2029. The CIS aims to deliver an additional 32 GW of capacity by 2030.

Bowen said that the scheme is working better than he thought it would, noting that a 600 MW pilot auction for batteries in Victoria and South Australia was massively oversubscribed. Furthermore, the first national tender for 6 GW of variable generation had 40 GW of bids registered.

"We are yet to award the winners of this auction, but I have received advice from my department that the quality of the projects is very strong," he said.

"Accordingly, I am pleased to announce that we have decided to make the next round of auctions bigger than originally envisaged to get more of these high-quality projects connected to the grid more quickly."

China produces world's largest offshore turbine

A 26 MW offshore wind turbine has been rolled off the production line by China's Dongfang Electric Corporation (DEC) in Fuzhou, Fujian Province.

With a hub centre at 185 m high and a rotor diameter of over 310 m, the wind turbine is the world's largest in both capacity and size.

With average wind speeds of 10 m/s, a single unit could generate 100 GWh of clean energy annually, enough to power 55 000 homes, said DEC.

China is already home to the world's largest operating offshore wind turbine. In August it turned on a 20 MW turbine installed by Mingyang Smart Energy in the South China Sea province of Hainan.

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Europe's hydrogen investment takes in transport and production assets

- Germany sets out network plan
- Terms of hydrogen auction published

Janet Wood

Several EU countries have outlined plans that will boost the outlook for hydrogen use in the bloc.

Last month German regulators approved the construction of a nationwide network of hydrogen pipelines just two and a half years after the network was proposed. Some sections are to be completed by 2032.

Vice Chancellor Robert Habeck said: "Today, the hydrogen core network has been decided. It is not yet finished – but it will now be built." Total project costs are forecast at €19.8 billion, which will be borne largely by the private sector.

The Association of Transmission System Operators said the new network should be able to transport up to 278 TWh hours of energy annually – the equivalent to a third of German demand.

In the UK, meanwhile, National Gas Transmission said it is working on a project, which will support the National Transmission System (NTS) to transition to hydrogen. Alistair Carvell, Hydrogen Innovation Engineer at National Gas said recently: "Our goal is to ensure that we are ready for hydrogen, hydrogen blends and carbon in Great Britain's National Transmission System."

Meanwhile, the European Commission (EC) has published the final terms and conditions for its second renewable hydrogen auction, introducing new resilience requirements that are aimed at "achieving security of supply of essential goods and contribution to Europe's industrial leadership and competitiveness."

The €1.2-billion auction, set to start in December, has a new resilience requirement, which says projects should "contribute to a diversified supply chain and avoid building dependency on a single third country which may threaten the security of supply of electrolysers". Proposed projects must reach financial close within 2.5 years after signing the grant agreement and begin operation within five years.

In Portugal the government has approved subsidies totalling €83 million to December 2025 for 22 green hydrogen production projects. The projects, part of the hydrogen and renewables component of the Recovery and Resilience Plan (PRR), "contribute to the goals of carbon neutrality in Europe and promote the energy transition by encouraging companies to produce hydrogen and other gases from renewable sources", said Laura Dominguez, senior consultant at FI Group.

The Ministry of the Environment and Energy approved the 22 applications through its Environmental Fund. Minister Maria da Graça Carvalho said the decision is "creating the conditions to put the country at the forefront of this sector", and this investment represents "an important step towards decarbonising the Portuguese economy".

Norway plans floating wind support while UK organisations set out opportunity

The Norwegian government has proposed to offer €3 billion in support for its first commercial floating offshore wind tender, in the Vestavind F and Vestavind B areas.

"Norway has an enormous potential for floating offshore wind on its continental shelf, but because the technology remains immature and costly, state support is required to accelerate its development," said Norway's Minister of Petroleum and Energy, Terje Aasland.

The news comes as a UK report, 'Floating Wind: Anchoring the next generation offshore', urges the government to invest in ports and other floating wind infrastructure to gain a headstart in the global floating wind energy industry by 2050. It says that by 2050, floating turbines could reach 40 GW in UK waters, and the cost of building floating projects could fall by 30 per cent by 2030 to under £100/MWh.

A recent report from RenewableUK puts the current global pipeline of floating offshore wind projects at 266 GW, compared with 244 GW last year. The number of projects has increased globally during that time from 285 to 316, while 245 MW of floating wind are fully operational across 15 projects in seven countries. Norway has the most with 94 MW across three projects and the UK is second with 78 MW in two projects.

SMRs attract interest from Czech and UK governments

The Czech government has signalled continuing interest in investing in small modular nuclear reactors (SMRs), following recent decisions that will take forward large nuclear units at the Dukovany site and Temelín.

The Ministry of Industry and Trade (MPO) believes the SMR option will modernise the Czech energy sector and open up new opportunities for domestic industry. The ČEZ Group wants to cooperate with Rolls-Royce SMR in the development and construction of this technology and to enter a strategic partnership with it.

Prime Minister Petr Fiala said a strategic partnership between ČEZ and Rolls-Royce SMR would "be a great opportunity for Czech companies with longstanding experience in the nuclear industry".

ČEZ is also investigating other sites suitable for the construction of other small modular reactors. Two named sites, Tušimice and Dětmarovice, are undergoing exploration and monitoring work to see whether they are suitable for the location of a nuclear power plant.

The UK government has meanwhile picked four companies to proceed to the next stage of negotiations for support to develop SMRs. Rolls-Royce, Holtec Britain, GE Hitachi and Westinghouse Electric, will be invited to enter negotiations for government support.

Meanwhile UK ministers have made contingency arrangements to fund the Sizewell C large-scale nuclear power project in case a final agreement with potential private investors is delayed, officials have admitted. A new £5.5 billion subsidy would kick-in if there is no agreement with private sector investors until mid-2026.

UK starts network reforms to deliver 'clean energy mission'

- 'Zombie' projects removed from connections queue
- Regulator promises fast action to deliver HVDC links

Janet Wood

The UK government has tasked the country's new National Energy System Operator (NESO) to set out a strategic spatial energy plan (SSEP), indicating where new energy assets will be built, to help speed up the transition to clean power and provide long-term certainty to investors. The first iteration of the SSEP will be published in 2026.

The SSEP is part of the new Labour government's so-called 'clean energy mission'. The government has set a 2030 target to run the electricity system using clean energy and recently the country closed its last coal fired power station, but the 2030 deadline remains a challenge.

Alice Delahunty, President of UK electricity transmission National Grid, said there was an "awful lot more to do" to meet the ambition. "I think it's an incredibly stretching target," she said. "If it went perfectly along current regimes, it wouldn't get there. So, it needs to go perfectly along reformed regimes."

Ed Miliband, Energy Secretary, has taken steps to support clean energy developers, including approving large solar farms and increasing the budget for offshore wind subsidy support, and pledged to remove barriers to building clean energy infrastructure.

Reforms to the network regime have begun and recently electricity network operators have removed 10 GW of so-called "zombie" projects in the connections queue, according to new figures from the Energy Networks Association.

ENA's Strategic Connections Group, made up of network operators and industry partners, is dedicated to accelerating the speed of grid connections. It has prioritised practical reforms and is advocating strategic changes to the UK's planning processes to make grid connections even faster.

Lawrence Slade, Chief Executive of Energy Networks Association, said: "Removing these stalled schemes is a necessary step to make the UK's grid connection process faster but it's just one part of the solution and work must continue at pace."

Meanwhile, the regulator has sped up its approval process for large network projects designed to reconfigure the network to maximise use of renewables. A groundbreaking celebration was held recently for the UK's single largest electricity transmission project, a £4.3 billion 2 GW high voltage direct current (HVDC) subsea link from Peterhead in Scotland to Drax in England, delivered as a joint venture by National Grid Electricity Transmission and SSEN Transmission.

Akshay Kaul, Ofgem Director General for Infrastructure Group, said: "We're standing here two years earlier than we might have been thanks to Ofgem's fast track new process which cuts red tape to get consumers across the country connected to renewable energy more quickly."

The project is the first of four planned subsea links between Scotland and England.

Energy groups call for pan-European action to increase storage

Europe must implement a comprehensive Action Plan on Energy Storage if it is to meet its energy goals, the Energy Storage Coalition has said. It has called on the European Commission to take action.

The Energy Storage Coalition – formed by SolarPower Europe, The European Association for Storage of Energy, WindEurope and Breakthrough Energy – made the call as the EU enters a new five-year term. It says energy storage is also vital to address the bloc's critical challenges in strengthening global competitiveness and securing energy supplies.

Doriana Forleo, Executive Director at the Energy Storage Coalition said: "The success of the energy transition depends on energy storage and renewables working together. The reform of the Electricity Market Design is a great step forward, but we need clear regulatory guidance and targeted incentives to unlock the full potential of energy storage across the EU."

The call comes as the UK government announced plans for a new support regime for long duration energy storage. Several technologies including pumped hydro and newer technologies such as compressed air, have been slow to roll-out because of their high capital cost. The proposed 'cap and floor' scheme, based on a similar regime used to bring forward interconnectors, would give chosen projects a guaranteed return underwritten by customers, but limit profit from peaking prices.

Azerbaijan opens up to China on green energy cooperation

Chinese energy company TBEA is the latest to have initiated discussions with Azerbaijan on possible cooperation in renewable energy equipment manufacturing, technology supply, and participation in regional infrastructure projects.

The Azeri energy ministry is considering a memorandum of understanding with TBEA, and cooperation could be developed within the framework of the imminent COP29 climate summit, to be held in Azerbaijan's capital city, Baku.

Azeri Energy Minister Parviz Shahbazov also met with the Vice President of PowerChina International Group, Yang Yisheng. PowerChina is already involved in the 240 MW Khizi-Absheron wind farm and the auction process for a 100 MW solar power project in Gobustan.

A recent report by research and intelligence company Rystad Energy expects Azerbaijan's renewable-based power generation (including hydropower) to more than triple from 7 per cent of overall generation last year to 22 per cent by 2030.

In an effort to reduce its domestic carbon footprint and free-up natural gas for export, Azerbaijan is planning $2 billion worth of investments in green energy initiatives.

"International investors have shown significant interest in funding these projects, and the country is looking to solidify these commitments through its role as host of COP29 in November," a Rystad analyst said. "More renewables at home will help the country meet its target of doubling its gas exports to Europe by 2027 and allow it to add green hydrogen production as part of its long-term energy strategy."

Renewable energy already represents nearly 20 per cent of new installed capacity in Azerbaijan, Rystad said, and is set to increase to 38 per cent by 2030. "At the same time, the country will continue to push for more fossil-fuel investment to meet both its export ambitions and rising domestic demand," the analyst added.

Gas fired power will remain the baseload, contributing more than 75 per cent of overall power generation in 2030 and remaining a transitional fuel in the long term, according to Rystad.

South Africa weighs up IPP procurement options

- Government to launch new procurement drive
- Calls for better regulatory and grid connection processes

Nadia Weekes

Conversations are intensifying at the heart of South Africa's government as ministers debate the details of the next phase of the Independent Power Producer (IPP) Programme.

Electricity and Energy Minister, Kgosientsho Ramokgopa, is expected to unveil proposals in November that should boost South Africa's efforts to procure 10 GW of renewable energy capacity.

Ramokgopa said that creating clear procurement pathways would restore the long-term policy certainty needed for IPPs, their financial backers, and the broader supply chain.

The energy landscape is at a critical juncture, as it grapples with not only generation capacity but also substantial industrialisation opportunities in the renewable energy sector.

According to Segemotso Scheepers, Head of the National Transmission Company of South Africa (NTCSA), significant lead times exist for important equipment like large transformers, which can take up to 36 months to deliver. This underlines the urgency for clear procurement strategies.

Since August 2011, the IPP Office has procured more than 8 GW of capacity that is now operational or under construction across 107 projects. Only 18 per cent of the required investment has come from international investors.

The IPP Programme has already resulted in dramatic reductions in energy costs, which have fallen by more than 70 per cent for wind energy and 90 per cent for solar.

To further streamline the bidding process, the ministry convened meetings with stakeholders, aiming to review past bid windows and address reservations that have previously hindered progress.

Proposed reforms may include efforts by Eskom to reduce timelines for grid connection cost estimates, and the finalisation of the curtailment framework that could unlock significant solar capacity in areas currently considered under-connected.

Brian Day, Chairman of the South African Independent Power Producer Association, suggested that grid connection and other regulatory approvals for renewable energy projects should be processed in parallel to reduce risks and speed up project implementation.

Ramokgopa also indicated that South Africa might look to international models, such as Saudi Arabia's solar parks, aiming to concentrate power generation projects in locations with strong grid access.

African countries eye new fossil fuel project lender

A coalition of oil-producing African countries is seeking $5 billion to launch an "energy bank" that would fund projects on the continent, as frustration grows over the reluctance of western institutions to bankroll fossil fuel initiatives because of environmental concerns.

The 18-member African Petroleum Producers' Organization hopes the lender can begin operating in early 2025, according to Haytham El Maayergi, Executive Vice-President of global trade at the African Export-Import Bank, a partner in the project.

Africa's oil producers have encountered funding restrictions from traditional western backers, including multilateral institutions whose rules increasingly bar them from oil and gas investing. The World Bank stopped financing upstream oil and gas projects in 2019 while the African Development Bank does not put money into fossil fuel projects.

El Maayergi insisted that "Africa's context is totally different" as its resources had not been fully developed and it had made only a minimal contribution to climate change. He also said that other projects such as electricity infrastructure also needed funding.

The African Energy Chamber, an advocacy group, has argued that Africa has the "sovereign right" to develop its natural resources, including oil and gas, in a "balanced and sustainable" manner.

The 18 countries in the Africa Energy Bank project, which include Nigeria, Angola and Libya, are each being asked to contribute $83 million, raising almost $1.5 billion. This would be matched by the African Export-Import Bank.

The remainder of the funds will be sought from other sources including Gulf states, banks and other institutions, sovereign wealth funds, cash-rich traders and international banks interested in taking an equity stake.

Petroleum ministers in the consortium are expected to meet in November to finalise plans for the new energy bank that will be headquartered in Nigeria's capital, Abuja.

Installed CCS capacity to double amid global collaboration

- Carbon reduction goals boost global CCS momentum
- European projects "delayed and expensive"

The latest report from the Global CCS Institute reveals significant momentum for the carbon capture and storage (CCS) technology as governments and industry around the world strive to slash greenhouse gas emissions.

With 628 projects across all stages of development, CCS project activities continue to display strong growth. Global CO_2 capture capacity is on track to double to over 100 million tonnes per year (Mtpa) of CO_2, once facilities currently under construction commence operation.

The Americas continue to lead the world in CCS facility deployment, catalysed by sustained policy support and funding incentives: 27 projects are in operation, and 18 are commencing construction across the US, Brazil and Canada.

Across Asia, storage hubs and cross-border CCS projects are a dominant trend, as nations with limited geological storage resources explore opportunities for nations with large storage resources to store their CO_2.

Across Europe, 191 projects are at various stages of development, including five in operation and 10 under construction. Across the Middle East and Africa, CCS project development has evolved from application in enhanced oil recovery to industrial decarbonisation and low-carbon fuel development.

Meanwhile, new research from the Institute for Energy Economics and Financial Analysis (IEEFA) has found that most of Europe's planned CCS applications are struggling to advance and are too expensive to work on a commercial basis.

Given CCS's technical immaturity and the problems that have plagued operational projects, the report warns that the technology's already prohibitive cost is likely to remain high, if not increase, in the near-term. IEEFA estimates the total cost of Europe's planned 200 CCS projects will be €520 billion.

While financial incentives in the form of reduced emissions trading system payments could cover about three-quarters of project costs, the remainder will need to be shouldered by governments.

The proposed timelines of European CCS projects are over-optimistic, the report said. About 90 will need to be operational by 2030 across the EU and the UK for both to meet their carbon capture targets. Currently, there are three operational CCS projects in the EU and none in the UK.

Natural gas demand picks up in 2024, says IEA

Global demand for natural gas is increasing at a stronger rate in 2024 than in the previous two years, but supplies remain limited due to the relatively slow growth of LNG production and lingering geopolitical tensions, the IEA has warned in its latest report on global gas markets and security.

Expected to rise by more than 2.5 per cent both this year and next, global gas demand is growing particularly fast in Asia. A rebound in Europe's industrial gas demand is also contributing to growth, even though it remains well below its pre-crisis levels.

"The balance between demand and supply trends is fragile, with clear risks of future volatility," said IEA Director of Energy Markets and Security Keisuke Sadamori. "Producers and consumers must work together closely to navigate these uncertain times while taking into account the need to advance clean energy transitions to ensure a secure and sustainable future."

Energy transition puts oil and gas majors on different paths

- BP looks to sell stake in wind business
- Equinor deepens commitment to offshore wind

Junior Isles

Oil and gas companies are taking different approaches on how to adapt their businesses to the global shift to clean energy.

Last month, in another move that indicates a further pull-back from renewables, BP announced that it is considering selling a minority stake in its offshore wind energy business.

According to a *Reuters* report, BP has teamed up with Bank of America to find partners for the deal, so that the company can reduce its share in terms of the investments that need to be made to develop projects in this area. The news agency stressed that BP still intends to develop projects in the offshore wind area.

BP's CEO Murray Auchincloss said the company is eyeing major investments in the Middle East and the Gulf of Mexico to boost BP's oil output. A BP spokesman said: "As Murray said at the start of the year in our fourth quarter results, the direction is the same – but we are going to deliver as a simpler, more focused and higher value company."

The news comes after the company faced pressure from shareholders regarding the strategy it was adopting in response to the energy transition, when profits from renewables were falling and oil and gas margins were rising.

BP, which is developing offshore wind farms in the UK, US, Germany, South Korea and Japan, is seeking to reduce its share of the huge investments needed to fund wind farm projects. It has previously said it plans to sell its US onshore wind business and this summer put plans for new offshore wind investment on hold.

Amid the challenges of the energy transition, BP has been investing in biofuels and solar energy in Brazil but is still betting on hydrocarbons in the country.

Although the likes of Shell, Chevron and ExxonMobil have doubled down on oil and gas to an even greater extent, not all of the international energy majors have taken the same approach.

Last month Norway's state-controlled oil and gas company Equinor bought a 10 per cent stake in Denmark's Ørsted, becoming the second-largest shareholder in the world's biggest offshore wind farm developer behind the Danish government.

Biraj Borkhataria, head of global energy transition research at RBC, said the stake gave Equinor access to offshore wind assets "without the risk on construction and delivery, as well as supply chains".

Anders Opedal, Equinor's Chief Executive, said: "The offshore wind industry is currently facing a set of challenges, but we remain confident in the long term outlook for the sector, and the crucial role offshore wind will play in the energy transition."

Meanwhile, last month Total Energies announced that it was intensifying its push into electricity generation, with a target of producing more than 100 TWh by 2030.

In 2024 TotalEnergies said it plans to complete its integrated power model in key deregulated markets this year, solidifying its strategic positioning for future growth.

"Our focus on renewables and flexible power generation is central to our strategy of long-term growth and sustainability," said Patrick Pouyanné, CEO of TotalEnergies. "By leveraging our integrated power model in deregulated markets, we are positioning ourselves to be a leader in the energy transition."

Unlike TotalEnergies, most oil and gas companies have not yet fully embraced the global energy transition. According to recent analysis by climate campaign group Uplift, only seven of 87 companies operating in the UK North Sea oil and gas sector are projected to invest in renewable energy by 2030.

Iberdrola increases UK investment as it achieves record profits

Iberdrola is to double its investment in the UK. The news came as the Spanish electricity giant reported record profits through September.

In late October the company revealed that net profits for the first nine months soared 50 per cent to €5.471 billion. In addition, operating profit (EBITDA) increased from January to September by 23 per cent compared to a year ago, reaching €13 269 million.

For the full year, Iberdrola expects that after the good performance up to the third quarter of the year, it will be able to close the year with a profit of €5500 million, which would represent an improvement of 14 per cent compared to last year.

The figures are attributed to record investments in the US and the UK.

Just prior to the financial report, Iberdrola revealed plans to more than double its UK investment plans for the next four-year period. The company announced that through its ScottishPower business, it would increase investment in the country from £12 billion to £24 billion for the period. After the Electricity North West (ENW) integration announced this summer, the UK has already become the Group's largest investment destination to 2026.

Iberdrola's made its announcement just ahead of the UK's International Investment Summit in London in mid-October.

UK Prime Minister Keir Starmer said: "Working people up and down the country will reap the benefits of Iberdrola's crucial investments in our green energy sector. Iberdrola choosing the UK as its largest location for investment is a major boost for our economy, and a clear vote of confidence in this government's ambitious clean energy mission and relentless drive for growth."

Iberdrola Executive Chairman Ignacio Galán added: "After having invested more than £30 billion in the last 15 years, the clear policy direction, stable regulatory frameworks and overall attractiveness of the UK are leading us to double our investments for 2024-28, reaching up to £24 billion.

In October the group also signed a €120 million loan with EIB for the development of energy innovation projects in Spain. The innovation project will cover the generation and integration of renewable energy, the digitalisation of distribution networks and the development of self-consumption and electric mobility solutions for customers.

Masdar outlines plan to become biggest renewable group

Masdar, the Middle East's biggest renewable energy company, has outlined plans to lift its wind and solar capacity to 100 GW by the end of the decade, which would make it one of the world's biggest renewable energy groups.

The group, part-owned by Adnoc, the state oil group, Taqa, the state water and power business, and sovereign investment fund Mubadala, has already announced nearly €6.5 billion of deals in Spain and Greece this year.

At the start of October, it bought a 50 per cent stake in Terra-Gen, one of the largest renewable independent renewable energy producers in the US. In the UK it has a 49 per cent stake in the £11 billion Dogger Bank South project, which will be one of the world's largest offshore wind farms when construction is finished.

Mohamed Jameel Al Ramahi, Chief Executive, said the company will continue to invest significantly in the Middle East, Europe and the US, the world's second-largest renewable energy market after China.

Al Ramahi said in an interview with the *Financial Times:* "By 2030, the Middle East will probably be 30 to 35 per cent of our power. Europe, I would say 20 per cent. Also 20 to 25 per cent in the US, and then of course Asia. That is the distribution in terms of geography."

Wind mars solid Q3 performance for GE Vernova

GE Vernova lost $99 million during the third quarter of the year as its offshore wind business continued to drag down the company's financial results.

The US energy equipment manufacturer actually made $8.9 billion in revenue during the quarter. But expenses related to its spin-off from General Electric Co. earlier this year and the costs of major lay-offs at its wind operations led to hundreds of millions of dollars in extra expenses during the quarter, resulting in the quarterly loss.

Commenting on the results, GE Vernova CEO Scott Strazik, said: "GE Vernova had a solid third quarter, delivering double-digit orders and continued revenue growth with services strength across all segments. We continued to leverage lean to drive operational improvements across safety, quality, delivery and cost."

GE Vernova said it delivered a solid third quarter, with adjusted EBITDA climbing to $243 million from $205 million a year ago, and confirmed its 2024 financial guidance.

At the wind segment, however, earnings before interest, tax, depreciation and amortisation (EBITDA) worsened to negative $317 million from negative $225 million. This was mainly due to incremental contract losses of around $700 million in Offshore Wind, partially offset by a gain of around $300 million on the settlement of a cancelled offshore project, along with increases at Onshore Wind.

The company now plans to cut around 150 offshore wind-related jobs at its 300 staff-strong hub in Barcelona, according to Spanish trade union CCOO.

The layoff is part of GE Vernova's restructuring plan for the offshore wind division, which will result in the elimination of 900 jobs, with 750 of them being in Europe, CCOO said.

Meanwhile, the company's gas segment has performed well. It reported new orders for gas turbines doubled to 14 GW on surging power demand.

"We're going from a chapter where customers were sustaining their gas fleet to a chapter where they're investing in their gas fleet," Strazik told the *FT*. "They need every megawatt more we can give them."

GE Vernova expects to deliver 70-80 gas turbines per year starting in 2026, up from an average of 55 turbines.

Americas

Avangrid capacity contract for Maine

Avangrid, part of the Iberdrola Group, won a contract from the US Department of Energy for a $425 million capacity contract for its Aroostook Renewable Project. The announcement comes as the Maine Public Utilities Commission (MPUC) prepares to issue a transmission line Request for Proposals to connect 1200 MW of renewable energy to the New England power grid in Maine.

The generation portion is being solicited by the MPUC separately. Avangrid intends to participate in the transmission line RFP process and will include the capacity contract as part of the company's proposal.

Construction of this high-voltage line is intended to relieve transmission constraints that have stalled the development of renewable resources in Northern Maine.

Repowering 137 MW of US wind farms

Exus Management Partners has awarded a 137 MW contract to Vestas Wind Systems for two repowering projects in the USA.

The contract covers the Highland North and Highland Cambria repowering projects in Pennsylvania, for which Vestas will supply V120-2.2 MW turbines. Delivery of the turbines will take place in Q4 2025, with commissioning planned for Q1 2026. The order also includes a 20-year service agreement.

Nordex wins Canadian orders for 500 MW

Nordex has announced that it has received orders for 74 N163 turbines with 500 MW capacity from an undisclosed party in Canada. The financial terms of the transaction have also not been disclosed.

The orders include a premium service for the maintenance of the turbines between 15 and 30 years. Nordex will supply the machines during the period from 2025 to 2026.

HALEU as fuel for US advanced reactors

The US Department of Energy (DOE) has awarded a contract to Framatome to develop High-Assay Low-Enriched Uranium (HALEU) fuel for advanced nuclear power reactors.

The DOE contract is for a 10-year period of performance to provide deconversion services for HALEU production for new domestic capacity in support of the mission of nuclear energy. Deconversion services include the design, licensing and construction of production facilities and the production of oxide and metal HALEU product.

Framatome is working closely with nuclear reactor developers and the DOE to ensure the supply chain establishment of HALEU meets their needs at this critical time in nuclear energy progress.

Asia-Pacific

MHI to supply MOX fuel assemblies

Mitsubishi Heavy Industries (MHI) has won an order from Kyushu Electric Power to supply MOX fuel assemblies for Unit 3 of the Genkai nuclear power station in Japan.

Under the terms of the contract, MHI will design the MOX fuel and have components such as cladding tubes manufactured by Mitsubishi Nuclear Fuel. These will be supplied to Orano, which will fabricate 40 MOX fuel assemblies at its MELOX plant in France.

MOU for S. Korea floating offshore wind farm

Doosan Enerbility, Siemens Gamesa Renewable Energy, and Equinor have signed an MOU on cooperation for the 750 MW Ulsan Bandibuli Floating Offshore Wind Farm. The project is located off the coast of Ulsan, South Korea.

Siemens Gamesa will be deploying a 14 MW large-size wind turbine, and Doosan Enerbility will assemble the nacelles.

Seungwoo Sohn, CEO of Doosan Enerbility's Power Services Business Group, said: "With the signing of this MOU, we will be able to further solidify the partnership between the three companies and by continuously engaging in collaborations, we expect to contribute to the promotion of Korea's offshore wind power ecosystem."

Jindal awards Suzlon 400 MW wind order

Jindal Renewables has placed a 400 MW order through JSP Green Wind 1 with Suzlon. It said that the project is the largest commercial and industrial wind energy order in India.

The project will be located in Koppal region in Karnataka, India. The power generated will be used for captive consumption at steel plants in Chhattisgarh and Odisha.

Suzlon will install 127 wind turbine generators, each with a rated capacity of 3.15 MW, using hybrid lattice tubular towers.

GE Vernova H-class GTs to repower Nanko station

GE Vernova has won an order for three 7HA.03 gas turbines to be installed at Kansai Electric's Nanko power station in Osaka, Japan. These turbines will replace the existing aging conventional LNG power generation assets and are expected to increase power plant efficiency and reduce its CO_2 emissions.

Ramesh Singaram, President and CEO, Asia of GE Vernova's Gas Power, said: "The plant is expected to deliver up to 1.8 GW to the grid in total and to be the among the most efficient in the country. In addition, 7HA.03 gas turbine technology currently has the capability to burn up to 50 per cent by volume of hydrogen when blended with natural gas, with a technology pathway to 100 per cent over the next decade."

Toshiba ST for Indonesian geothermal plant

PT Inti Karya Persada Tehnik (IKPT), a subsidiary of Toyo Engineering, and EPC contractor for the expansion of the Wayang Windu Geothermal Power Plant Unit 3 in West Java, Indonesia has awarded Toshiba Energy Systems with an order to supply a steam turbine and a generator.

This is the first time Toshiba will supply equipment for a geothermal plant operated by Star Energy Group, Indonesia's largest geothermal power producer.

Europe

Renewable diesel back-up for Finnish data centre

Verne's data centres in Helsinki, Pori and Tampere in Finland will use Neste MY Renewable Diesel to power back-up generators. The switch from fossil diesel to renewable diesel will help Verne reduce the greenhouse gas emissions from their backup generators by on average 90 per cent over the lifecycle of the fuel.

Neste MY Renewable Diesel is made from 100 per cent renewable raw materials, such as animal fat from food industry waste and used cooking oil. Having a similar chemical composition to fossil diesel, Neste's renewable diesel enables Verne to make the switch without any modifications to its generator infrastructure.

SPIE selected for Thor termination and testing

SPIE Global Services Energy, a subsidiary of SPIE, announced that its wind power high-voltage entity Correll has won a contract from Jan De Nul to complete the 66 kV (IAC) termination and testing on 72 wind turbine generators for RWE's Thor Offshore Wind Farm, which will have a capacity in excess of 1 GW when complete.

Work is due to commence in July 2025 with the mock-up scheduled for November 2024. Offshore installation and commissioning of the cable system are expected in 2025.

Jan De Nul was awarded the EPCI cable contracts by RWE in consortium with Hellenic Cables and will provide the entire cable package.

Thor Offshore Wind Farm will be constructed in the Danish North Sea, approximately 22 km off the coast of Thorsminde on the west coast of Jutland.

66 MW order for Nordex in Scotland

Nordex will supply twelve N149/5.X turbines for the construction of a new 66 MW onshore wind farm for Capital Dynamics. The order also includes a Premium Service contract for the turbines over 30 years.

The Douglas West Extension is being built about 40 km southeast of Glasgow in a rural region in South Lanarkshire.

Nordex will supply and install the wind turbines on tubular steel towers with a hub height of 125 m from summer 2025.

Framatome and ČEZ sign MoU on VVER-1000 fuel

Framatome has signed a Memorandum of Understanding (MoU) with ČEZ regarding Framatome's own-design VVER-1000 fuel development programme.

Nineteen VVER reactors are currently in operation in the European Union, including four VVER 1000 MW reactors in the Czech Republic and Bulgaria, and 15 VVER 440 MW reactors in the Czech Republic, Finland, Hungary and Slovakia. The international context has accelerated the need for a Framatome sovereign VVER fuel design to reduce the risk of interruption in the supply of critical services and to reduce dependency on imports from outside of Europe.

NKT signs framework agreement for Dutch grid

Dutch distribution system operator Enexis has entered into a long-term framework agreement with NKT to deliver medium-voltage power cables.

Over the next eight years, Enexis Netbeheer intends to lay several thousand kilometres of underground power cables to expand the power grid in the Dutch provinces of Groningen, Drenthe, Overijssel, Brabant and Limburg to prepare for an increasing amount of renewable energy.

The framework agreement will secure supply of the necessary medium-voltage power cables. NKT will deliver approximately 600 km of power cables per year over the next eight years. The framework agreement includes an option to extend for an additional four years.

International

GE Vernova wind turbines for Boulder

GE Vernova has signed an agreement with Aula Energy and CS Energy to provide 38.6 MW-164 m turbines for the Boulder Creek Wind Farm in Queensland, Australia. The project is located 40 km southwest of Rockhampton. The deal includes a five-year full-service agreement.

Site preparatory works at the Boulder Creek Wind Farm are expected to commence before the end of 2024, with activity aiming to ramp-up from early to mid-2025, and operations anticipated to commence in 2027.

Two new solar plants in NSW and Queensland

The Australian Government has approved two solar power projects with a combined generating capacity of 800 MW. The projects are the 450 MW Goulburn River Solar Park in New South Wales and the 350 MW Sixteen Mile Solar Project near Chinchilla in Queensland.

The 450 MW Goulburn River Solar Park is located near Merriwa between the Central-West Orana Renewable Energy Zone (REZ) and the Hunter Central Coast REZ and will have direct access to the existing transmission network. The project will include construction of 1 million solar panels, a battery energy storage system (BESS) and local road upgrades.

The 350 MW Sixteen Mile Solar Project comprises over 570 000 solar panels and a 120 MW BESS. It is planned to connect it to the existing Western Downs Substation.

Wärtsilä renews O&M agreement for Ndola

Wärtsilä has signed a renewal of its O&M agreement for a 105 MW hydropower plant owned by the IPP Ndola Energy Company Ltd (NECL) in Zambia. By ensuring the reliability and availability of the plant, NECL can meet its Power Purchase Agreement PPA obligations with Zambia's utility, ZESCO.

The plant operates with six Wärtsilä 32 engines and six Wärtsilä 32 twin turbochargers. Hydropower is the main source of electricity in Zambia. However, the country is facing a powe rshortage due to a drought that has impacted hydropower generation. The NECL plant is therefore important for maintaining a reliable electricity supply.

Inverters for 50 MW Australian BESS project

Gamesa Electric will supply battery inverters for Australian energy and metals group Fortescue to use in a 50 MW/250 MWh battery energy storage system (BESS) project in Western Australia. Known as the North Star Junction BESS, the project will utilise 12 Gamesa Electric Proteus PCS-E units. Gamesa Electric will supply the inverters in plug-and-play configuration in six PCS stations, including transformers and MV equipment.

The project will be located 145 km south of Port Hedland, in Western Australia's Pilbara region. It is part of Fortescue's plan to achieve Real Zero Scope 1 and 2 emissions across its Australian terrestrial iron ore operations by 2030.

Hydrogen

Germany gets serious about switch to hydrogen

Germany is prepared to invest nearly €19 billion that will establish a hydrogen transmission system throughout the country with a network of pipelines covering a total of more than 9000 km that will move the pollution-free fuel all over the country and connect with other sources.

Gary Lakes

The Bundesnetzagentur (the Federal Network Agency of Germany) has approved the hydrogen core network that was proposed by the country's gas system operators. Approval of the network shows that Berlin is keen to move forward with the energy transition and put hydrogen into practical use throughout Germany's economic sectors.

As much as €18.9 billion will be invested into creating a 9040 km pipeline system that is meant to come into full operation by 2032 through step-by-step construction. The first sections of the network will begin working in 2025. About 40 per cent of the pipelines will be new-built and the remaining 60 per cent will consist of gas pipelines converted to transport hydrogen.

"The approval for the hydrogen core network gives the network operators the go-ahead to gradually set up and operate the infrastructure for hydrogen," Klaus Muller, President of the Bundesnetzagentur, said in a statement announcing the approval.

"The first pipelines will be converted starting next year. Our thanks go to everyone involved for their hard work over the last one and a half years or more in putting processes and planning in place and playing a constructive part in discussions, which were not always easy," he said.

"The hydrogen core network is the first step in the process of establishing a nationwide hydrogen infrastructure in Germany," the statement said. [It] will connect future hydrogen clusters across the country with each other. These are clusters of regional and local hydrogen projects, for example in industrial or business parks. The hydrogen core network also takes account of connections with Germany's neighbouring countries.

The Bundesnetzagentur gave the application its approval following minor changes, for instance only those pipelines were approved that will be necessary for transport tasks in the hydrogen core network, the statement said.

The Federal Network Agency serves as the country's main authority for regulating infrastructure for the energy, railway, postal and telecommunications sectors. It decides on infrastructure development and ensures fair, competitive and efficient services in these markets and guards consumer protections.

In preparing their plan for the hydrogen network, gas transmission system operators carried out market surveys on the production of and demand for hydrogen as part of their processes for the two most recent gas network development plans – in 2020 and 2022. During their research, gas pipelines that could be converted to carry hydrogen were identified. Operators then developed their own, non-binding hydrogen model in the gas network development plan, which includes the first hydrogen clusters in Germany.

The development and operation of the network required more binding commitments on the part of producers and consumers as well as the construction of pipelines. This led the Federal Government to decide in the spring of 2023 to move ahead with the establishment of a hydrogen core network that would connect all the key hydrogen production, import and consumption points across Germany with each other.

Germany has put forward a National Hydrogen Strategy designed to promote the widespread use of hydrogen and achieve the goal of climate neutrality by 2045. The Strategy was introduced in 2020 and updated in 2023. Its intension is to make Germany a global leader in hydrogen technologies. The Hydrogen Core Network is to function as the core component to bring this goal about. Once in operation, hydrogen will be flowing throughout Germany from the places it is manufactured to the locations it is needed as fuel.

The Strategy calls for domestic electrolysis production capacity to reach 10 GW minimum by 2030. Production of green hydrogen is a priority and relies on renewable energy sources to power the electrolysers.

The hydrogen plan includes subsidies for hydrogen power plants as well as for hydrogen-powered vehicles. Germany intends for its hydrogen production to drive heavy industry, as well as fuel the aviation and transport sectors.A National Hydrogen Import Strategy is being devised because Germany is aware that it will be unable to meet its future hydrogen demand solely with domestic production, therefore it is lining up a diverse and sustainable supply.

The country is taking a comprehensive approach to developing an economy that incorporates hydrogen. Its programme seeks to place hydrogen into a number of important economic sectors by ensuring energy security, climate protection and economic competitiveness.

Germany's hydrogen infrastructure will see further development as a regular part of the country's gas and hydrogen network development planning process. Joint consultation between natural gas and hydrogen and electricity frameworks make it possible to look at potential developments simultaneously.

According to the Bundesnetzagentur statement, both gas and hydrogen transmission network operators will continue to adapt their plans for the hydrogen network in line with future challenges once the Agency has confirmed the gas/hydrogen scenario framework.

Gas

Market analysts differ on future of LNG demand

Future demand for gas and sources of supply are questions the energy market deals with every day. In recent reports, some major analysts see the future of LNG in different ways.

Gary Lakes

With the year coming to a close, it's time to forecast how important commodities like natural gas might behave in the times ahead. For the time being, the gas market is looking balanced, but according to some projections the future could bring over-supply or greater demand.

In a recent comment from RBC Capital Markets, the investment bank said a big influx of LNG is coming online and that it will transform the global market, bringing about wide and enduring effects.

"A wave of new LNG supply – the biggest yet – is set to reshape the global market in the coming years, with broader implications than prior growth given increasing inter-linkages between regional gas markets following the Russia-Ukraine conflict," analysts from the investment bank wrote, according to a report by CNBC.

This new injection of supply could push the LNG market into "an extended period of oversupply by the end of 2026," the report quoted a RBC analyst as saying. That period would remain until 2030, the analyst added, saying that prices could go below double digits.

The CNBC report noted that throughout 2024 a number of analysts have warned that weak demand growth along with anticipated waves of export capacity could give rise to a "massively oversupplied market."

"As a stream of planned infrastructure continues to flood the market, it's unclear if demand will increase to absorb each wave," the report said.

According to RBC Capital, global LNG trade has doubled over the last 10 years, rising from around 240 million tons in 2014 to more than 400 million tons last year. A big part of this has been caused by the disruption in deliveries of pipeline gas from Russia to the European Union countries, most of which have stopped importing piped gas from Russia because of Moscow's February 2022 invasion of Ukraine. That action has seen the rise of more deliveries of LNG from the US and Qatar – the world's main LNG suppliers – to the EU.

Some Russian LNG continues to be delivered to Europe, but there is a strong chance that imports of this Russian gas, too, will be halted.

Russia once supplied Europe with 40 per cent of its gas demand. Over the last two years that market percentage has fallen to roughly 10 per cent and only a few EU members – Hungary, Slovakia, Czechia – continue to receive Russian gas by pipeline. Those deliveries may not continue for much longer. Ukraine intends to end its gas transit agreement with Russia at the end of the year. That could leave those countries looking to arrange gas exports through their EU member neighbours, or possibly find a route through Turkey, which continues to receive Russian gas through pipelines across the Black Sea.

According to the RBC Capital analysis, global LNG production capacity will increase by around 50 per cent before the end of this decade. The US and Qatar will continue as the big global suppliers with a combined market share of 50 per cent.

Other countries plan to increase their existing production capacity in case there is demand growth in Europe, and also be ready for a growth in gas consumption in Asia. Growth in Asia is expected to rise only by 5 per cent annually, and 70 per cent of that is projected for China, India and South Korea.

According to a new review of global gas markets and security produced by the International Energy Agency (IEA), global demand is increasing during 2024 at a stronger rate than in the previous two years. New gas supplies coming to market in 2024 remain limited due to the relatively slow growth of LNG production while geopolitical tensions continue to fuel price volatility, the IEA said.

Global gas demand is expected to rise by 2.5 per cent during 2024 and a similar rise is expected by the IEA in 2025, according to the organisation's latest 'Global Gas Security Review'. Fast-growing markets in Asia account for a large amount of the increase while a rebound in Europe's industrial gas demand will also contribute, even though demand remains well below its pre-crisis levels, the IEA said.

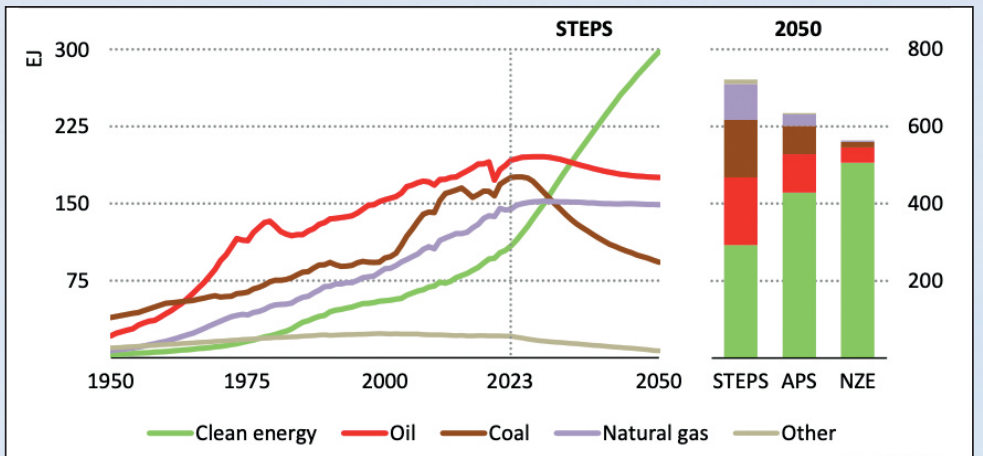
Meanwhile, global energy company Shell said world LNG demand would grow beyond the year 2040, driven by industrial demand in China and economic development in South and Southeast Asia.

In its recently released LNG Outlook 2024, Shell said global LNG demand would increase by more than 50 per cent by 2040 as the result of coal-to-gas switching in China and southern Asia. China and the countries in that region will use more LNG to support their economic growth, the report said.

Shell said global LNG rose to 404 million tons in 2023 compared to 397 million tons in 2022. A tight supply of LNG constrained growth while it also maintained prices and price volatility above historic averages, the energy giant said. Shell is a major producer and trader in LNG.

The company noted that demand for natural gas had already peaked in some regions of the world, but that overall demand continues to rise globally. Demand for LNG is expected to reach 625-685 million tons a year by 2040, Shell said, referring to industry estimates.

Global energy mix by scenario to 2050

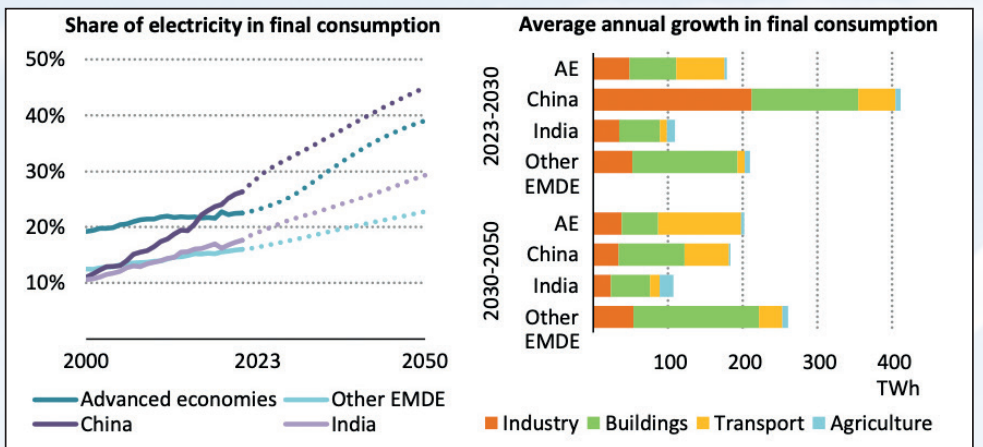


STEPS, a scenario based on current policy settings, sees clean energy poised for huge growth, while coal, oil and natural gas each reach a peak by 2030 and then start to decline

Notes: EJ = exajoules; STEPS = Stated Policies Scenario; APS = Announced Pledges Scenario; NZE = Net Zero Emissions by 2050 Scenario. Oil, coal and natural gas refer to unabated uses as well as non-energy use. Clean energy includes renewables, modern bioenergy, nuclear, abated fossil fuels, low-emissions hydrogen and hydrogen-based fuels. Other includes traditional use of biomass and non-renewable waste.

World Energy Outlook 2024, © IEA/OECD, page 24, Fig 1.1

Electricity in total final consumption and demand growth in the STEPS to 2050

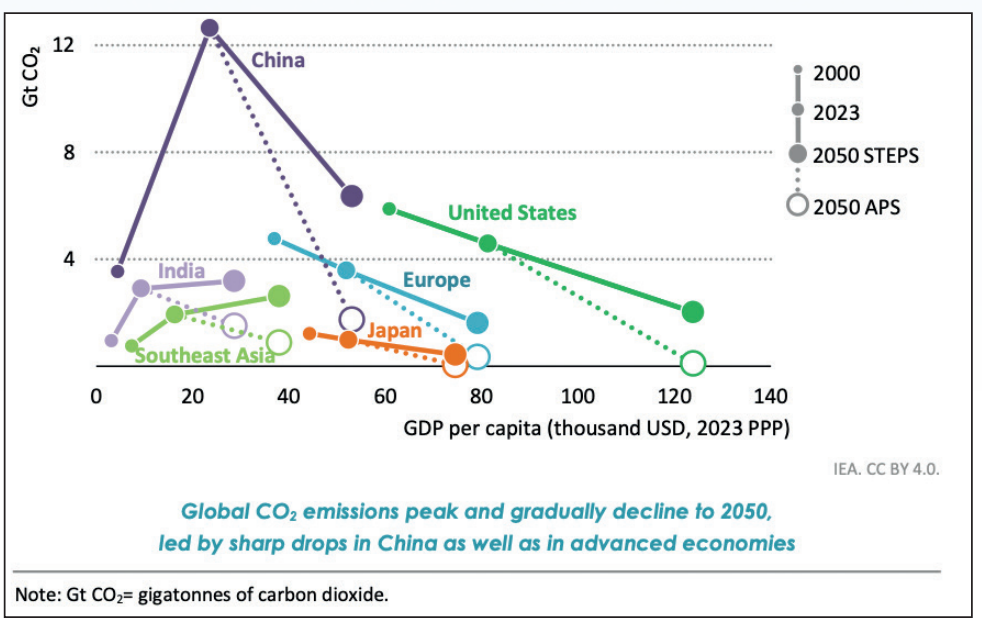


Emerging market and developing economies, especially China, dominate the growth story in all sectors, while advanced economies see demand increase as transport electrifies

Notes: TWh = terawatt-hours; AE = advanced economies; Other EMDE = emerging market and developing economies other than China and India.

World Energy Outlook 2024, © IEA/OECD, page 40, Fig 1.10

CO_2 emissions and GDP per capita in selected countries/ regions in the STEPS and APS



Global CO_2 emissions peak and gradually decline to 2050, led by sharp drops in China as well as in advanced economies

Note: Gt CO_2= gigatonnes of carbon dioxide.

World Energy Outlook 2024, © IEA/OECD, page 28, Fig 1.4

For more information, please contact:

IEA Publications
International Energy Agency

Website: www.iea.org

Contact information:
www.iea.org/contact

Source: *IEA World Energy Outlook 2024, https://www.iea.org/reports/world-energy-outlook-2024, CC BY 4.0*

Boosting industry competitiveness: *electrify and flex that demand*

The potential for energy-intensive industries to electrify is increasing with technological advancements. In parallel, the business case for industry flexibility is now greater than ever with the power sector experiencing record levels of negative price hours. Eurelectric's **Cillian O'Donoghue** believes it is becoming increasingly clear that those industries that electrify their processes and flex their demand will be the winners in the transition.

O'Donoghue: the EU should centre its comprehensive industrial strategy around the 4 'i's

This month, Eurelectric published its 'Power Barometer'. The barometer is Eurelectric's annual data report offering an evidence-based analysis of the EU power sector's performance over the past year. This year's edition had two major themes. Firstly, the potential for industry to electrify is greater than previously thought. Yet, perversely, the opposite is happening: industrial demand is dropping. Secondly, negative price hours have reached record levels and are undermining the attractiveness of investments in new generation. Thankfully, a potential major solution to the latter (negative prices), lies in the former (industry flexibility).

Let's begin with negative prices. As of August 2024, the EU experienced the highest number of negative prices in electricity wholesale markets. Prices went below zero for more than 1030 hours between January and August 2024 in at least one EU bidding zone, according to our latest Power Barometer. This meant that power suppliers had to pay to supply electricity to the grid, instead of being paid themselves. While this phenomenon can challenge clean energy generation investments, it also presents opportunities to electrify further and invest in storage and flexibility solutions that help balance the increasing variability in our ever-greener energy system.

Notably, negative prices are a wake-up call for an increasingly worrying trend for our sector: there is not enough power demand in Europe. The good news is that there are ways to fix this and several actors that can make this change happen, starting with energy intensives.

In 2023 and 2024 negative prices mostly occurred at times of peak renewable power generation, especially solar. In 2023, there were negative prices during 9 per cent of the total hours. This increased to 18 per cent this year with solar power giants Spain and Portugal seeing negative prices for the first time. Such occurrences complicate the business case for new renewable capacity and other low carbon technologies, as they make return on investments more difficult and increase renewable curtailments.

Not all is doom and gloom, however. Negative prices highlight the need for more flexible power demand to absorb excess electricity during low-price hours. They present an opportunity for drawing investments into projects that enhance system flexibility and add storage capacity, both of which help assimilate the growing volume of renewable energy.

In the first half of 2024, renewables alone made-up half of total power production followed by a stable 24 per cent of nuclear generation. Solar PV installations surged to 56 GW in 2023, representing a 300 per cent growth compared to 2019. Wind also increased its capacity by 16 GW, despite falling below the necessary growth rate to meet 2030 targets. By 2030, we expect to see renewables accounting for 70 per cent of the EU power generation mix. That is, if we can keep a sound business model and increase power demand.

One of the most important lessons from negative prices is that we need to boost power demand to help absorb supply surplus. Large industrial energy consumers can make a difference here, by electrifying their processes which are still heavily reliant on fossil fuels.

The demand for electricity is closely tied to economic activity. As Europe's industries experience economic decline and relocate abroad – due to growing inflation, high capital costs and uncompetitive energy prices – overall demand for power decreases. This is what happened during the energy crisis, where over 50 per cent of the demand reduction that occurred between 2021 and 2023 can be attributed to industrial decline.

Europe's industrial sectors, traditionally heavy users of energy, are critical to Europe's economy and competitiveness, but are not sufficiently electrified. Today, only a third of industrial final energy demand is powered by electricity. We must therefore address the common misunderstanding that electrification cannot directly power most industrial processes.

A joint study by the Fraunhofer institute and Agora confirms that it is technically feasible to electrify nearly 90 per cent of industry in Europe. Most notably, process heating, which is responsible for 75 per cent of all industrial emissions, could be directly powered via existing technologies such as electric boilers, arc furnaces, heat pumps, induction heating, plasma torches and many more.

There is one especially interesting case of industrial electrification that I would like to draw attention to and that is the work being done by BASF – the world's largest chemical producer – , Saudi Arabia's Sabic and German gas giant Linde. In a major milestone for their sector, they commissioned the world's first electric cracker demonstration project in April this year. Steam cracking is used to produce ethylene and other high-value chemicals (HVCs). These electrified steam crackers employ resistance and shock-wave heating. With electrification, the energy efficiency of steam crackers is expected to be as high as 95 per cent, versus the 40 per cent efficiency we see for today's fuel-based steam crackers.

So if the technology exists, then what's stopping industry from electrifying? High capital costs of electric alternatives often hamper industry from switching to electro-intensive processes. More support is needed from policymakers to ensure the power sector and the industrial base grow together. Eurelectric recently wrote a letter to Heads of State and Government to offer solutions to this interconnected challenge.

As detailed in the letter, we believe the EU should centre its comprehensive industrial strategy around four key pillars, which we like to call the 4 'i's:

1. Industry electrification incentives: Policymakers can contribute by developing a range of solutions to encourage the electrification of industrial processes. The first move should be revising the EU's current energy taxation policy. As shown in our Power Barometer 2024, on the retail side, taxes and levies are widening the competitiveness gap with global rivals.

In the EU, taxes on electricity bills are, on average, 1.4 times higher than those on gas bills. Revising the European Taxation Directive thus presents an opportunity to create a level playing field between the two energy sources.

Beyond taxation, policymakers can further encourage the electrification of industrial processes by establishing a dedicated electrification bank, a proposed competitiveness fund and counter guarantees to lower investment risks.

Another key element in supporting industrial electrification is recognising and appropriately valuing flexibility services in various markets. This ensures that the benefits of flexible resources are fully realised, promoting efficient energy system operation and effective price signals.

2. Implementation: Ensuring the effective implementation of existing EU legislation is crucial. This involves close monitoring and enforcement to guarantee that Member States comply with the directives and regulations set forth by the EU. Among the key files to implement is the electricity market reform.

Expanding access to long-term contracts like Power Purchase Agreements (PPAs) and Contracts for Difference (CfDs) for clean energy procurement will also ensure price stability for large energy consumers and predictability for suppliers. Although the PPA market is growing, it is not advancing quickly enough, with most of the growth being concentrated in Spain and Germany.

3. Investment certainty: EU policymakers should provide clear and consistent policy frameworks that offer long-term certainty for investors. This includes measures that reduce financial risks and enhance the attractiveness of investing in clean energy. Most importantly, they should refrain from myopic state interventions or short-term fixes that can damage competitiveness and delay climate action.

4. Infrastructure development: The rapid growth of renewables, and in particular of variable energy sources such as solar and wind, is leading to an unprecedented amount of connection requests to Europe's electricity grid. Lithuania currently holds the record in Europe, with a 1425 per cent growth in grid connection requests for solar PVs alone.

Combined with connection requests coming from other decentralised assets such as heat pumps and electric vehicles, Distribution System Operators are facing an unprecedented challenge in keeping the power grid stable.

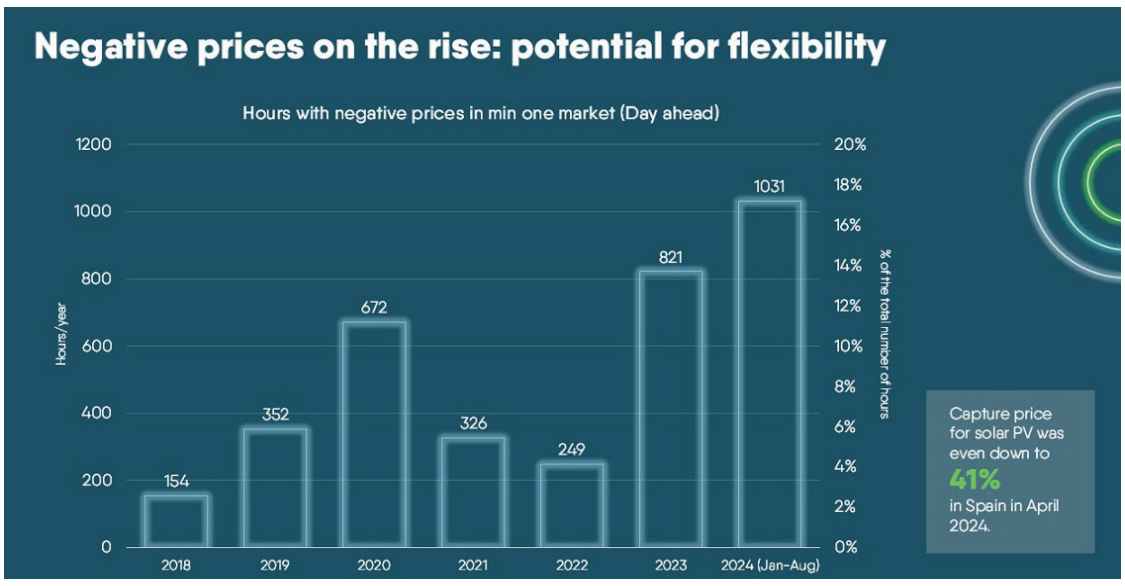
Therefore, facilitating the development of modern and resilient grid infrastructure that helps industrial electrification and grid connections increase will be crucial. This includes investments in distribution grids, the integration of smart grid technologies and the expansion of cross-border interconnections for a total of €67 billion per year – as shown in our 'Grids for Speed' study.

The path to a decarbonised and competitive energy future is clear. By prioritising electrification, ensuring investor certainty, boosting demand and developing infrastructure, Europe can boost electrification, achieve its climate targets and maintain its leadership in the global energy transition.

As we move forward, it is imperative that policymakers and industry work collaboratively to implement these strategies. Together, we can drive the electrification agenda, and create a resilient, competitive and decarbonised economy.

Cillian O'Donoghue is Policy Director at Eurelectric

Negative prices highlight the need for more flexible power demand to absorb excess electricity during low-price hours



Climate finance outlook: reasons to be cheerful

Achieving net zero by mid-century depends on the successful execution of a vast number of projects. But although the challenges to raising the trillions of dollars of capital required are significant, corporations and investors have reasons to be optimistic. **Joseph Jacobelli** explains.

The challenges facing climate finance are formidable. The path ahead is fraught with obstacles, many of which, like geopolitical factors, remain unpredictable. Yet, there are grounds for optimism. While implementation will take time, it is crucial to view the financing of this transition through a long-term lens of three to five years, rather than a quarterly perspective. The unprecedented growth across three key sectors – global renewable energy capacity, green fixed-income instruments, and impact investment portfolios – demonstrates climate finance's increasing momentum.

There are numerous aspects to the variety of challenges in funding energy transition projects. To catch the opportunities and to understand the risks, it is essential to gauge what the challenges are. These revolve around government and private sector actions, the funding of projects in non-developed economies, and geopolitical uncertainties.

The global shift to a low-carbon economy and achieving net zero by the middle of this century depends on the successful execution of a vast number of projects. This requires a substantial amount of capital. In a September 2024 commentary in *The Energy Industry Times* titled 'Private sector finance: the linchpin of energy transition investment', it was highlighted that the projected capital requirements are immense.

Annually, several trillion dollars will be needed, with estimates ranging from $3.5 trillion to $7 trillion, depending on project categorisation. While the balance sheets of the corporates involved in the transition are insufficient to fund all potential projects, dedicated capital is abundant globally. Nevertheless, the bridge between the projects and the funding remains incomplete, with several crucial elements yet to be fully established.

At the government level, policy signals must be clear, and mechanisms to incentivise investments in energy transition projects must be promoted in order to enhance their bankability. Furthermore, the policies must be well-executed, with barriers such as bureaucratic red tape being minimised.

At the market level, comprising policymakers, regulators, financial institutions, and service providers, several obstacles need to be addressed. The think-tank Rocky Mountain Institute highlights issues such as inconsistent definitions and labels regarding what qualifies as a transition finance project, the need to increase the availability of transition-relevant data, and the challenge of addressing the stigma of high financed emissions. The latter refers to emissions resulting from the lending and investment activities of financial institutions, in other words, the carbon footprint of the projects they fund.

Moreover, accelerating clean energy investments in emerging and developing economies constitutes a crucial aspect of the global decarbonisation endeavour. Typically, the domestic funding resources of such economies are more constrained, necessitating additional measures to attract investments from the local governments of international entities, including Multilateral Development Banks (MDBs) like the World Bank or the Asian Development Bank.

The intricate geopolitical landscape, marked by Russia's ongoing invasion of Ukraine, instability in the Middle East, and escalating tensions between the US, EU, and China, presents significant challenges to energy transition capital flows. These geopolitical issues highlight vulnerabilities in supply chains, uncertainties in market access, and obstacles to international cooperation.

Despite the challenges, corporations and investors have reason to be optimistic about climate finance's future. The sector's track record is particularly encouraging, with three notable successes: the huge expansion of global renewable energy capacity, the colossal growth in green fixed-income instruments, and the enormous rise in green investment assets under management.

The expansion of renewable energy generation capacity has exceeded expert predictions. Total capacity reached approximately 3.9 TW in 2023, up from 1.2-1.3 TW in 2010, according to IEA and IRENA data. Total capital expenditure likely surpassed $3 trillion for generation capacity, plus at least $1.5 trillion for supporting infrastructure including storage and grid networks, though precise figures vary significantly across technologies and regions. Notably, while only 1 TW was added during the 2010s, installations accelerated to 1.5 TW between 2020 and 2023. This momentum is expected to continue, with the IEA forecasting renewables to supply nearly half of global electricity demand by 2030.

China is projected to dominate this expansion, contributing almost 60 per cent of new capacity. Despite this progress, current trajectories fall short of the COP28 target to triple renewable capacity by 2030. The IEA outlines four scenarios projecting total capacity between 7.9 TW and 11.45 TW. A realistic estimate suggests capacity will increase 2 to 2.5-fold from 2023 levels, reaching 9-10 TW. Achieving this requires stronger national climate commitments, improved international financing cooperation, and substantial grid and storage investments.

The growth of green bonds demonstrates another success story. These debt securities, whose proceeds fund environmental or climate-related projects, have seen remarkable expansion. Over 34 000 green-related bonds were issued between 2006 and June 2014, raising over $4174 billion, based on data from non-governmental organisation Climate Bond Initiative, with particularly strong volumes since 2019. Green, social, and sustainability-linked (GSS) bonds already account for 14 per cent of the fixed income market having grown at a compound annual growth rate of 43 per cent in the ten years to 2023, according DWS, a financial institution.

A diverse range of entities issues these bonds, including governments, financial institutions and corporations. In the first half of 2024, major green bond issues included the European Union ($12 billion), the European Investment Bank ($6.9 billion), government-owned French utility EDF ($9.5 billion), and US independent power company Pattern Energy Group ($8.8 billion), according to the Climate Bond Initiative. Issuance was also global with the top four countries including the US, Germany, France and China. In 2024, GSS issuance is expected by S&P and others to reach approximately $1 trillion. The share of the overall fixed income market should continue to rise in the coming years.

A third indicator of climate finance growth is the rising volume of assets under management (AUM) dedicated to green objectives. The Global Impact Investing Network reports that the global impact investing market – capital deployed to generate both measurable social or environmental benefits and financial returns – reached over $1.57 trillion in AUM, managed by more than 3900 organisations. This represents a 21 per cent compound annual growth rate over five years, signalling mainstream acceptance.

For comparison, AUM totalled $1.16 trillion in 2022 and $715 billion in 2020. The average investment portfolio holds $986 million in impact AUM, with a median of $42 million. While investment managers comprise 59 per cent of organisations, they manage only 27 per cent of global impact AUM, as pension funds and insurers hold larger proportions. Developed markets dominate, with Europe and North America representing about four-fifths of institutions. Despite regulatory complexity and economic pressures, investors report satisfaction with both financial and impact performance. Impact investing is yet another category in climate finance, which will continue to grow over the next few years.

The dramatic growth in global renewable energy capacity, green fixed-income instruments, and impact investing AUM exemplifies climate finance's remarkable success. While the sector has overcome significant hurdles and faces fresh challenges, viewing its trajectory through a long-term lens of three to five years, rather than through daily headlines, reveals compelling investment and business opportunities emerging from climate finance's momentum.

Joseph Jacobelli, head of single-family office Bougie Impact Capital Ltd., has over 30 years' experience in energy markets. He promotes climate finance awareness through his 'Asia Climate Finance Podcast' and publications, including his forthcoming book, 'Empowering Clean Energy's Succession'. This commentary draws from that book.

Jacobelli: The sector's track record is particularly encouraging

Scorecard: Aligned GSS+ (green, social, and sustainability-linked) debt
Source: Climate Bond Initiative August 2024

	First Half 2024		Cumulative since 2006	
	US$ billion	Aligned deal count	US$ billion	Aligned deal count
Green	385.1	1,628	3,201.5	29,007
Social	70.5	1,646	906.0	12,685
Sustainability	93.9	571	896.2	5,057
Sustainability-linked bonds	4.6	14	52.9	124
Total	**554.1**	**3,859**	**5,056.6**	**46,873**

Renewables: still falling short

The International Energy Agency has published 'Renewables 2024', an analysis and forecast to 2030. While renewables are expected to grow significantly, projected growth is still expected to fall short of the tripling of capacity goal agreed at COP28 in Dubai last year. ***TEI Times*** presents a summary of the report.

Climate and energy security policies in nearly 140 countries have played a crucial role in making renewables cost-competitive with fossil-fired power plants. At the same time, industrial policies that encourage local manufacturing of solar panels and wind turbines are fostering domestic markets. However, this is not quite sufficient to reach the goal of tripling renewable energy capacity worldwide established by nearly 200 countries at the COP28 climate summit in Dubai last year.

According to the International Energy Agency's (IEA) 'Renewables 2024: Analysis and forecast to 2030' published last month, global renewable capacity is expected to grow by 2.7 times by 2030 – surpassing countries' current ambitions by nearly 25 per cent but still falling short of what is needed.

Considering existing policies and market conditions, the IEA's main case sees 5500 GW of new renewable capacity becoming operational by 2030. This implies that global renewable capacity additions will continue to increase every year, reaching almost 940 GW annually by 2030 – 70 per cent more than the record level achieved last year. Solar PV and wind together account for 95 per cent of all renewable capacity growth through the end of this decade due to their growing economic attractiveness in almost all countries.

Such rapid expansion presents an opportunity for countries to announce enhanced ambitions in the next round of Nationally Determined Contributions (NDCs) due in 2025. But only 14 countries had explicit renewable capacity targets in the NDCs they had designed before COP28. In the IEA's main case, nearly 70 countries, collectively accounting for 80 per cent of global capacity, reach or surpass their current ambitions for 2030. China dominates among these overachievers, but other major economies, such as Brazil, India and the US, also contribute.

The 2030 forecast has two main drivers: solar PV and China.

China is set to cement its position as the global renewables leader, accounting for 60 per cent of the expansion in global capacity to 2030. The country is forecast to be home to every other megawatt of all renewable energy capacity installed worldwide in 2030, after surpassing its end-of-the-decade 1200 GW target for solar PV and wind six years early. Since ending feed-in tariffs in 2020, China's cumulative solar PV capacity has almost quadrupled and wind capacity has doubled, driven by cost-competitiveness and supportive policies. China's success stems from comprehensive support for both large-scale and distributed renewables across all renewable technologies.

The EU and the US are both forecast to double the pace of renewable capacity growth between 2024 and 2030, while India sees the fastest rate of growth among large economies. The Inflation Reduction Act's tax credits will continue to boost growth in the US, while competitive auctions and corporate power purchase agreements are set to drive expansion in the EU. Member countries' growth trends put the bloc's 600 GW solar PV ambition for 2030 within reach, but more effort is needed for wind. In India, the rapid expansion of auctions, the introduction of a new support scheme for rooftop PV and stronger financial indicators for many utility companies make the country the fastest growing renewable energy market among large economies through 2030.

New solar capacity added between now and 2030 will account for 80 per cent of the growth in renewable power globally by the end of this decade. Adoption accelerates due to declining costs, shorter permitting timelines and widespread social acceptance. Cost-competitiveness and policy support also stimulate the growth of distributed applications among residential and commercial consumers as more households and companies seek to reduce their electricity bills.

Despite recent supply chain and macroeconomic challenges, the wind sector is expected to recover. Policy changes concerning auction design, permitting and grid connection in Europe, the US, India and other emerging and developing economies are expected to enhance project bankability and help the wind sector recover from recent financial difficulties. The forecast sees the rate of global wind capacity expansion doubling between 2024 and 2030 compared with 2017-23. Hydropower capacity growth remains stable, driven by China, India, the ASEAN region and Africa. The role of other renewables, including bioenergy, geothermal, concentrated solar power and ocean, is expected to decline due to a lack of policy support.

Hydrogen remains a negligible driver for new renewable capacity growth. Despite increased policy support, hydrogen produced from renewable energy is set to account for just 4 per cent of total hydrogen production in 2030, mainly due to insufficient demand creation. While global installed electrolyser capacity is expected to increase 50-fold by the end of the decade, only part of it will be supplied by new renewable power plants, as half of the electrolysers are estimated to use abundant low-cost renewables generation from existing plants. Overall, hydrogen is forecast to drive only 43 GW of new renewable capacity by 2030, or less than 1 per cent of total global renewable capacity expansion.

The IEA believes tripling of global renewable capacity is within reach, but policy improvements are needed.

Its accelerated case sees global renewable capacity reaching almost 11 000 GW in 2030, laying out a pathway for meeting the tripling goal. In this case, China, Europe, India and the US collectively provide 80 per cent of total installed capacity worldwide. The case sees China addressing grid integration challenges and companies installing distributed solar PV systems at a faster pace, while in Europe and the US, governments reduce long permitting timelines and stimulate investment in new grid capacity and flexible assets to unlock additional deployment. In India, policies addressing challenges such as land procurement, grid connection wait times and the weak financial health of power distribution companies deliver additional growth.

Large untapped renewables potential in emerging and developing economies can be realised if policies improve. High financing costs reduce the economic attractiveness of renewables in most emerging and developing economies. Other key challenges include weak grid infrastructure and a lack of visibility over auction volumes. Measures to reduce risks, including by creating stable policy environments with clear long-term targets, can help unlock additional capacity. In countries with fossil fuel overcapacity with long-term contracts, policy makers could consider renegotiating inflexible power and fuel contracts and accelerating the phasedown of fossil fuel plants.

In the IEA's main case, renewables will account for almost half of global electricity generation by 2030, with the share of wind and solar PV doubling to 30 per cent. At the end of this decade, solar PV is set to become the largest renewable source, surpassing both wind and hydropower, which is currently the largest renewable generation source by far.

Increasing wind and solar PV generation is leading to higher curtailment, underlining the growing need for flexibility. In countries where grid investments and system integration measures are not keeping pace with rapid deployment, curtailment could become a growing challenge. In Chile, Ireland and the UK, for example, the curtailment of wind and solar PV recently reached between 5 per cent and 15 per cent. Despite growing investment in battery storage in many of these markets, further flexibility measures, including long-term storage and large-scale demand-response, will be necessary. By 2030, solar and wind penetration is set to reach close to 70 per cent in countries such as Chile, Germany, the Netherlands and Portugal.

Crucially, grid infrastructure and system integration of renewables need increasing policy attention. Investment in grid infrastructure is lagging, with more advanced projects waiting to be connected, though grid reforms in some countries are beginning to deliver results. At least 1650 GW of renewable capacity is currently in advanced stages of development and waiting for a grid connection, 150 GW higher than at this point last year. However, grid queues for projects at early stages of development have decreased, with projects either moving forward or dropping out of the queue – some without penalty – due to lack of progress. Queues to integrate energy storage are also significant as deployment rises.

Meanwhile, the solar PV and wind manufacturing race continues, but the dynamics are changing.

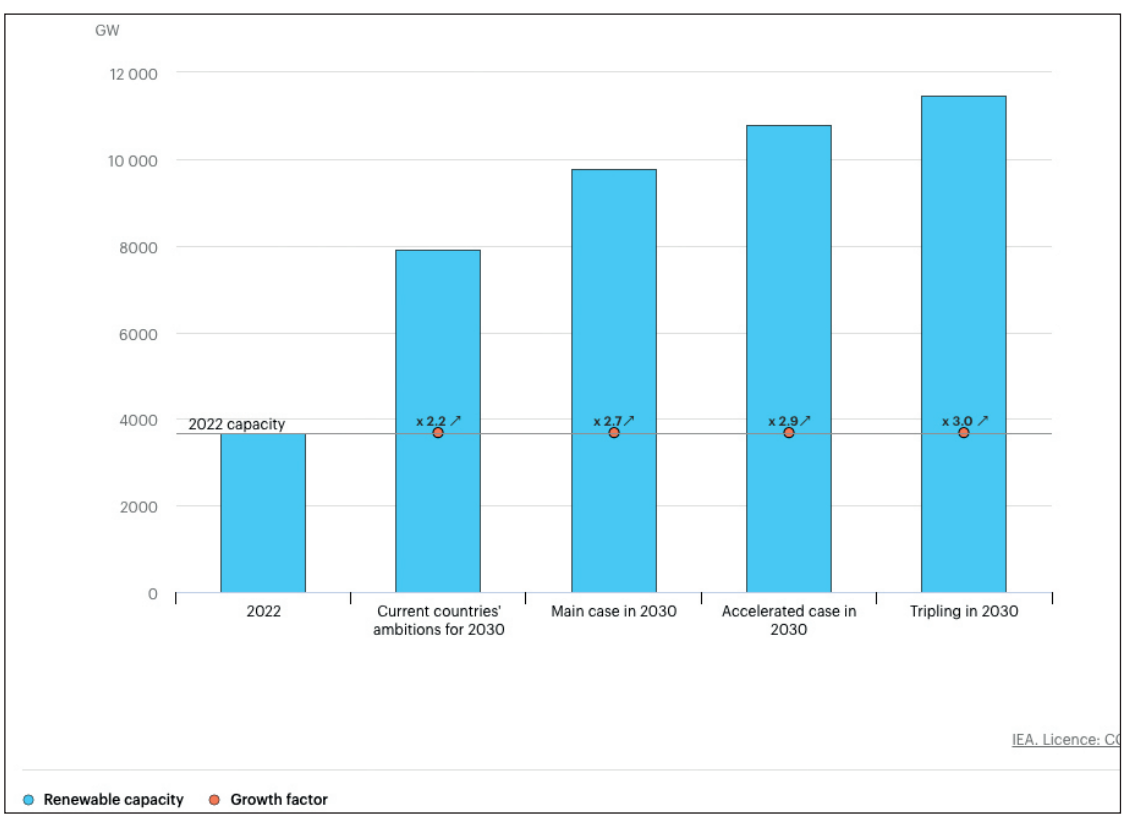
Solar PV manufacturers are scaling back investment plans due to a deepening supply glut and record-low prices. Global solar manufacturing capacity is expected to reach over 1100 GW by the end of 2024, more than double the projected PV demand. This oversupply has caused module prices to more than halve since early 2023, leading to negative net margins for integrated solar PV manufacturers in 2024. The challenging market conditions have resulted in the cancellation of about 300 GW of polysilicon and 200 GW of wafer manufacturing capacity projects, valued at approximately $25 billion.

China's leadership in solar PV manufacturing will continue while industrial policies and trade measures stimulate diversification. By 2030, China is expected to maintain more than 80 per cent of global manufacturing capacity for all PV manufacturing segments. Meanwhile, solar cell and module manufacturing capacity almost triples in the US and India. However, manufacturing PV modules in both countries currently costs two to three times more than in China. This gap is set to remain in place for the foreseeable future. Policy makers, says the IEA, should consider striking a fine balance between the additional costs and benefits of local manufacturing, weighing key priorities such as job creation and energy security.

In contrast, the wind turbine manufacturing sector needs more investment to avoid supply chain bottlenecks by 2030. Global onshore wind manufacturing capacity could reach 145 GW, barely above expected installations in 2030 despite the incentives available in Europe, the US and Southeast Asia. For offshore wind, the situation is even more severe. Without new manufacturing projects, supply chain bottlenecks could delay the rollout of offshore wind in EU member states, which are pursuing ambitious 2030 offshore wind goals.

A copy of 'Renewables 2024' can be downloaded at https://www.iea.org/reports/renewables-2024a

Renewable capacity growth and the gap to global tripling, 2022-2030



Junior Isles

Stepping out of the Dark Ages

The International Energy Agency's (IEA) latest World Energy Outlook (WEO) provided few surprises in terms of the direction of travel of the energy sector, but it did shed light on the pace of the clean energy transformation and the central role of electricity in the ongoing change.

According to the IEA, based on today's policy settings, the world is set to enter "a new energy market context" in the coming years. Low-emissions sources like wind and solar are set to generate more than half of the world's electricity before 2030 – and demand for all three fossil fuels – coal, oil and gas – is still projected to peak by the end of this decade.

"In this context, the WEO-2024 shows that the contours of a new, more electrified energy system are coming into focus as global electricity demand soars," stated the report. Data from the Paris-based agency shows that electricity use has grown at twice the pace of overall energy demand over the last decade.

"In previous World Energy Outlooks, the IEA made it clear that the future of the global energy system is electric – and now it is visible to everyone," said IEA Executive Director Dr Fatih Birol. "In energy history, we've witnessed the Age of Coal and the Age of Oil – and we're now moving at speed into the Age of Electricity, which will define the global energy system going forward and increasingly be based on clean sources of electricity."

Global electricity demand growth is set to accelerate further in the years ahead, adding the equivalent of Japan's demand to global electricity use each year in a scenario based on current policy – and rising even more quickly in scenarios that meet national and global goals for achieving net zero emissions. According to the IEA, global electricity demand was rising at an annual rate of 1000 TWh. It also increased its forecast for demand in 2035, in its business-as-usual scenario, by 6 per cent, or 2200 TWh, to 37 371 TWh.

Notably, the IEA said a combination of rising incomes in the developing world and higher temperatures from climate change meant that power consumed for residential air conditioning would rise by an amount greater than the entire Middle East's electricity use today. The report said air conditioning would need an extra 697 TWh of electricity by 2030, more than three times the extra demand from computer data centres. Electric vehicles, meanwhile, would require an extra 854 TWh, the IEA said.

China, which has been responsible for two-thirds of the increase in global electricity demand over the past decade, is a "major part of what is happening", said the IEA. China already accounts for half the world's electric cars on the road. By 2030, it is projected that 70 per cent of all new car sales in the country would be electric.

"Whether it's investment, fossil fuel demand, electricity consumption, deployment of renewables, the market for EVs, or clean technology manufacturing, we are now in a world where almost every energy story is essentially a China story. Just one example: China's solar expansion is now proceeding at such a rate that, by the early 2030s – less than ten years from now – China's solar power generation alone could exceed the total electricity demand of the United States today," said Dr Birol.

With electricity use growing twice as fast as energy demand, and most of that electricity coming from clean energy sources, the casual observer would be forgiven for thinking that the climate change battle is being won. Unfortunately, we could not be further from the reality.

Despite the progress, the world is far from reaching its climate goals. Although carbon dioxide emissions, responsible for driving the climate crisis, are expected to peak within this decade the pace of reduction in the emissions is nowhere near fast enough. According to the IEA, temperatures are on track to rise by 2.4°C by the end of the century, well above the 1.5°C target set by the Paris Agreement.

UN predictions are even bleaker. The United Nations Environment Programme (UNEP) Emissions Gap Report 2024 forecast finds that a failure to increase ambition in the next round of Nationally Determined Contributions (NDCs) and start delivering immediately would put the world on course for a temperature increase of 2.6-3.1°C over the course of this century.

António Guterres, UN Secretary-General, warned: "Today's Emissions Gap report is clear: we're playing with fire; but there can be no more playing for time. We're out of time. Closing the emissions gap means closing the ambition gap, the implementation gap, and the finance gap. Starting at COP29."

The report shows that there is technical potential for emissions cuts in 2030 up to 31 Gt of CO_2 equivalent – which is around 52 per cent of emissions in 2023 – and 41 Gt in 2035. This would bridge the gap to 1.5°C in both years. In terms of the role the electricity sector could play, increased deployment of solar photovoltaic technologies and wind energy could deliver 27 per cent of the total reduction potential in 2030 and 38 per cent in 2035.

But for clean energy to continue growing at pace, much greater investment in new energy systems, especially in electricity grids and energy storage, are necessary.

The WEO 2024 stated: "Today, for every dollar spent on renewable power, only 60 cents are spent on grids and storage, highlighting how essential supporting infrastructure is not keeping pace with clean energy transitions. Secure decarbonisation of the electricity sector requires investment in grids and storage to increase even more quickly than clean generation, and the investment ratio to rebalance to 1:1."

This year, several countries in Europe have seen electricity prices dropping to negative for a record number of hours, driven by a rapid rise in renewables. However, there has been slower progress in the storage infrastructure needed.

Matthew Boulton, Director of Solar, Storage and Private Wire of EDF Renewables UK said: "…Investing in renewables is key to enhancing energy security and unlocking a secure and affordable energy system that is resilient to global change. While it is excellent to see the rapid growth of renewables globally, we still need to move faster to get on track for net zero. We must utilise technologies like battery storage to create greater flexibility and invest in a stronger, smarter grid for a reliable system that can support the clean energy we need."

As Dave Jones, Global Insights Programme Director at Ember, put it: "As we move further into the age of electricity, solar and batteries are stealing the show."

We may be entering the Age of Electricity but let us hope we do not have to wait an age get the supporting grid infrastructure technologies to where they need to be, or for all our efforts we could be spending more time in the dark than we expected.

Cartoon by Jem Soar