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Power-to-X holds the promise to transform the global economy onto a green footing, but to do so means adopting a pragmatic approach and breaking down barriers to the widespread adoption and development of a much more hydrogen-centric energy system. *Page 15*

Big polluters miss climate targets deadline

Since signing the Paris Agreement in 2015, most countries have struggled to stick to emissions targets

There is deepening concern as the world's biggest polluters fail to submit national action plans for cutting carbon emissions. **Junior Isles**

The EU, Australia, Indonesia, South Africa and India are among the big polluters that have missed a UN deadline for new climate targets, fuelling speculation that the global economy and the withdrawal of the US from the Paris Climate Agreement are taking a toll on nations' commitment to tackling global warming.

Under the Paris Agreement, signed in 2015, nearly 200 countries were due to submit updated Nationally Determined Contributions (NDCs) by February 10th. These NDCs are meant to include country-specific headline figures for cutting greenhouse gas emissions by 2035. Many countries are already falling well short of the targets they set for 2030, with the consequence that carbon emissions and global temperatures are still rising. Last year was recorded as the hottest year ever.

Commenting on the number of NDCs submitted, Nick Mabey, co-founder of UK-based climate think-tank E3G, said only about one- quarter to one-third of the G20 economies had been expected to submit their targets on time. "Because of the shock of the US presidency and all the other issues, there is not a lot of leader attention on this issue," he said.

While Brazil, New Zealand, Switzerland, UAE and the UK were the most notable to submit upgraded targets by the deadline, there were some worrying absences.

Poland, which holds the rotating chair of the EU presidency, is one of the governments that is most sceptical of climate targets and is unlikely to push the agenda ahead of presidential elections in May.

"The quality matters more than the speed of submission," one European official said. The EU submits one overarching NDC for all countries within the bloc.

Nonetheless, the failure of the EU to submit NDCs has fuelled concern over the bloc's commitment to its climate goals.

Mexico, which last year elected a new government led by climate scientist Claudia Sheinbaum, said it would seek to submit its target around mid-year. South Africa said it aimed to have a new climate plan by around September. China, meanwhile, is said to be still assessing geopolitical developments after the election of Donald Trump as US President. Trump pulled

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Global investment in energy transition hits $2 trillion milestone

Investment in the clean energy transition exceeded $2 trillion for the first time in 2024, according BloombergNEF's (BNEF) Energy Transition Investment Trends 2025.

The report reveals that investment in the low-carbon energy transition worldwide grew 11 per cent to hit a record $2.1 trillion last year. BNEF also reports that global energy transition investment would need to average $5.6 trillion each year from 2025 to 2030, in order to get on track for global net zero by 2050, in line with the Paris Agreement.

Growth was driven by electrified transport, renewable energy, and power grids, which all reached new highs last year, along with energy storage investment. While overall investment in energy transition technologies set a new record, the pace of growth was slower than the previous three years, when investment jumped by 24-29 per cent annually.

Investments in renewable energy hit $728 billion, which includes investment in wind (both on- and offshore), solar, biofuels, biomass and waste, marine, geothermal and small hydro. Investment in power grids totalled $390 billion, which includes investment in transmission and distribution lines, substation equipment, and the digitalisation of the grid.

BNEF's report also reveals a marked difference between investment in mature and emerging sectors of the clean energy economy. Technologies that are proven, commercially scalable and have established business models, like renewables, energy storage, electric vehicles, and power grids, accounted for the vast majority of investment in 2024. These sectors drew $1.93 trillion, growing 14.7 per cent, despite hindrance from policy decisions, higher interest rates and expected slower consumer purchasing.

In contrast, investment in emerging technologies, like electrified heat, hydrogen, carbon capture and storage (CCS), nuclear, clean industry and clean shipping, reached only $155 billion, for an overall drop of 23 per cent year-on-year. Factors that discourage investment in these sectors include affordability, technology maturity, and commercial scalability.

In order to scale these industries, the report stressed public and private sectors need to do more to de-risk these technologies, otherwise, they are not likely to have any meaningful impact on emissions by the end of the decade.

The largest market for investment was mainland China, which alone accounted for $818 billion of investment, up 20 per cent from 2023. China's investment growth was equivalent to two-thirds of the total global increase in the year, with all sectors reviewed in the report showing solid growth.

The EU, US, and UK, which drove growth in 2023, saw different results in 2024.

Investment was stagnant in the US, reaching $338 billion, and down in both the EU and UK, hitting $381 billion and $65.3 billion, respectively. China's total investment last year was greater than the combined investment of the US, EU and UK. Of the large markets included in the report, India and Canada also added to overall global growth, increasing their investments by 13 per cent and 19 per cent, respectively.

A separate report by Global Energy Monitor said the wealthiest nations are not building their fair share of wind and solar. Utility-scale solar and wind capacity grew by over 20 per cent in 2024 from 3.6 TW to 4.4 TW. Yet just 10 per cent of these projects are being built by the Group of 7 (G7), despite these rich countries owning nearly half the world's wealth.

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the US out of the climate accord during his first week of office.

This has led Argentina to propose withdrawing from the pact. Indonesia is also now questioning the usefulness of the Paris Agreement following the US's exit.

Mabey said that delaying submissions by three to six months "was not so much a problem", because it would ensure countries could produce solid plans. "It would be much better if it was as high ambition as possible, but also that it was linked very clearly to both national implementation procedures and international support," he said.

A UN official also said the quality of the climate plans was the most important consideration and countries should take the extra time to deliver the best plans.

EU officials say the bloc will be late submitting its plan amid concerns that its green agenda will hamper economic growth.

The EU's Green Deal, aimed at decarbonising the economy, was launched in 2019 but has since come under fire from European companies complaining of high energy prices and overregulation. Member states are also concerned about waning economic growth, while the US' decision to withdraw from the Pais Agreement and scrap climate goals has increased calls for the bloc to rethink its entire approach.

European Commission Vice-President Teresa Ribera told the *Financial Times*: "The global reality has evolved, and we may need to think to what extent these things that were there need to be updated."

The Commission says, however, that it must stick to its climate goals and must therefore balance protection of the planet with improving the continent's flagging competitiveness. "We need to ensure that there's a story of growth and prosperity," said Ribera, who is in charge of the green transition and competition, adding that this was "a fine line that we need to strike".

Last month Ribera laid out how the Commission might achieve this. She promised to mobilise more than €100 billion to support clean manufacturing, including via the European Investment Bank. The bloc's next multi-year budget, which still has to be agreed, would also include a competitiveness fund to boost European research and manufacturing of clean tech.

A Clean Industrial Deal will lay out how to boost demand for made-in-Europe products – from steel to chemicals and cars – through streamlining public procurement and allowing the most power-intensive plants to get backing from the European Investment Bank when they purchase energy. The commissioner will also propose joint purchasing and strategic stockpiles of 17 critical raw materials.

Another area of action will be to drastically cut the number of small and medium companies affected by existing environmental regulations, reducing their reporting requirements and giving businesses more time to comply with the revised rules.

As greenhouse gas emissions continue to rise and annual temperatures increase, experts have questioned whether it is still feasible to regard a limit of warming within 1.5°C as achievable.

Two recent studies, published in the journal *Nature*, both said the lower limit of the Paris accord looked increasingly out of reach without urgent climate action.

Electricity demand growth set to accelerate, says IEA

- Annual consumption forecast to rise at nearly 4 per cent
- Natural gas fired power generation marks new global high

Junior isles

The world's electricity consumption is forecast to rise at its fastest pace in recent years, growing at nearly 4 per cent annually through 2027 as power use climbs in several sectors across the economy, according to a new International Energy Agency (IEA) report.

'Electricity 2025', the latest edition of the IEA's main market analysis of the sector, forecasts that the growth in global demand will be the equivalent of adding an amount greater than Japan's annual electricity consumption every year between now and 2027. The surge is primarily driven by robust growing use of electricity for industrial production, increased demand for air conditioning, accelerating electrification, led by the transport sector, and the rapid expansion of data centres.

Most of the additional demand over the next three years will come from emerging and developing economies, which account for 85 per cent of the demand growth. The trend is most pronounced in China where electricity demand has been growing faster than the overall economy since 2020. China's electricity consumption rose by 7 per cent in 2024 and is expected to grow by an average of around 6 per cent through 2027. The demand growth in China has been fuelled in part by the industrial sector, where alongside the traditional energy-intensive sectors, the rapidly expanding electricity-intensive manufacturing of solar panels, batteries, electric vehicles and associated materials played a significant role. Air conditioning, electric vehicle adoption, data centres and 5G networks are additional contributors.

"The acceleration of global electricity demand highlights the significant changes taking place in energy systems around the world and the approach of a new Age of Electricity. But it also presents evolving challenges for governments in ensuring secure, affordable and sustainable electricity supply," said IEA Director of Energy Markets and Security Keisuke Sadamori. "While emerging and developing economies are set to drive the large majority of the growth in global electricity demand in the coming years, consumption is also expected to increase in many advanced economies after a period of relative stagnation. Policy makers need to pay close attention to these shifting dynamics, which will be addressed at the international 'Summit on the Future of Energy Security' that the IEA is hosting with the UK government in London in April."

The new report forecasts that growth in low-emissions sources – primarily renewables and nuclear – is sufficient, in aggregate, to cover all the growth in global electricity demand over the next three years. In particular, generation from solar PV is forecast to meet roughly half of global electricity demand growth through 2027, supported by continued cost reductions and policy support.

A separate report from the IEA, however, also revealed that global coal fired power generation continued to grow in 2024, albeit at a slower pace, rising 1 per cent year-on-year after a 1.7 per cent increase in 2023. Going forward, coal fired generation is expected to remain relatively stable as more clean energy use curbs expansion.

Meanwhile, natural gas fired power generation rose 2.6 per cent in 2024, marking a new global high. The Middle East is projected to drive growth in gas-fired power through 2027, particularly in Saudi Arabia, where gas generation is expected to rise by 10 per cent as the country transitions away from oil.

Europe was the only major region where gas fired generation declined in 2024, largely due to high gas prices and a colder winter. The IEA forecasts that global gas fired power generation will see modest annual growth of around 1 per cent in 2026-2027, with rising demand in China, India, and Southeast Asia balancing declines in advanced economies. Additionally, the role of gas fired plants in providing flexibility to power systems is expected to increase worldwide.

Natural gas remains the crucial bridge in the energy transition

Natural gas will play a vital role in the energy transition, supporting the expansion of renewables and accelerating the shift away from coal, according to the latest 'Horizons report' from Wood Mackenzie.

The report, titled 'The bridge: Natural gas's crucial role as a transitional energy source', emphasizes that while the world is increasingly turning to renewable energy, natural gas remains fundamental to meeting global energy needs and reducing emissions in the medium-term.

"Gas demand has surged by 80 per cent over the past 25 years, now meeting almost a quarter of the world's energy needs," said Massimo Di Odoardo, Vice President of Gas and LNG Research at Wood Mackenzie. "Its success lies in the scale of global resources, low production costs, ease of storage and dispatch, and comparative environmental advantages."

Surging electrification, increasingly delivered by renewable power sources, will lead the charge to curb CO_2 emissions, says the report. Electrification can only move so fast, however, and the adoption of emerging low-carbon technologies, such as hydrogen, is currently too slow to achieve net zero emissions by 2050. With coal still accounting for 30 per cent of the world's energy needs, shifting to gas as a transition fuel is a compelling option, argues Wood Mackenzie.

Despite its vital role in the future energy mix, the report also highlights that challenges remain. It says high LNG prices since 2022 risk undermining the full potential of wider gas adoption in Asia and that carbon prices would be needed to shift the market.

"In China and India, where gas usage is mainly used for peak shaving, gas demand is still expected to grow by almost 100 bcm through to 2050 in the power sector, offering the most practical option for ensuring flexibility as renewable investments surge," said Di Odoardo. "Without a carbon price of around US$100/tonne, reducing China's and India's dependency on baseload coal looks like a massive ask. But the prize could be a reduction of more than 300 Mt of CO_2 by 2035."

Emissions remain an issue as well, said Wood Mackenzie. Gas and LNG both produce substantial greenhouse gas (GHG). However, according to the report, claims that the LNG value chain is more GHG-intensive than coal is unfounded.

"Our analysis shows that, on average, LNG has around 60 per cent lower GHG intensity than coal. Even when considering a 20-year global warming potential (GWP) and comparing methane-intensive LNG with coal burnt in highly efficient plants, LNG is still 26 per cent less GHG-intensive," said Di Odoardo. "Nevertheless, its carbon dioxide and methane emissions need to be addressed as a matter of urgency to ensure its primacy as a bridging fuel."

The report concludes that natural gas, particularly LNG, will be critical in the shift to a lower-carbon future, bridging the gap as emerging low-carbon technologies strive to reach critical mass.

Europe must base energy security on clean electrification

Europe needs an energy security strategy that is based on clean electrification, according to a recent report published by Eurelectric, the organisation that represents Europe's electricity sector.

The study, carried out by Compass Lexecon on behalf of Eurelectric and formally unveiled at the Munich Security Conference, demonstrates the need for a new approach to energy security based on clean electrification to reduce fuel imports dependence, lower exposure to commodities price shocks and boost crises resilience.

Providing a backdrop for the study, Eurelectric noted: "Cables in the Baltic repeatedly sabotaged, devastating storms leaving Ireland in the dark, war raging in Ukraine and price shocks caused by Russia's fuel disruptions: Europe's energy system is being challenged like never before.

"Meanwhile, Europe is decarbonising its economy with clean and renewable power set to meet 60 per cent of final energy use by 2050. As energy needs evolve, so should Europe's energy security strategy."

The EU's current energy security strategy was adopted in 2014, at a time when countries relied heavily on Russian imports and renewables made up only a small fraction of the overall mix. Today, this picture has fundamentally changed.

Energy imports are expected to decrease from 60 per cent of EU energy supply in 2022 to 13 per cent by 2050, thanks to transport and heating electrification. Renewables are set to generate 69 per cent of total power by 2030 and Russian oil and gas will be gradually phased out. These developments call for an integrated power-led security approach.

"Energy security has always been a problem but it has never been such a tough problem," said Eurelectric's President and E.On CEO Leonhard Birnbaum. "The recent year has shown us that business-as-usual in Europe is no longer an option. With the threats faced by our sector, security of supply is becoming an urgent priority that policymakers and regulators must acknowledge [this]."

To secure Europe's power supply, the study suggests strengthening three pillars:

1. Better planning: Preparedness frameworks should encompass the entire value chain, include all energy vectors, infrastructure, span across longer timeframes and factor in external threats to better identify system needs.

2. Flexibility: massive flexible capacity will be needed to complement variable renewables – 175 GW should come from new storage technologies and demand side response by 2030. To incentivise investments, capacity mechanisms and flexibility support schemes will be crucial.

3. Functioning markets: effective price signals should reflect system needs and allow consumers to contribute to security of supply by adjusting their energy use.

US debates a slowdown in fossil fuel exit

- Energy Secretary wants to keep coal in the power generation mix
- Claims policies favour new gas plant

Janet Wood

US Energy Secretary Chris Wright has called on the electricity industry to stop the closure of coal power plants, saying "no one has won by that action".

Coal accounts for about 15 per cent of US power generation, down from more than half in 2000, according to the US Energy Information Administration (EIA). More than 120 coal fired power plants are scheduled to be shut down over the next five years, said Michelle Bloodworth, President of the America's Power trade group.

Coal power advocates say they are hopeful a national energy emergency declared by Trump on his first day in office provides an avenue for the government to intervene, but environmentalists cite the advantages of other generation sources.

"Coal has been uneconomic compared to every other energy source except for nuclear power for quite a few years now," Erich Pica, President of Friends of the Earth, said in an interview. "The only way you keep coal plants operating is if the federal government subsidises the heck out of this extinguishing energy source."

Recent figures in the EIA's 'Short-Term Energy Outlook' (STEO), anticipate that US utilities and independent power producers will add 26 GW of solar capacity to the US electric power sector in 2025 and 22 GW in 2026, adding to a record 37 GW of solar capacity added last year. It forecasts wind capacity will increase by 8 GW in 2025 and 9 GW in 2026, slight increases from the 7 GW added in 2024.

Natural gas is still the largest source of US power generation and instead of coal, US states are investing in gas-fired plant alongside renewables to meet growing demand.

In Nevada, a ten-year old plan to end coal generation will be completed when the state's last utility-owned coal plant will cease running later this year. But environmentalists are dismayed that the North Valmy site will be re-powered as a natural gas plant. Regulators approved the conversion, but the utility has further proposed to add 411 MW of natural gas peaking units.

"Utilities all get judged for how reliable they are," said Michael Milligan, an independent power system consultant who specialises in the integration of renewable energy into the power grid. "They don't get extra credit for being extra reliable – nobody gets fired if they're too reliable."

In Pennsylvania, the Federal Energy Regulatory Commission has approved a proposal from system operator PJM with criteria for new projects that include being ready to build, high capacity and the ability to produce electricity at times of shortfalls. Critics say the process favours gas fired plants.

Battery auctions in prospect in Argentina and Brazil

Argentina and Brazil are both setting out to procure battery storage by auction for the first time.

Argentina's Energy Secretariat within the Ministry of Economy has launched an auction to contract 500 MW of new battery capacity across the Metropolitan Area of Buenos Aires.

The international open call, dubbed Almacenamiento GBA (AlmaGBA), envisages an investment of $500 million. The selected projects will have to be implemented in 12 to 18 months.

Winning bidders will secure contracts with power distributors Edenor and Edesur, with state-run wholesale electricity market administrator CAMMESA acting as guarantor.

The tender is the first of a series of measures aimed at guaranteeing energy supply in the country.

Meanwhile Brazil is planning its first auction to add batteries and other storage systems to its national power grid and expects to attract investments of $450 million, according to an estimate by consultancy Oliver Wyman.

The proposed auction will take place in June and will offer 10-year contracts, with supply beginning in July 2029. The systems will have to deliver maximum power availability equal to four hours a day, receiving a fixed price.

Power companies such as Portugal's EDP and Brazil's ISA Energia have indicated they are interested in bidding for contracts.

Grid upgrades planned for Rio de Janeiro

Enel Distribuição Rio has announced a 74 per cent increase in grid investment to modernise the distribution grid in 66 municipalities in the state of Rio de Janeiro. It will spend R$6.1 billion ($1.03 billion) in its investment plan for 2025 to 2027, compared with R$3.5 billion between 2024 and 2026. It more than doubles the amount invested between 2021 and 2023.

"We are investing more and more throughout the concession area. The new plan provides for an even greater volume of resources, which will be earmarked for a series of measures to speed up the restoration of power and bring us ever closer to our customers," said Francesco Moliterni, President of local network operator Enel Rio. Enel will reinforce the automation of the network with thousands of telecontrol devices, which make it possible to remotely operate the electricity system and reduce restoration times in the event of outages. The company will also intensify preventive and corrective maintenance actions to reduce unscheduled shutdowns, inspecting 66 000 km of electricity network.

"Our aim is to ensure that the number of customers affected by outages is as low as possible, making the service more efficient and agile," explained Moliterni.

US Congress acts to speed up transmission network expansion

- Priority lines to be identified and fast-tracked
- Electrification and demand growth delayed by years-long process

Janet Wood

Republicans in both Houses of Congress have joined forces to propose legislation that would require the Federal Energy Regulatory Commission (FERC) to reform the 'queue' of transmission network projects to fast-track priority projects.

Representative Troy Balderson (R-OH) and Senators John Hoeven (R-ND) and Todd Young (R-IN) introduced the identical Guaranteeing Reliability through the Interconnection of Dispatchable (GRID) Power Act, H.R. 1047 and S. 465.

If signed into law, the measure would direct FERC to develop rules that authorise regional transmission organisations and independent system operators to fast-track critical projects by allowing them to bypass the years-long wait in the interconnection queue.

The American Exploration and Production Council, the Ohio Oil and Gas Association, the Ohio Chamber of Commerce, the Ohio Manufacturers' Association all endorsed the bill.

"Our interconnection queue is buckling under its own weight," said Balderson. "Transmission providers are tasked with ensuring we have enough electricity to keep the lights on, but the growing backlog of projects is adding years to an already time-consuming process."

Todd Snitcher, President and Chief Executive of the Electric Power Supply Association (EPSA), said significant increases in electricity demand are expected in every region of the country, driven by data centres, domestic manufacturing and the electrification of various sectors of the economy.

The bill would empower "grid operators to put baseload power generation projects at the front of the line for approval" said Hoeven. The bill would set deadlines for FERC, requiring the agency to promptly set up the priority approval process and to start acting on baseload power projects.

Grid operators would be required to conduct feasibility and system impact studies on the generation projects before signing an interconnection agreement, and also required to allow for public comment and stakeholder engagement before submitting proposals to FERC.

"Grid operators should be given significant flexibility to address current or future reliability concerns, including the creation of an accelerated interconnection for resources identified as critical to maintaining reliability," said EPSA's Snitcher. "The bill appropriately requires stakeholder feedback and FERC approval before any changes are made, ensuring that all viewpoints are heard."

Congress's action has come as fears have been raised that tariffs imposed by President Trump on Canadian exports to the USA will raise electricity prices, because Canada may retaliate by limiting power exports to northern US states.

According to the US Energy Information Administration, the states that use electricity wheeled across from Canadian are North Dakota, Michigan, Minnesota, and Wisconsin, Connecticut, Maine, Massachusetts, Vermont, and New York, including New York City.

Tennessee fusion plan aims for commercialisation

The Tennessee Valley Authority (TVA) and Type One Energy have agreed to jointly develop plans for a potential TVA fusion power plant using Type One Energy's stellarator fusion power technology. They hope the 350MW fusion pilot power plant, named Infinity Two, will provide power as early as the mid-2030s, potentially repurposing retired TVA fossil fuel power plant infrastructure.

The Cooperative Agreement expands on Project Infinity, first launched by Type One Energy, TVA, and the U.S. DOE's Oak Ridge National Laboratory (ORNL) in early 2024, with support from the state of Tennessee. Originally centred on deploying the Type One Energy Infinity One stellarator prototype in TVA's Bull Run power plant, Project Infinity now encompasses a deeper, broader engagement toward commercialisation of fusion energy.

Joe Hoagland, TVA Vice President Innovation and Research, explained: "Energy security is national security, and we are focused on developing a technology, supply chain, and delivery model to build an industry that can power America and the world."

ABI Research noted investment in fusion is rising, reaching a record $7 billion in 3Q 2024. "Nuclear fusion and SMRs are just one of many energy alternatives enterprises and industries are looking into," said Daniel Burge, Smart Energy for Enterprises and Industries Analyst at ABI Research.

Indonesia wavering on climate commitments

- Climate envoy says Paris Agreement "irrelevant" after US withdrawal
- Analysis shows new energy plan increases coal use

Junior Isles

Last month the Environment Ministry again pledged Jakarta's support for the landmark Paris climate deal following its climate envoy's suggestion that the agreement was "irrelevant" after US President Donald Trump again withdrew from it.

In late January climate and energy envoy Hashim Djojohadikusumo, said targets to cut greenhouse gas emissions for countries such as Indonesia were unfair when the US, as the world's largest historical polluter, was reversing on climate commitments.

"If the US, which is currently the second-biggest polluter after China, refuses to comply with the international agreement, why should countries like Indonesia comply?" Hashim told a conference in Jakarta.

"This is a matter of justice. Indonesia 3 tons, America 13 tons… Where is the justice in that?" said Hashim, referring to carbon dioxide emissions per capita figures. Hashim added that he believed an agreed $20 billion financial programme to help wean Indonesia off coal would "certainly be scrapped" by the US under Trump. The so-called Just Energy Transition Partnership "is a failed programme", he said.

Despite the statements, there has been no indication from the government that it would withdraw from the Paris Agreement, with officials still saying that it would continue to consider the pledge's targets going forward as they attempt to harness other alternative sources of energy.

"We have to boost our competitive strengths while still paying attention to the agreement's consensus," said Energy and Mineral Resources Minister Bahlil Lahadalia.

Indonesia is the world's sixth-largest polluter because of its heavy reliance on coal. It generates 66 per cent of its electricity from coal and continues to build new coal fired power plants to fuel its growth.

President Prabowo Subianto has pledged to cut CO_2 emissions by 2030 to reach net zero emissions by 2060. In its new national electricity master plan announced in November, it therefore committed to phasing out coal by 2040. Analysts have said that is an aggressive target for a country that has failed to meet any of its climate goals.

A new report by London-based think-tank Ember says that although the master plan projects growth in renewables, there will in fact also be a sharp rise in coal generation beyond 2030.

Ember's analysis claims that the new plan includes 26.8 GW of new coal capacity over the next seven years, with more than 20 GW of that coming from captive coal plant expansion, which supplies energy to industry rather than the grid.

■ The Indonesian government has announced plans to build more than 20 nuclear power plants by 2050. State utility PLN is said to be collaborating with companies from Japan and the US to construct several nuclear power plants with a total capacity of 4.3 GW, including floating small modular reactors (SMRs). The challenges posed by climate change are one of the reasons cited for the need to build nuclear power plants.

Japan adopts new carbon reduction targets as part of energy plan

Japan's government has adopted new decarbonisation targets aimed at reducing greenhouse gas emissions by more than 70 per cent from 2013 levels over the next 15 years. The new targets came as the country set out a new energy plan that increases the share of renewables and ends the nuclear phase-out policy adopted after the Fukushima nuclear plant meltdown.

Last month saw the country submit its new Nationally Determined Contribution (NDC), to the United Nations under the Paris Agreement, committing Japan to reducing carbon emissions by 60 per cent by 2035 from the 2013 levels, and by 73 per cent by 2040. Japan previously set a 46 per cent reduction target for 2030.

The new targets were put forward as the government approved its new energy plan for the next five years, which for the first time sets a goal for renewables to be the country's largest source of production by 2040 and seeks to make the most of nuclear energy to reach almost the level prior to the Fukushima accident.

The plan specifically states that offshore wind is "a winning card for making renewable energy the main power source" because of the possibility of mass introduction as well as anticipated economic ripple effects. The government aims to have offshore wind projects with a total capacity of 30-45 GW by 2040.

The new basic energy plan approved by the Council of Ministers establishes the share of each type of energy in the country's mix for its fiscal year 2040, when it aims for renewables, such as solar and wind, to account for between 40 per cent and 50 per cent of the total, thermal energy for approximately 30 per cent to 40 per cent, and nuclear energy for around 20 per cent.

In the previous energy plan, drawn up in 2021, Japan envisaged that the share of renewables would be between 36 per cent and 38 per cent by 2030, which has now been revised upwards making it the main energy source for the first time. The new document, however, removes the previous textual reference that it would prioritise these energies.

The new plan also discards the textual reference to "reducing dependence on nuclear energy as much as possible that had been systematically included since the Fukushima accident in 2011 and, instead, states that the use of nuclear energy will be maximised together with renewables, keeping the percentage at around 20 per cent – almost the level prior to the incident.

In fiscal 2023, the percentage of energy production through nuclear in the Asian country stood at 8.5 per cent, according to government data.

To achieve its nuclear target, Japan estimates that it would have to have some 30 reactors in operation. Currently, the archipelago has 14 active reactors, 19 suspended and 2 under construction, while 27 have been shut down or are being dismantled, according to data from the International Atomic Energy Agency (IAEA).

Australia supports hydrogen industries with tax breaks

The Australian Senate has given the green light to a $6.7 billion hydrogen production tax incentive (HPTI) that will unlock investment opportunities across Australia, opening the door to increased scale of 'green' hydrogen produced using renewable energy sources.

The Future Made in Australia (Production Tax Credits and Other Measures) Bill 2024 is part of the Australian government's $22.7 billion Future Made in Australia Plan and aims to maximise economic and industrial benefits of the international move to net zero.

The government said it would introduce the tax breaks for businesses active in the production of green hydrogen and critical mineral miners and processors in order to stimulate growth in these industries.

The incentives include A$2 ($1.25) per kilogram of green hydrogen produced between 2027 and 2028 and between 2039 and 2040 for up to ten years per project, the country's resource ministry said.

For critical minerals, the tax break would come in at 10 per cent of "relevant processing and refining costs" for the 31 minerals the Australian government has identified as critical, the ministry also said. Those would be in effect for the same period as the green hydrogen tax break.

A key detail about eligibility for the tax breaks is that a project must be up and running to qualify for them. In other words, companies must secure the upfront investment in green hydrogen production or critical mineral processing before they become eligible for the new incentives.

Hydrogen is also seen as an important energy storage vector that can maximise the use of green but intermittent renewable energy sources such as wind and solar, which are rising rapidly in the country.

India needs massive investment to meet 2070 net zero target

India will require significant investment, particularly in the power sector, to achieve its 2070 net zero commitment, according to a report by Moody's Ratings. The power sector, which accounts for 37 per cent of the country's carbon emissions, will need funding equivalent to 2 per cent of GDP annually over the next decade and between 1.5-2 per cent of GDP over the next 25 years.

Moody's estimates that India's power sector will require investments of between Rs4.5 trillion and Rs6.4 trillion ($53-$76 billion) until FY2034-35. Beyond that, annual investments will range from Rs6 trillion to Rs9 trillion through FY2051. These investments will be shared between public and private players, with both domestic and foreign capital playing a crucial role, says Moody's.

India's economy is projected to grow at an average of 6.5 per cent annually over the next decade, with power demand rising at a similar pace, Moody's said. While India is expected to add 450 GW of renewable capacity during this period, it will not be sufficient to meet rising demand. As a result, coal-based power generation capacity is projected to expand by about 35 per cent, increasing from 218 GW to approximately 295 GW by 2034-35.

Solar and wind power will dominate new capacity additions over the next 20-25 years, while nuclear and hydropower will play a smaller role, Moody's said. Installed generation capacity is expected to double by FY2034-35, supporting a 1.7-1.8x rise in power demand. The share of non-fossil fuel-based electricity is projected to grow to 45-50 per cent of total output by FY2034-35, up from around 23.5 per cent in FY2023-24.

Nuclear is also set to see a massive boost in nuclear. Following policy reforms announced by the Indian government, which now allow private and foreign investments in the nuclear sector, NTPC, India's largest power producer, is set to triple its initial nuclear power target. It now aims to invest $62 billion to build 30 GW of capacity instead of the earlier 10 GW plan. India, which has committed to achieving 500 GW of non-fossil fuel capacity by 2030, aims to reach 100 GW of nuclear capacity by 2047.

Last month Indian Prime Minister Narendra Modi concluded agreements with both France and the US that will support his country's nuclear programme.

Germany boosts renewable energy expansion

- New offshore wind sites to be auctioned
- Partners roll-out battery storage and solar

Janet Wood

The German Federal Network Agency has launched a tender for the N-9.4 offshore wind site in the North Sea. The site can accommodate 1 GW of installed offshore wind, and it is expected to be fully operational in the third quarter of 2032.

The tender is the first of several planned over the next four years that could bring as much as 12 GW of additional installed offshore wind capacity to the German grid. The next will be for two offshore wind areas with a combined installed capacity of 2.5 GW recently defined by Germany's Federal Maritime and Hydrographic Agency. According to its 2023 plan the sites will be auctioned by Germany's Federal Network Agency later this year.

Germany's offshore wind targets are at least 40 GW of offshore wind in operation by 2035 and at least 70GW by 2045.

Meanwhile, RWE has commissioned a 220 MW/235 MWh battery – one of Germany's largest – at its Hamm and Neurath sites. Nikolaus Valerius, Chief Executive of RWE Generation SE, said large-scale energy storage is vital to complement the expansion of renewable energy sources, and it has additional battery storage projects already in the pipeline. A new player in the German battery industry is a partnership between Zurich-based energy storage owner-operator BW ESS and German energy storage developer Mirai Power. The two companies say Germany is expected to add around 7GWh of new battery capacity by 2026, five times current levels, and the partners aim to develop up to 1GW of large batteries in Southern Germany.

"Southern Germany is a region with huge energy storage development potential, and our partnership with a global leader like BW ESS will help us accelerate our efforts to decarbonise the energy system," said Marco Frascati, Managing Director of Mirai Power.

Other new partnerships are focusing on expanding solar farms. Axpo and Raiffeisen Waren-Zentrale Rhein-Main AG (RWZ) recently announced a partnership that focuses on new economic opportunities for farmers. RWZ will handle landowner outreach and the associated contract negotiations and it plans to participate as a regional anchor shareholder, offering its RWZ customers new economic prospects options. Axpo will be responsible for the development, construction, and operation of the solar installations.

Meanwhile German newspapers report that authorities are considering repurposing the Nord Stream 2 pipeline, which was built to transfer gas from Russia to Germany. It would potentially be used to deliver green hydrogen or natural gas from Finland, according to German reports.

Explosions in 2022 severely damaged both Nord Stream pipelines and they are currently inoperable.

Partners begin research projects on offshore energy storage

Sixteen partners from across the European offshore renewable energy sector have launched the Offshore Electricity Storage Technology Research (OESTER) project to accelerate the development of offshore electricity storage technologies.

The three-year project includes utilities such as RWE and Vattenfall, and the Dutch research organisation TNO and has been approved under the framework of Mission-driven Research, Development and Innovation (MOOI), by the Netherlands Enterprise Agency. The Dutch Marine Energy Centre (DMEC) said the project will address challenges in the renewable energy transition, such as system integration, and demonstrate the benefits of renewables.

Energy storage systems could offer a viable solution to challenges that face the renewables sector due to the mismatch between variable energy production and demand. This often results in electricity curtailment, reducing the effective utilisation of renewable resources and limiting their potential to accelerate the energy transition.

In addition, when wind farms are generating simultaneously it can lead to oversupply and low or even negative prices. This may damage the business case of offshore wind farms.

Key technologies under evaluation include batteries integrated into wind turbine monopiles; compressed air energy storage; underground pumped hydro co-located within wind farms; electrolysers on offshore platforms directly connected to wind farms.

Poland investment agreed for new nuclear and wind

Plans for the Polish government to provide public aid to state energy company Polskie Elektrownie Jadrowe (PEJ) to build Poland's first nuclear power plant have passed its Lower House, with just one MP voting against the bill and one abstaining.

The new legislation, which sees PEJ receive public aid of up to €14.5 billion, will be now debated by the Senate. The current version of the Polish Nuclear Power Programme would see construction of two plants with a total capacity of 6-9 GW.

Industry Minister Marzena Czarnecka said recently: "2025 is a year of strategic decisions, when it comes to investment in the energy sector," adding, "We'll invest PLN650 billion ($159 billion), including PLN65 billion in power grid investments alone."

Meanwhile the European Investment Bank (EIB) has signed off a €400 million loan agreement with Polska Grupa Energetyczna (PGE) to support development of the Baltica 2 offshore wind farm. The project, being developed with Denmark's Ørsted, will have a capacity of 1.5 GW and be located in the Baltic Sea, 40 km off the coast. The project, set for completion in 2027, will have 107 turbines.

EIB Vice-President Teresa Czerwińska called it a "transformative" step for the country's energy sector.

UK to invest in generation and networks to support electrification

- Nuclear permitting process to be eased
- Drax subsidy maintained but reduced

Janet Wood

The UK government has kicked off planning reforms intended to ease permitting for new nuclear plants.

New nuclear, along with other forms of carbon-free generation, were seen to have gained in importance recently, because the UK's independent Climate Change Committee placed more emphasis on electrification in its advice to government on how to reach net zero. The latest advice, which makes recommendations on policies to keep the country on a trajectory to net zero by 2050, refers to the period 2038-2042 and envisages widescale electrification in most sectors including home heating.

The government has also called artificial intelligence and data centre development "a strategic priority for growing the UK economy", establishing a new AI Energy Council to study the opportunities for "renewable and innovative energy solutions" to power 'AI Growth Zones'.

Reforms to planning rules will clear a path for small modular nuclear reactors (SMRs) to be built in the UK.

Among the planned changes announced by Secretary of State Ed Miliband are scrapping a list of eight current nuclear sites that were identified as potential new-build areas after a government-led selection process. That assumed new nuclear plants would be on the gigawatt scale, but the government believes SMRs' lower requirements on space and evacuation zones mean they could be built on many different sites across England and Wales (Scotland has outlawed new-build).

Chris White, law firm DWF's UK Head of Nuclear, also highlighted in particular, "the removal of the current 'sunset' provision (which effectively puts a time limit on development at a prescribed list of sites)," saying it "should further encourage and accelerate private sector developers".

The government was more equivocal on a decision on whether to continue to subsidise the Drax biomass power station, which has been under scrutiny over sustainability concerns for its wood pellet fuel. Miliband has decided subsidies will be renewed from 2027, but at a lower level and under tighter conditions.

Under the new agreement, Drax will have a "much more limited" role in the UK's energy system, providing power only when it is needed, Energy Minister Michael Shanks said in the statement. The previous arrangement "did not deliver a good enough deal for billpayers and enabled Drax to make unacceptably large profits", he added.

Susie Elks, Senior Policy Advisor for climate change think-tank E3G said: "E3G's modelling has shown that the government can hit its 2030 power target without the need for biomass. It is reckless to continue subsidising this industry which is a false climate solution."

Meanwhile the government's infrastructure adviser, the National Infrastructure Commission (NIC), has warned that electrification will require major investment in low-voltage distribution grids. It says demand for electricity is set to climb by 50 per cent by 2035 and to double by 2050. The NIC said: "The current regulatory process is too complex and focused on the short-term cost of network investment, rather than the wider goals of economic growth and decarbonisation." It estimates that annual investment in the distribution networks should be "at least" double current rates to hit the £37-50 billion required and must accelerate most steeply.

European Commission publishes new Clean Industrial Deal plan

The European Commission has published proposals for a new 'Clean Industrial Deal' (CID) plan, centred on promoting of domestic clean technology manufacturing, especially of renewable and low-carbon hydrogen technologies.

Jorgo Chatzimarkakis, Chief Executive of Hydrogen Europe, said: "By incentivising demand and rewarding early movers, looking at the pull over the push, the Clean Industrial Deal can jumpstart Europe's clean technology sectors, including hydrogen." But he called for urgent action, saying: "If there is no positive development in the next 18 months, we are all but guaranteed to miss our 2030 climate targets."

The Affordable Energy Action Plan (AEAP), a strategy to lower energy costs for EU citizens, included new methodologies for network taxes and charges to incentivise flexibility, along with proposals to accelerate permitting.

However, Hydrogen Europe said it was "dismayed" that the CID indicators are expressed in terms of electrification, which it said was not technology neutral.

The European Partnership for Energy and the Environment (EPEE), representing manufacturing companies and associations operating in the refrigeration, air-conditioning and heat pump industry, also welcomed the CID and AEAP.

Director General Russell Patten said: "Our products are a key solution provider for the decarbonisation of heating and cooling and an important contributor to energy security" and highlighted plans for a new Heating and Cooling Strategy to be published in 2026.

Rwanda launches new policy to boost energy generation

- Government targets better access to cleaner energy
- Focus on infrastructure expansion and off-grid solutions

Nadia Weekes

The Rwandan government has unveiled a new energy policy that identifies a requirement for at least RWF2.5 trillion ($1.8 billion) in investment to expand generation from various sources over the next decade.

The new policy focuses on increasing energy access and transitioning to cleaner energy solutions. While just over half of households in Rwanda have access to electricity at present, the policy sets the bold target of providing universal access by 2030.

To achieve this, the government will focus on expanding the national grid, improving infrastructure and promoting off-grid solutions like solar home systems and mini-grids.

The government plans to encourage private sector participation in energy projects. To attract investment, it plans to streamline regulatory processes, offer incentives for renewable energy projects, and facilitate public-private partnerships.

International cooperation will also play a crucial role. Rwanda will leverage regional and international partnerships in order to improve energy security and access to climate finance mechanisms.

The policy highlights the importance of using the country's abundant energy resources to reduce dependency on imports, and to use energy not just as a utility but as a catalyst for broader socio-economic progress.

Because hydropower accounts for 27 per cent of Rwanda's total installed electricity capacity, the policy aims to conserve water catchment areas and increase storage capacity for reservoirs, as well as develop micro hydropower projects and rehabilitate existing plants.

With its geographical location near the Equator, Rwanda has huge solar potential, but only 12 MW of installed capacity. The policy aims to enhance solar energy use by supporting hybrid solar-storage technologies and local production. The target is for 30 MW by the fiscal year 2029-30 and another 20 MW by 2034-35.

Wind resources are generally poor in most of Rwanda, but some areas show promise. The policy allocates RWF500 million for feasibility studies and RWF15 billion to build 15 MW of wind power capacity.

Rwanda's potential for geothermal energy is estimated at up to 90 MW. The policy supports resource assessment to attract investors and manage exploration risks.

Lake Kivu holds significant methane gas resources, with an estimated volume of 40 billion cubic metres (bcm). Methane has been exploited for power generation in Rwanda since 2015, currently producing 82.4 MW. An investment of RWF218 billion will be made to increase methane generation and further exploit this energy resource for cooking and fertiliser production.

The government aims to expand waste-to-energy capacity by supporting local initiatives, offering incentives for plant development, and promoting large-scale production and distribution.

Rwanda has extensive peat resources with an estimated 23-33 million dry tonnes of exploitable deposits, representing a technical potential of 121–161 MW of capacity. The policy focuses on developing hybrid power systems combining peat with other energy sources, as well as researching efficient peat power generation and promoting investment in peat by-products.

Having identified nuclear energy as a long-term solution, the policy supports the creation of a regulatory framework and allocates RWF5.3 billion for a feasibility study for a nuclear power plant with.

Finally, the energy policy includes a feasibility study for developing hydrogen technology, with an investment of RWF500 million.

Türkiye on track to surpass renewables targets

Türkiye has successfully doubled its solar energy capacity in two and a half years, surpassing its 2025 target ahead of schedule, according to analysis by the UK-based think-tank Ember.

By the end of 2024, the country's solar capacity reached 19.6 GW, up from 9.7 GW in mid-2022, the research reads. Self-consumption installations accounted for 94 per cent of the growth.

"Over the past two years, solar and wind energy combined have avoided $15 billion in natural gas imports, reinforcing Türkiye's energy independence," Ember noted, adding that the country has a pipeline of 33 GW in pre-licensed solar and wind projects, far surpassing its 2030 target.

Türkiye concluded a wind tender auction in January, awarding 1.2 GW of capacity to five projects across three provinces. The move is expected to attract $1.2 billion in investment.

One hundred firms bid for Iraq steam power plants

More than 100 local and foreign companies are bidding for projects to construct 11 steam power stations in Iraq with a combined generation capacity of 15 GW, according to the Iraqi Electricity Ministry.

The ministry is offering three investment models to the companies wishing to formally bid for these projects.

A capacity of 6000 MW is to be located at four plants in South Iraq, 5500 MW at five plants in Central Iraq and 3500 MW at three plants in the North.

Iraq is seeking to boost its power supply networks following severe damage during wars.

India, France unveil nuclear reactor partnership

- New-generation reactors to boost electricity supply
- Collaboration extends to training researchers and professionals

Nadia Weekes

India and France have agreed to jointly develop a new generation of nuclear reactors as one of the three nuclear agreements signed during a visit to France by India's Prime Minister Narendra Modi.

Under a new strategic partnership, the two countries will cooperate on advanced modular reactors (AMRs) and small modular reactors (SMRs), alongside developing a joint road map on AI data centres and wider civil nuclear cooperation.

Noting that AI requires vast amounts of electricity, India's foreign secretary, Vikram Misri, said SMRs and AMRs could play a key role.

SMRs have a smaller capacity than conventional nuclear reactors and can be manufactured in factories and installed elsewhere. This class of reactors, which can have as much as 300 MW of generating capacity, can be assembled in locations where larger nuclear facilities are not feasible.

There has been renewed interest in India's nuclear energy sector by major players such as France following the government's recent move to amend the Atomic Energy Act and Civil Liability for Nuclear Damage Act.

Misri said the two sides will collaborate in jointly designing, developing and producing SMRs and AMRS, and also cooperate in training researchers and professionals in civil nuclear energy.

Though the technology is still in its initial stages, such cooperation can help India leverage the existing industrial ecosystem for nuclear components and power plants, Misri added. India plans to have at least five SMRs by 2033.

India's nuclear power generation capacity has grown significantly, nearly doubling from 4780 MW in 2014 to 8180 MW in 2024. Capacity is projected to triple to 22 480 MW by 2031-32. At present, nuclear power plants contribute 1.8 per cent of India's total installed power capacity of 462 GW.

In a joint statement, the two governments said that "nuclear energy is an essential part of the energy mix for strengthening energy security and transitioning towards a low-carbon economy".

Nigeria to see improved power generation in 2025, says AfDB report

Nigeria is likely to experience improved power supply in 2025, bolstered by several factors including a planned $1 billion package from the African Development Bank (AfDB), but must overcome funding and distribution challenges.

"While advancements in generation, grid infrastructure and regulatory reforms offer optimism, persistent challenges around gas supply, distribution inefficiencies and funding limitations will need to be addressed for sustained growth," according to a new report by Olaniwun Ajayi.

The Nigerian National Integrated Power Project (NIPP) and other initiatives will boost renewable energy development, particularly solar. "Nigeria presents a compelling investment opportunity for both domestic and international investors," the report states.

Olaniwun Ajayi said infrastructure improvements were anticipated through large-scale investment in transmission and distribution networks, reducing losses and boosting reliability.

"Nigeria's continued engagement with the West African Power Pool (WAPP) reflects a strategic effort to integrate the national grid into regional energy systems, facilitating cross-border electricity trade," the report adds. This positions Nigeria as a key player in regional energy stability.

The establishment of the Nigerian Independent System Operator (NISO), expected to be completed by early 2025, marked a significant step towards a decentralised electricity market and should improve the efficiency of system operations.

Nigeria suffers frequent blackouts due to systemic failures. In 2024 alone, the national grid collapsed multiple times, throwing millions into darkness and disrupting economic activities.

According to the report, the potential unbundling of the Nigerian Bulk Electricity Trader (NBET) will lead to a more mature, competitive electricity market, enabling direct, bilateral trading between generation and distribution companies, thereby allowing for transparency in electricity pricing.

Under the Interconnected Mini-Grid Accelerated Scheme (IMAS), several mini-grids have been established across the country, providing clean, renewable energy to underserved communities, unlocking new economic opportunities and improving access to key services such as education and healthcare.

By replacing traditional fossil fuel-based energy sources, such as diesel generators and kerosene, the mini-grids are also significantly reducing carbon emissions.

BP pivots on clean energy ambition

- Oil and gas major bows to pressure from investors
- Shell says green energy businesses must start delivering returns

Junior Isles

BP is switching focus back to its roots after its bet on renewable energy hit the group's share price, causing a backlash from investors.

The UK-headquartered oil and gas major has abandoned an attempt to reinvent itself as a green energy company, bowing to pressure from investors after its aggressive shift away from fossil fuels over the past five years.

The group now says it will increase oil and gas spending by a fifth to $10 billion a year and cut expenditure on renewables by 70 per cent.

BP's Chief Executive Officer Murray Auchincloss said that the change was a "fundamental reset of BP's strategy", as he scrapped targets to cut fossil fuel production and develop 50 GW of renewable power.

"Our optimism for a fast transition was misplaced and we went too far, too fast," he said, as he announced the new strategy following pressure from activist investor Elliott Management. "Oil and gas will be needed for decades to come."

He said the growing electricity demands of data centres would make gas, in particular, the fuel of choice. "The challenge is how do we decarbonise this stuff as much as you can," he said, adding that BP was already actively capturing carbon emissions."

BP said it plans to more than double the oil major's market value within five years to $200 billion, the level it achieved before the 2010 Deepwater Horizon disaster.

In response to the decision, Charlie Kronick, Senior Climate Adviser for Greenpeace UK, said: "This is positive proof that fossil fuel companies can't or won't be part of climate crisis solutions; this conversation is over.

"The Climate Change Committee has said UK emissions must be drastically slashed – the reality is now it's up to the government to see this through and to ensure companies like BP pay their share for the climate damage they're causing."

Auchincloss said, however, that the group had not abandoned its plans to be a diversified energy company. "I don't really see anybody else doing any more than we're doing at this type of scale," he said. "You will see no better integrated energy company in the world than BP."

Earlier in the month BP reported strong renewables growth with increased solar capacity. The company said installed renewables capacity reached 4 GW by the end of December 2024, marking an increase from 2.7 GW in 2023 and 2.8 GW in Q3 2024.

Meanwhile, its competitor Shell also looks set to shift away from renewables investment. At the end of January, Wael Sawan, the UK oil major's Chief Executive, said the company's green energy businesses must start delivering returns to shareholders. In its fourth-quarter results, it revealed that it had written down the value of its US wind business by $996 million, after quitting the Atlantic Shores project off the coast of New Jersey.

It also said its renewables and energy solutions business recorded an adjusted earnings loss of nearly $500 million in 2024, a 166 per cent fall compared with the year before.

Sawan said Shell had spent $8 billion on renewables since 2023 and was on track for its three-year target of between $10 billion and $15 billion of investment. But he warned: "The key for us is making sure that we deliver the returns that our shareholders expect of us from that capital."

Siemens Energy gets off to strong start

Siemens Energy has made a strong start to its new fiscal year, as demand for its products remained favourable and the strong order trends continued.

Revenue of €8.9 billion increased by 18.4 per cent, with all segments recording growth. Orders for Siemens Energy amounted to €13.7 billion. As expected, this was below the high level of the prior-year quarter, in which Grid Technologies and Transformation of Industry had booked exceptionally high orders. Profit before Special items more than doubled year-over-year to €481 million (Q1 FY 2024: €208 million) again held back by results of Siemens Gamesa, but to a significantly lesser extent than in the prior-year quarter.

Christian Bruch, President and CEO of Siemens Energy AG, said the strong first quarter reflects the market opportunities arising from the increasing demand for electricity, and noted that the strong cash flow was mainly driven by growth across all businesses.

"Strong electricity consumption growth, replacement investment and the requirements of the energy transition necessitate investment in energy infrastructure supporting all businesses of Siemens Energy," he said. At Siemens Gamesa we continue to work on the measures to reach breakeven in fiscal year 2026. We continue to strive to resume sales activities for the 5.X onshore turbine during fiscal year 2025."

Gas Services assumes a comparable revenue growth of 7 per cent to 9 per cent and a profit margin before Special items of 10 per cent to 12 per cent.

Grid Technologies plans to achieve a comparable revenue growth of 23 per cent to 25 per cent and a profit margin before Special items between 10 per cent and 12 per cent.

Transformation of Industry expects a comparable revenue growth of 11 per cent to 13 per cent and a profit margin before Special items of 8 per cent to 10 per cent.

Siemens Gamesa assumes a comparable revenue growth of negative 9 per cent to negative 5 per cent and a negative profit before Special items of around €1.3 billion.

The company expects to achieve comparable revenue growth (excluding currency translation and portfolio effects) in fiscal year 2025 in a range of 8 per cent to 10 per cent and a profit margin before Special items between 3 per cent and 5 per cent.

Shortly after announcing the results, Siemens Energy re-elected Joe Kaiser as Chairman of its Supervisory Management Board. Speaking at the virtual Annual General Meeting, Kaiser said: "Today's Annual General Meeting has shown that our shareholders are convinced of the operational strength and strategic direction of Siemens Energy."

EU businesses warn Brussels on excessive green regulation

European companies have warned Brussels policymakers that excessive regulation related to decarbonisation will harm the bloc's competitiveness, especially as the Trump administration has scrapped US climate change commitments.

Christian Bruch, Chief Executive at Siemens Energy, said the burden on businesses from rules intended to measure their impact on the environment was "disproportionate" to the benefits.

"Just making cosmetic changes to regulations will not move us one inch closer to becoming more competitive," Bruch said, as he singled out the Corporate Sustainability Reporting Directive (CSRD), a rule the EU introduced in 2023 requiring companies to detail their environmental and social impact.

The directive has created more than 1000 data points that must be reported to Brussels, he said, adding that it needed to be "radically shortened and simplified".

Last month the biggest business lobby groups in France, Germany and Italy joined the campaign, calling for the European Commission to go beyond its promise to merely prune reporting regulations by adjusting EU laws "to match the standards of our competitors where appropriate".

In a sign of the growing pressure Brussels is under, the Commission has said it will review the reporting requirements on companies across four pieces of environmental legislation, including the CSRD.

Patrick Pouyanné, the head of oil major TotalEnergies, described the CSRD as "a monster" formed from "good intentions".

Hydrogen partnerships gain momentum

Several major European companies have announced major tie-ups that will support the growth of hydrogen production, signifying growing confidence in the future of the nascent technology.

In mid-February French energy major TotalEnergies and compatriot industrial gas supplier Air Liquide signed agreements to develop projects for offshore wind-powered production and delivery of green hydrogen.

The agreements cover two projects for the production of 45 000 t/y of green hydrogen using renewable power, generated mostly by the OranjeWind offshore wind farm, a joint development by TotalEnergies and RWE.

These projects aim to cut CO_2 emissions from TotalEnergies' refineries in Belgium and the Netherlands by up to 450 000 tonnes a year and contribute to the European renewable energy targets in transport.

Under the first agreement, TotalEnergies and Air Liquide will set up a joint venture that will build and operate a 250 MW electrolyser near the Zeeland refinery in the Netherlands. This project is expected to enable the production of up to 30 000 tonnes of green hydrogen each year, most of which will be delivered to Zeeland's platform.

The electrolyser will be commissioned in 2029 and cut the site's CO_2 emissions by up to 300 000 tonnes a year. This project represents a global investment of around €600 million.

The tie-up followed an earlier announcement by Siemens that it has signed an agreement to become preferred supplier and technology partner for Guofu Hydrogen's production of electrolysers and green hydrogen.

Siemens, together with RCT GH Hydrogen, a Germany-based supplier of hydrogen systems and services, signed a Memorandum of Understanding (MoU) with the China-based supplier of integrated solutions for hydrogen energy, to collaborate on advancing the hydrogen value chain. The partnership marks a significant step forward in the global expansion of green hydrogen technology.

The partnership focuses on three key areas: developing and engineering Guofu's electrolysers and electrolyser systems; equipping new electrolyser manufacturing facilities starting in Germany; and developing, constructing, and operating new hydrogen production plants. RCT GH Hydrogen, as a technology partner, will lead the engineering, procurement, and construction of state-of-the-art hydrogen production facilities.

"This strategic partnership exemplifies Siemens' commitment to driving the industrialisation of green hydrogen production," said Axel Lorenz, CEO of Process Automation at Siemens. "Our portfolio and domain expertise, combined with Guofu Hydrogen's vision and RCT GH Hydrogen's proven engineering capabilities, will help establish new standards in electrolyser manufacturing efficiency and scalability."

Americas

AtkinsRéalis JV will retube Pickering

Candu Energy, an AtkinsRéalis company, in a joint venture with Aecon Group, has won a contract from Ontario Power Generation (OPG) to progress the early works associated with the Pickering Nuclear Generating Station Retube, Feeder and Boiler Replacement project (RFBR).

The contract covers professional engineering services, procurement, and execution planning associated with critical path activities for the announced life-extension of four of Pickering's Candu 1 reactors to operate until the mid-2060s. The mandates are worth approximately C$1.1 billion to the joint venture for early works and roughly C$1 billion for the definition phase.

BWRX-300 RPV contract awarded

BWX Technologies (BWXT) has been awarded a contract by GE Hitachi Nuclear Energy (GEH) to manufacture the reactor pressure vessel (RPV) for the first BWRX-300 SMR to be constructed at Ontario Power Generation's Darling New Nuclear Project site.

The RPV is the largest component within the BWRX-300. GEH previously awarded a contract to BWXT for RPV-related engineering analysis, design support and manufacturing and procurement preparations.

Early site preparation work at Darlington has been completed with construction of the first unit expected to start later in 2025, pending regulatory approval, and commercial operations expected to commence by the end of 2029. A total of four units are planned for the site.

Asia-Pacific

Vedanta seeks bids for Indian NPPs

The Vedanta Group is seeking bids from firms to build 5 GW of nuclear power capacity in India to meet the energy needs of its facilities. Initial bids are to be submitted by March 22.

The company said: "We are looking for a globally recognised company with a proven track record of designing, building, and operating nuclear plants to deliver an end-to-end turnkey project."

It added that it will arrange for the land, infrastructure support, and regulatory approvals.

Vedanta currently has an energy portfolio consisting of 9000 MW of thermal and 4000 MW of renewables under construction. It is aiming to expand its capacity to 20 GW over the next three years.

Siemens Energy supplying gas turbines to Taiwan

Siemens Energy is supplying two gas turbines and related components for the 1200 MW Kuo Kuang 2 power plant in Taiwan.Taiwan predicts its electricity demand will rise by 12-13 per cent by 2030. As a result, the country is expanding clean power generation and upgrading the grid.

Siemens Energy's scope of supply is a complete power island solution including two SGT6-9000HL gas turbines, one SST6-5000 steam turbine, three SGEN6-2000P generators and the Omnivise T3000 control system.

Kuo Kuang 2 is being built with CTCI Corporation as the consortium partner responsible for the plant EPC.

BHEL wins $920 million boiler contract

Bharat Heavy Electricals Limited (BHEL) has won a contract from Maharashtra State Power Generation Company (Mahagenco) worth $920 million for the supply, erection, and commissioning of the boiler-turbine-generator (BTG) package at the coal fired Koradi thermal power station in Nagpur, Maharashtra.

The contract is for two 660 MW units (Units 11 and 12). The scope of work includes equipment supply, civil works, erection, commissioning, and successful performance guarantee testing of both units.

Unit 11 is scheduled to be operational within 52 months, and Unit 12 within 58 months.

Xodus to support CCS hub in Japan

Global energy consultancy Xodus has won a contract to support the development of an advanced carbon capture and storage (CCS) hub in Japan.

Xodus will work with a consortium comprising West Japan Carbon Dioxide Storage Survey (WEST), ENEOS, Electric Power Development (J-Power) and ENEOS Xplora to deliver the Offshore Western Kyushu CCS project.

Under the terms of the contract, Xodus will design the pipeline and cable geotechnical surveys for the Offshore Western Kyushu CCS project.

Offshore Western Kyushu CCS aims to capture and store approximately 1.7 million tons of CO_2 per year from ENEOS's oil refineries and J-Power's thermal power plants located in the Setouchi and Kyushu regions. The captured emissions will be transported via ship and pipeline to saline aquifers off Japan's southwestern island of Kyushu for permanent storage.

Caparo extends Wärtsilä service agreement

Indian energy company Caparo Power has renewed the O&M Agreement it has with Wärtsilä, with a five-year extension.

The 36 MW plant operates with four Wärtsilä 34SG engines powered by natural gas. It supplies baseload electricity to nearby industries through a dedicated transmission system.

In addition to operating the plant, the agreement includes maintenance management, spare parts, operational support, and Wärtsilä's Expert Insight solution. Wärtsilä Expert Insight is a predictive maintenance service that proactively detects potential issues and provides actionable advice to solve them.

Europe

300 MW biofuel power station for Ireland

Ansaldo Energia will supply a AE94.3A turbine for the 300 MW Tarbert Next Generation Power Station in Ireland. The plant will run on 100 per cent hydrotreated vegetable oil (HVO), produced by processing waste feedstocks. SSE Thermal is the plant owner.

The simple cycle plant will supply electricity at periods of peak demand and support the expansion of Ireland's renewable energy generation capacity.

Stefano Gianatti, Executive Vice President New Units of Ansaldo Energia, said: "We are grateful to SSE Thermal for the confidence it has placed in Ansaldo Energia. This new project award demonstrates the Ansaldo Energia capacity to offer low-CO_2 solutions for the power generation market. Our capabilities on HVO successfully complement those on hydrogen, thus providing customers a wide choice to decarbonise their assets."

Vattenfall signs offshore wind power PPA

Vattenfall has signed a power purchase agreement (PPA) with chemicals group LyondellBasell (LYB), for electricity from the Nordlicht 1 wind farm off the German coast.

The PPA covers the supply of electricity from Nordlicht 1 for a period of 15 years, starting in 2028. Under the contract, LYB will purchase around 450 GWh per year for plastics production.

Vattenfall is currently developing the Nordlicht 1 wind farm. The wind farm is located 85 km north of the island of Borkum in the German North Sea. It will have a total output of 980 MW from 68 wind turbines. It is due to be completed and connected to the grid in 2028.

Vattenfall holds a 51 per cent share of the wind farm, while BASF owns 49 per cent.

Finnish hydrogen plant to be powered by Fortum

Fortum has won a contract to supply zero-carbon electricity to cover the initial power needs of a green hydrogen production plant in southwestern Finland owned by P2X Solutions.

The companies have signed a five-year PPA, with the corresponding Guarantee of Origin, which will allow the Harjavalta plant to meet the EU requirements for renewable hydrogen. Fortum will source power for the plant from its renewable energy portfolio.

The 20 MW Harjavalta project is described as the first industrial-scale green hydrogen and synthetic methane plant in Finland. The facility is in the commissioning phase and is expected to start production in early 2025.

Sweco to future-proof east Denmark electricity grid

The Danish distribution system operators Cerius-Radius and its joint service company Nexel selected Sweco to partner in developing the electricity grid in Eastern Denmark. Sweco's order value is estimated at about $11 million over five years.

Sweco will provide EPC services under the agreement which extends until 2030. After the five-year term there is the possibility of three further one-year extensions.

Dariush Rezai, Business Area President of Sweco in Denmark, said: "Sweco plays an important role as an advisor in accelerating the green energy transition in Denmark, and we are excited to contribute our expertise in this new collaboration to future-proof the electrical grid in Eastern Denmark."

2 GWh batteries for UK LDES scheme

Invinity Energy Systems and UK-based energy infrastructure developer Frontier Power signed a partnership and supply agreement to deploy up to 2 GWh of Invinity's vanadium flow batteries.

The batteries will be used in projects that Frontier Power is currently developing to bid into the UK long duration energy storage (LDES) cap and floor scheme. The first application window of this is expected to be open between Q2 and Q3 2025.

Under the terms of the agreement, Frontier Power has reserved up to 2 GWh of Invinity's manufacturing capacity. Final volumes will depend on how much capacity is enabled by Ofgem's 2025 LDES window and how many, if any, project bids are accepted.

The companies will also explore opportunities for collaboration in other locations where Frontier Power is active, including Japan, Korea, Vietnam, Malaysia, the US and the EU.

International

Order for Al Wahda power plant in Morocco

Mitsubishi Power has won a contract to supply two M701JAC gas turbines and auxiliary equipment for the Al Wahda Open Cycle Gas Turbine Power Plant in Morocco owned and operated by The National Office of Electricity and Drinking Water (ONEE).

In addition, Mitsubishi Power signed a long-term service agreement with ONEE for the provision of parts, repairs and services.

Al Wahda is located in the Province of Ouazzane in the north of Morocco. The power plant will be a peaking plant to help stabilise the growing renewable energy contribution to the country's national grid.

Once operational, the plant's two gas turbines will generate a combined 990 MW, representing nearly 7 per cent of Morocco's national grid capacity.

The M701JAC gas turbines are capable of co-firing hydrogen with natural gas, offering flexibility for future decarbonisation.

The Al Wahda Power Plant is expected to begin operation in 2027.

Samsung C&T wins Qatari EPC contract

Samsung C&T Engineering and Construction (E&C) has won a $2.84 billion EPC contract for the Qatar Facility E Desalination and Combined Cycle Power Project in Doha, Qatar under a consortium with Japan's Sumitomo Corporation. The project, expected to be completed in 2029, will supply 16 per cent of Qatar's electricity and 17 per cent of its desalinated water.

The project involves construction of a 2400 MW combined cycle gas turbine (CCGT) power plant and a desalination facility that will produce around 500 000 t/day of water.

Saudi Arabia to expand Qurayyah IPP

Saudi Arabia has announced that it will invest $3.57 billion to expand the Qurayyah CCGT power plant in the Eastern Province by 3.01 GW.

The Saudi Procurement Company has signed a PPA with the Saudi Electricity Company and ACWA Power for this project. The expansion plan includes readiness to incorporate carbon capture units.

ACWA to develop Egypt's largest wind farm

ACWA Power has signed a 25-year PPA with the Egyptian Electricity Transmission Company (EETC) for a 2 GW wind project in Egypt. The project will become the largest wind farm in Egypt, surpassing ACWA Power's existing 1.1 GW Suez Wind Farm. It will also be the largest single-asset independent power producer (IPP) in the country.

The 2 GW wind project will play an important role in supporting the Egyptian government to increase the renewables share in its generation mix to 42 per cent by 2030.

Hydrogen

Discoveries of white hydrogen in Earth's crust could unveil new alternative energy

Tucked away at numerous locations around the Earth, there exists an energy source that promises to make a difference in the future of how we power our world. White hydrogen, which is naturally occurring, is coming into focus within the scientific and business communities. And while it won't be easy to develop, it really might make a difference once it is.

Gary Lakes

If the world wanted to invest in developing a whole new infrastructure for a new industry, would it want to put that money into an energy resource that would provide clean, non-polluting energy, or build a system around capturing, transporting, piping, shipping, storing, and sequestering carbon dioxide? – just so we could continue to burn carbon-generating, greenhouse gas emitting, climate destroying hydrocarbons?

Science has determined that currently there exists about six trillion tons of white hydrogen in the world. White hydrogen is formed underground through a natural geochemical process without human involvement.

Science says white hydrogen has clean energy potential and has numerous advantages over the hydrogen that is manufactured through whatever method is currently used – either from green renewable sources or energy from fossil fuels like coal and gas.

Those advantages include: it is known to be naturally occurring; and it is found in the Earth's crust which means it does not require any energy-intensive processes to produce – that makes it more cost effective and environmentally friendly.

Yet the method of extracting it for use is in the early days of development and there will be significant challenges (as there was with oil and gas). Some developers have suggested fracking – but that puts the new resource in the basket with hydraulic fracturing for natural gas, with big expenses and possible environmental damage.

An entire infrastructure will need to be developed, unless some existing natural gas facilities can be switched to hydrogen, which is now the case in some instances. But new drilling equipment, pipelines, storage and transportation hardware will also need to appear. This in itself would likely create a new industry and many jobs.

There will be difficulties, but when this energy source is burned it produces only water vapor and no direct carbon emissions. As manufactured green hydrogen is capable of doing now, this would make a big contribution to significantly decarbonising industries like steel, aluminium, and transport.

Across the globe, and despite efforts by politicians and hydrocarbon businesses to downplay alternative energies, universities, colleges, private companies, research institutions, and independent entrepreneurs are working to crack the nut that is cheap hydrogen energy. The ongoing technological research and advances promise to make hydrogen a prime source of global energy at some point. As more attention goes to white hydrogen, it is itself looking like a future major player even if time and investment will be needed to overcome the challenges and scale up production.

When hydrogen was first considered as a clean fuel, it was believed that hydrogen did not occur naturally in nature. But that turned out to not be the case, and some scientists have known this for some time. As the story goes, white hydrogen was first discovered in Mali in 1987 in the village of Bourakebougou where a crew was drilling for water. When a workman smoking a cigarette leaned over the well, it exploded. The borehole was closed but reopened in 2012 and has since been supplying the village with a fuel source for power generation. The white hydrogen can be used as is, without the complicated processing needed for hydrocarbons or low-carbon hydrogen.

In recent years, explorers have gone looking for white hydrogen in a number of places, and usually it is found within mountain ranges where the tectonic plates in the Earth's crust rub each other. White hydrogen has been found in the US, Australia, Mali and Albania.

A potentially significant discovery was announced in the Lorraine region of France last month. So far it is considered the Earth's largest deposit of natural hydrogen, estimated at 46 million tons.

Researchers from the GeoRessources laboratory at the University of Lorriane and the French Center for Scientific Research were checking for methane deposits at the Folschviller mining basin in Mosellee, when they stumbled across white hydrogen at a depth of 1250 m.

The researchers reported that the data indicated that the basin is very rich in white hydrogen and suggested that if their findings are confirmed, it could mean a big step forward in the transition to clean energy.

Drilling for white hydrogen is also taking place in a number of locations in the US, including Texas, Colorado and Nebraska, and also Australia. As more research takes place, the promise of white hydrogen continues to capture the imagination of entrepreneurs, and perhaps eventually it could capture some markets.

Gas

US looks to boost gas sales in Asia with Alaska LNG project

Donald Trump's return to the White House has been seen by some as a boon for the US energy industry, especially for the Alaska LNG project, the future of which has been revived.

Gary Lakes

US President Donald Trump has not held back about his desire to see US energy dominate world markets. Certainly, the US is already a big producer and exporter of oil and gas but Trump has made it clear that he not only wants to boost domestic production and reduce regulatory barriers that hinder oil and gas projects, but he wants to see more exports, especially of LNG.

To this end, he has lifted pauses placed on the construction of new LNG export terminals along the Gulf of Mexico put there by former President Joe Biden and granted export authorisations. Trump has urged American companies to sell more oil and gas abroad as well as urged European and Asia countries to buy more LNG.

Europe is expected to purchase more US LNG as it takes new measures that will restrict imports of Russian LNG and as the use of renewables throughout Europe grows. Asian countries are also likely seen buying more US LNG in future. Japan, Taiwan and the Philippines have recently expressed their interest.

Among Trump's prime project choices is Alaska LNG, which has been on the stove for some time, but which has grown cold due to a lack of support due to long-term questions about the need for LNG in the face of efforts to reduce carbon emissions and a lack of support from the previous administration. The cost of the project has also been an issue. But as the market for LNG appears to be returning, Alaska LNG is once again a topic of discussion.

Alaska LNG and the possible participation in it by Japan was discussed last month when Prime Minister Shigeru Ishiba visited Trump at the White House. Although the project was discussed only during a closed meeting, it was reported that Trump emphasized that imports of Alaskan LNG would give Japan the opportunity to reduce its reliance on Middle East gas deliveries and at the same time address Japan's trade imbalance with the US.

There had been some speculation prior to Ishiba's visit that Japanese firms might become partners in the project, but there has been no solid evidence of that yet, apart from comments made by Trump during a joint press conference.

"Japan will soon begin importing historic new shipments of clean American liquefied natural gas in record numbers," Trump said, according to *Alaska Public Media/BBC*. "It'll be record numbers," he added with his usual hyperbole.

Ishiba said through a translator that Japan isn't just interested in LNG. "As the country of Japan, we are interested in importing not just LNG but also bioethanol, ammonia, and other resources at a stable price, a reasonable price from the United States," Ishiba said. "And we also want to improve the trade deficit that the US has towards Japan."

Meanwhile, Japanese conglomerate Mitsui told the *Asahi Shimbun* that it is considering a study on the Alaska LNG project but had not made a final decision.

Although Japan has in the past questioned the viability of the project – it will cost around $40 billion and require the construction of a gas pipeline across Alaska from the North Slope to the state's southern shore. But it is eager to avoid the embargoes that Trump has been threatening the US's other allies with and maintain a strong relationship in the face of an imposing China and erratic North Korea.

Ishiba is reported to have told his host that he hopes Japan can participate in the Alaska LNG project, but he said nothing of the project publicly while in Washington.

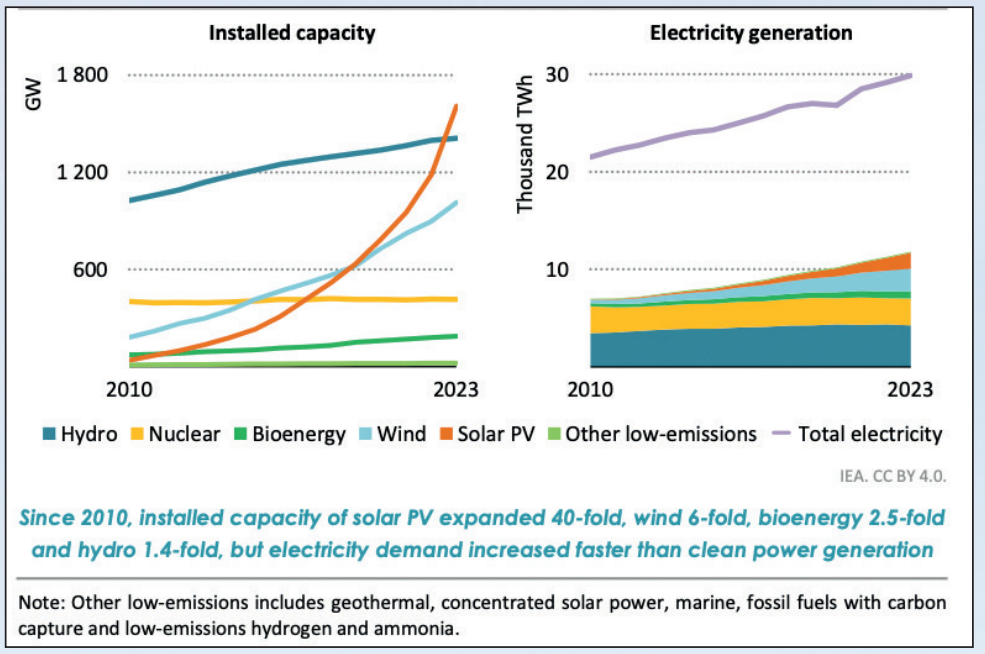
Alaska LNG is seen by many in the US oil and gas industry as one of the most important energy projects in the country. The project was approved under Trump's first administration and received Federal Energy Regulatory Commission (FERC) authorisation in 2020. Final legal approval was obtained in 2022, in spite of strong opposition from several environmental groups.

Alaska's state-owned Alaska Gasline Development Corporation (AGDC) owns the project. Last month AGDC entered an exclusive agreement with developer Glenfarne to move ahead, although there is much to do before any gas will begin to flow.

ExxonMobil, TransCanada, BP and ConocoPhillips are participants in the project. The infrastructure work includes a 1300 km pipeline through Alaskan wilderness that begins on the North Slope and runs to a new LNG export facility at Nikiski on the southern coast of the state. The LNG facility is to have a capacity to export 20 million tons annually for a 30-year period. And the pipeline will transport 3.3 billion cubic feet per day of gas processed near the production site.

Recent developments have been happy news in Alaska. According to Alaskan Governor Mike Dunleavy, President Trump has "rescued Alaska – rescued, I think, the country, and quite frankly, the world."

Change in electricity demand by region, 2021-2027

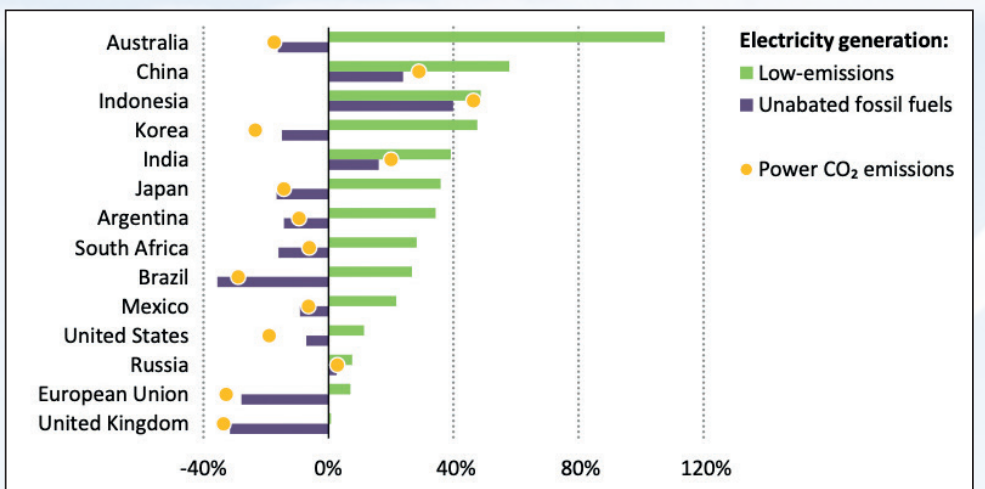


Since 2010, installed capacity of solar PV expanded 40-fold, wind 6-fold, bioenergy 2.5-fold and hydro 1.4-fold, but electricity demand increased faster than clean power generation

Note: Other low-emissions includes geothermal, concentrated solar power, marine, fossil fuels with carbon capture and low-emissions hydrogen and ammonia.

Electricity 2025, © IEA/OECD, page 14

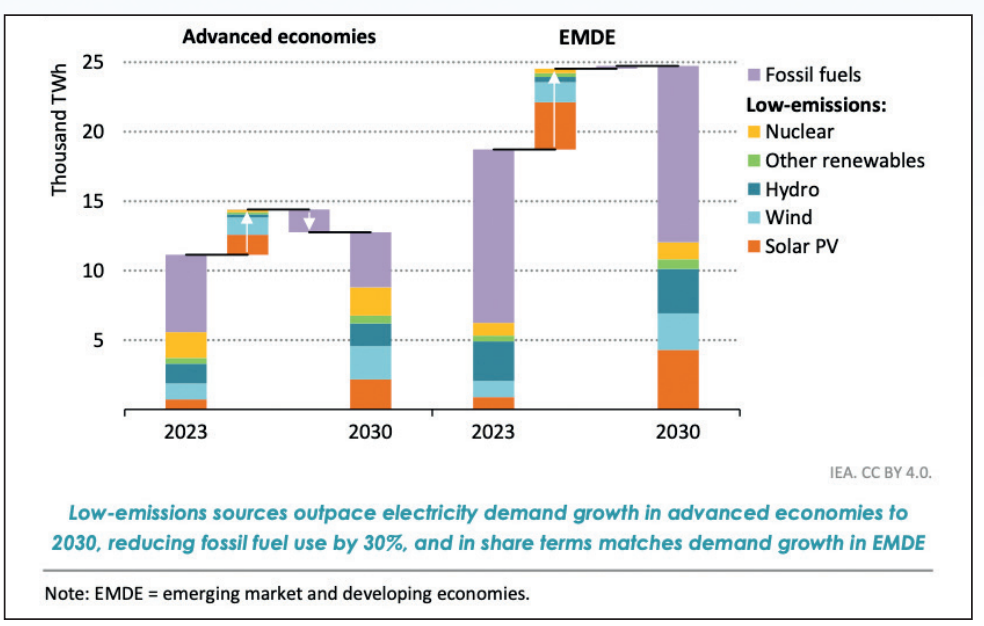
Evolution of per capita electricity consumption and GDP in selected regions throughout the years, 1990-2027



Over the past five years, low-emissions sources outpaced any electricity demand growth in many regions, driving down unabated fossil fuels and cutting power sector emissions

Electricity 2025, © IEA/OECD, page 15

Growth rates of electricity demand and GDP in selected regions, 2003-2027



Low-emissions sources outpace electricity demand growth in advanced economies to 2030, reducing fossil fuel use by 30%, and in share terms matches demand growth in EMDE

Note: EMDE = emerging market and developing economies.

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For more information, please contact:

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Infrastructure and investment in hydrogen: a global view

Many countries have identified hydrogen as key to decarbonising their economies. But who is lagging behind and what can they learn from those leading the way in infrastructure and investment in hydrogen? Bramble Energy's **Dr. Tom Mason** explores the leading infrastructure and investment strategies driving green hydrogen success worldwide.

Hydrogen is increasingly recognised as a cornerstone of global net zero ambitions, and nations across the globe are ramping up efforts to grow the global project pipeline.

Key examples include Germany, which has committed over €9 billion ($9.5 billion) to hydrogen development, and China, where ambitious hydrogen goals have drawn significant attention of late — with plans for fuel cell vehicles, green hydrogen production, and critical infrastructure development. Japan has also impressed, having recently updated its Basic Hydrogen Strategy, seeing the government commit around $98.8 billion over the next five years towards nine core technologies, including fuel cells and water electrolysis.

But who is lagging behind and what can they learn from those leading the way in infrastructure and investment in hydrogen? The US and UK both stand out. Having suffered setbacks with serious changes in political parties, the development and continued support of hydrogen and its associated technologies have taken a massive hit.

The Trump administration has prioritised policies aimed at advancing energy sovereignty via domestic fossil fuel production. The move to expand oil, natural gas, and coal extraction within the US has come with a significant push to reduce regulations on the fossil fuel industry, streamline permitting processes for energy projects, and open up more federal lands and waters for exploration and drilling. As he starts to put into play more of his ideas, we are probably likely to see incentives for the investment in fossil fuel infrastructure, such as pipelines and refineries.

The UK, since coming under a Labour government, has seen a massive cut in the green prosperity plan that was promised for battery manufacturing, hydrogen power, offshore wind, tree planting, flood defences and home insulation.

There has been a little progress since the publication of the UK Hydrogen Strategy, supporting hydrogen hubs and clusters such as the HyNet North West. But from a government perspective, last year was a year of stagnation rather than advancement of policy frameworks, and the UK still lacks a credible strategy for the implementation of hydrogen and other technologies to achieve true net nero in the economy.

Although hydrogen investment in Europe is strong, it has also started to lag in the follow through and this may carry on with some of the same political instability we have started to see in France and Germany.

Dr Mason: Although hydrogen investment in Europe is strong, Europe has also started to lag in the follow through

The right investment

While obvious, it needs to be said; one of the critical factors in driving innovation and development in sustainable energy solutions is money. Unfortunately, global financial markets pose a challenge, as high-interest rates incentivise investors to choose safer options, such as government bonds, rather than investing in companies or projects. Encouraging investment in the renewable energy sector requires policies and incentives that provide financial security and attractive returns for investors, such as tax incentives, subsidies, and favourable regulatory frameworks, which we have seen in the countries leading the charge in hydrogen.

Although we have seen a lag in follow through, Europe as a whole leads the charge in this area with 617 projects and the highest total investments announced ($199 billion) through 2030. Japan and South Korea are also showing good growth with an increase of 130 per cent in vital hydrogen investments. India is also a fast growing market with growth of 110 per cent although focusing on industrial use first.

China has also demonstrated its dedication to hydrogen in both investment and strategy. One such strategy, from which other nations could learn, is how China has resolved the 'chicken and egg' scenario that has long hindered the development of the hydrogen economy – whether to prioritise fuel cell vehicles or the infrastructure to support them. China has focused on putting the right resources in place, including subsidies into rapid scaling across the board, so it can all come to fruition together – a similar trajectory seen in the solar PV and wind industry, which China also continues to lead.

Countries need to focus on the entire value chain. If you create an amazing vehicle but it can't be refuelled it loses all importance. The critical part, and there is a parallel here with battery electric and heat pumps, is that the infrastructure generally is not ready for electrification on a wholesale basis.

Facing the challenges

Climate, level of industrialisation, consumer culture and geography are all majorly different across the world and hydrogen is needed in different places to completely different extents in a net zero world. Because of the level of industrial globalisation, the effort must be global. A good parallel is aircraft or deep-sea marine, if you don't have infrastructure and regulatory consistency globally you can't fly or sail to different places.

The infrastructure needed for all clean energy technologies to function efficiently is a complex and tricky outlook. When it comes to hydrogen, a key concern across geographies is the grid itself and where the electricity comes from. And even after producing hydrogen, the question remains: how do you transport it efficiently to where it's needed? For green hydrogen to be the most viable option, you need large-scale renewables and in excess to direct grid use.

Some countries are obviously already in a better place if they have the natural resources to deliver on this, making them good candidates for developing hydrogen. As an example, in 2023, 35 per cent of Australia's total electricity generation was from renewable energy sources, including solar (16 per cent), wind (12 per cent) and hydro (6 per cent). With these renewable energy advantages, Australia has identified hydrogen opportunities including export. Australian hydrogen can be exported as an energy carrier to countries less able to generate renewable electricity.

Hydrogen is ideal for curtailed energy and also transmission over long distances like LNG is today, but without the investment in the necessary infrastructure, such as hydrogen pipelines, storage facilities and refuelling networks, we cannot support large-scale production and distribution.

According to IRENA, investment costs for electrolyser plants can be slashed by up to 40 per cent in the short-term and 80 per cent in the long-term through various strategies, including improved design, economies of scale, material substitution, enhanced efficiency, and operational flexibility. There's also a need for advancements that increase both process efficiency and the lifespan of electrolyser technology.

Making electrolyser technology more competitive will trigger deployment, giving us important learnings and data globally, which enables lower cost, attracts private capital for R&D and drives further improvement. Put simply, if we want to make sure that ultimately all hydrogen used is green, we have to use and invest in electrolysis more.

Emerging trends

We still need to execute radical innovation and a symbiotic relationship between renewables and hydrogen infrastructure, meaning new technologies are essential for a market-driven adoption. As renewables increase in grid penetration, hydrogen becomes even more viable due to the need to curtail, which would make hydrogen extremely low-cost and therefore viable for the market to adopt without significant subsidy.

Many of the world's hydrogen leaders, such as Japan for example, have shown success through collaboration between governments, large corporations and innovative startups. Sharing risks, insights from demonstration projects, highlighting what works and pooling resources is one of the best ways to accelerate the transition from pilot to industrial-scale operations and an approach nations such as the UK and US could certainly benefit from.

Dr. Tom Mason is CEO of Bramble Energy.

Australia: continuing the clean energy surge

Australia's massive growth in clean energy generation capacity testifies to the positive national investment profile. This is the latest in a series of country analyses where ***TEI Times*** looks at the country's generation and consumption profiles, policy, emissions targets and investment attractiveness.

Australia's energy transition to net zero is accelerating, marked by rapid coal retirements and a projected tripling of renewable energy generation capacity by 2050 from current levels. This surge is driven by strong government policies, increasing electricity demand, and substantial expansion in clean energy development. Major international asset and investors are leading this shift, while offshore wind, battery storage, and green hydrogen are rapidly emerging as key growth sectors.

Decarbonisation commitments

Australia's climate action has been a complex and inconsistent affair, with significant political divisions at the federal and state levels. At the federal level there has been a lack of commitment from conservative coalitions (led by the Liberal Party) versus pro-action policies by the more progressive coalitions (led by Labour). Meanwhile, individual states have set their own emissions reduction and renewable energy targets, often more ambitious than the federal government's goals.

For instance, the Australian government has committed to a 43 per cent emissions reduction below 2005 levels by 2030 and net zero by 2050. However, the two most populous states, New South Wales and Victoria, have set more aggressive targets. New South Wales aims for a 50 per cent reduction by 2030, 70 per cent by 2035, and net zero by 2050. Victoria wants to reduce emissions by 28 to 33 per cent by 2025 and 45 to 50 per cent by 2030, with net zero by 2050.

This disparity in targets and commitments has resulted in state-led actions playing a more significant role in Australia's decarbonisation efforts than federal policies. States have been investing in new renewable energy capacity, phasing out fossil fuels, and implementing ambitious emissions reduction targets. While the federal government may face increasing pressure to strengthen its climate commitments, the states have emerged as the primary drivers of Australia's clean energy transition. Future climate action in the country is likely to continue to be led by individual states, as they forge ahead with their own decarbonisation strategies.

Energy mix profile

Australia's energy consumption has seen significant transformation and is poised to see even more dramatic shifts in the coming years. The average annual growth rate over the past ten years of oil consumption was zero per cent and that of coal was negative 2.3 per cent. At the same time, the consumption rate of gas rose 1 per cent and that of renewables 5.2 per cent. This, while the rate for overall demand was relatively sluggish. The picture for the electricity generation mix to 2050 will be even more dramatic.

The compound annual growth rate for electricity demand to 2050 is projected to be around 2 to 3 per cent by most institutions, including the Australian Energy Market Operator (AEMO) and Department of Climate Change, Energy, the Environment and Water (DCCEEW).

Australia mandates AEMO to publish an Integrated System Plan every two years for essential infrastructure that will meet future energy needs. The 2024 plan projects that generation will nearly triple by 2050 (1 to 4 per cent annual growth). This increase is primarily driven by the retirement of coal fired power plants, higher electrification across various sectors, and broader economic growth. About 90 per cent of the nation's coal capacity is expected to be retired by 2035.

The phase-out means a need for large-scale investment in renewables, storage, and transmission infrastructure. The transition to EVs, industrial electrification, and the growth of green hydrogen production will further drive electricity demand, highlights the plan.

Additionally, population and economic growth will contribute to greater consumption. Increased adoption of rooftop solar, household batteries, and virtual power plants will shift demand patterns but still require substantial grid investment. The potential for renewable energy exports, particularly through green hydrogen, could push electricity demand even higher under more ambitious scenarios. AEMO's most likely 'Step Change' scenario forecasts annual growth of around 2.5 to 3 per cent. Under a high-growth scenario with stronger decarbonisation policies and international demand for clean energy, electricity demand could increase by over 4 per cent annually.

Investment environment

Australia has one of the best renewables investment profiles in the world. The nation enjoys a high sovereign credit long-term rating and outlook from rating agencies. Moody's is Aaa (Stable) and S&P's AAA (Stable), the latter is in fact higher than that of the US which stands at AA+, one notch lower. Australia scores highly in the Global Corruption Perceptions Index, in the Rule of Law Index and the EY Renewable Energy Country Attractiveness Index 40, all in the top 10 per cent. In terms of innovation and transparency, the country is still well rated – in the best 17 and 22 per cent, respectively. The massive growth in clean energy generation capacity testifies to the positive national investment profile.

For investors, there are a series of important considerations when investing in projects in Australia. Some of the challenges are not specific to the Australian context while others are.

Issues found in many jurisdictions include regulatory transparency and policy shift due to changes in the administration at the federal level have created some level of uncertainty for some investors. The country's grid infrastructure and transmission network are constrained and at times has struggled in some regions to absorb the fast-increasing amount of distributed generation and renewables. There is also a shortage of skilled labour. Admittedly, regulatory, grid, and human resources trials are common in a great many countries and regions.

Country specific challenges include geographic and supply constraints due to the country's vast distances which raises cost as well. Another is the lack of firming capacity as well as fluctuating wholesale electricity prices which can make revenue streams unpredictable.

Key policies and incentives

Australia's federal government has introduced multiple climate, energy transition, and decarbonisation policies that may directly impact overseas investors. These policies create investment opportunities in renewables, hydrogen, and low-carbon industries while also imposing compliance requirements for emissions-intensive businesses. The most critical policies include legally binding net zero commitments, investment incentives, and market regulations. The three most talked-about ones in the media and academia regarding climate change, energy transition, and decarbonisation are the Climate Change Act 2022, Safeguard Mechanism (Reform 2023), and the Capacity Investment Scheme (CIS) – 2023 Expansion.

The Climate Change Act enshrines the country's net zero by 2050 target and a legally binding 43 per cent emissions reduction by 2030. It provides policy certainty for investors and aligns government decisions with emissions goals. However, some experts argue that stronger interim targets and enforcement mechanisms are needed to drive deeper decarbonisation.

The Safeguard Mechanism policy applies to large industrial emitters and requires them to reduce emissions intensity annually or buy offsets. It is a cornerstone of Australia's industrial decarbonisation strategy and affects sectors like mining, energy, and heavy manufacturing. Academics and industry groups debate its effectiveness, with some arguing that loopholes and reliance on offsets may weaken its impact. Others highlight its role in driving low-emissions investments and cleaner technologies.

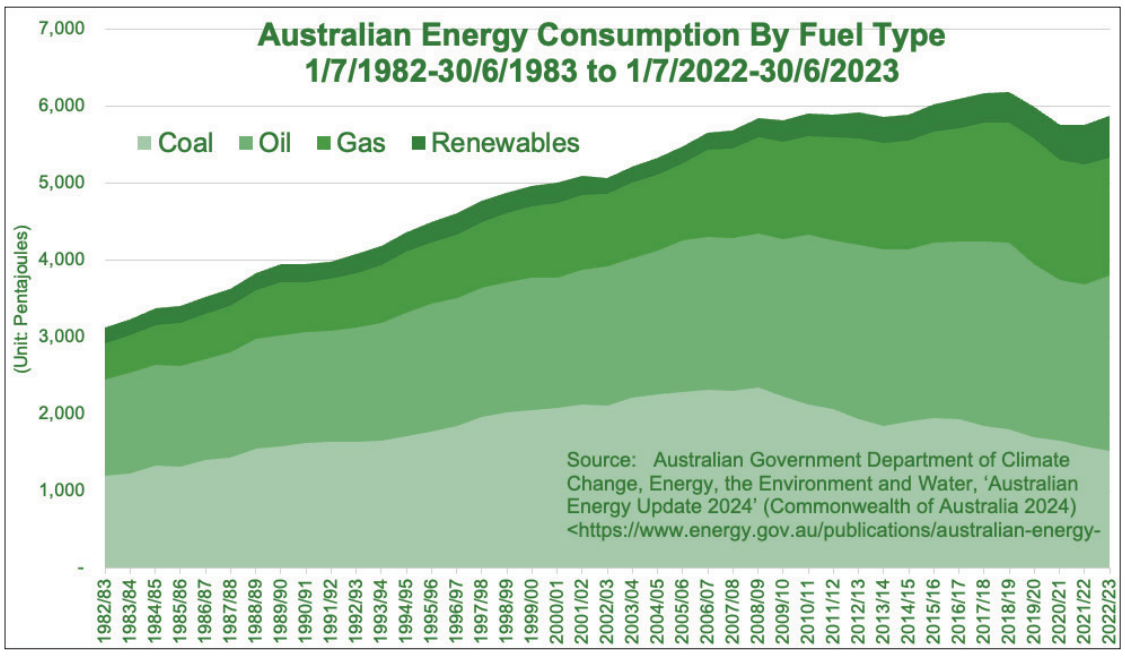
The CIS policy is designed to accelerate investment in renewables and firming capacity (such as grid-scale batteries and pumped hydro) by providing revenue guarantees for projects. It is crucial for replacing retiring coal fired plants and ensuring grid reliability as Australia transitions to 82 per cent renewable electricity by 2030. Frequently experts question whether investment in grid infrastructure and storage is happening fast enough to avoid supply shortfalls.

Investor backdrop

Australia's Clean Energy Council reported that 2024 marked the strongest year for large-scale renewable energy investment in the country since 2018, with a total capital commitment of A$9 billion ($5.65 billion). According to the Clean Energy Council's latest 'Quarterly Clean Energy Investment Report,' seven new large-scale renewable energy projects were approved in the fourth quarter of 2024. These projects represent 1598 MW of new generation capacity and A$2.4 billion in capital investment. Throughout 2024, investments were secured for 4346 MW of new renewable energy generation capacity. Additionally, energy storage experienced significant growth, with commitments to 4029 MW/11 348 MWh of new projects. In the fourth quarter alone, investments totalling 870 MW/1936 MWh were made in new energy storage initiatives.

The country's attractive renewables investment parameters have attracted a great variety of asset and financial investors. A good sample list is the top ten renewable energy investors in Oceania from PF Nexus, a data provider. They include corporations such as ENGIE (France), Enel Green Power (Italy), Iberdrola Group (Spain), Lightsource BP (UK), Mainstream Renewable Power (Ireland), and Vena Energy (Singapore). As well as financial investors such as Aquila Capital, Brookfield Asset Management, PacifiCorp – a Berkshire Hathaway company.

Prepared for The Energy Industry Times by Joseph Jacobelli at Asia Clean Tech Energy Investments.



Australia has one of the best renewables investment profiles in the world

Power-to-X and the H_2 economy: a snap-shot on the state of play

Power-to-X holds the promise to transform the global economy onto a green footing, but to do so means adopting a pragmatic approach and breaking down barriers to the widespread adoption and development of a much more hydrogen-centric energy system. MAN Energy Solutions SE's **Dr.-Ing. Florian Gruschwitz** explains.

In any realistic scenario, the green energy transition is predicated on a massive shift towards the electrification of transport and industry. Transportation, for example, is currently one of the three largest sources of greenhouse gas emissions worldwide, behind only power generation and industry. It is responsible for producing more than 8 billion tonnes of CO_2e a year. Emissions from this sector have more than doubled since 1990 and there is plenty of evidence to suggest that emissions from transport will continue to grow without even more concerted action.

As with much of the world's hard-to-reach and high emissions heavy industries – the steel, cement, and agrochemicals sectors for example – transportation has remained stubbornly resistant to change despite the growing success of consumer electric vehicles. Domestic cars, while a significant source of emissions, are just a small part of the overall transport sector when considering areas like shipping, heavy vehicles, and air transport. It's simply not possible to directly electrify some industrial sectors and certain areas of transport and the energy density of fossil fuels is hard to challenge in many applications. However, the development of commercially viable so-called power-to-X technologies holds the promise to play a major role in making the clean energy transition finally become a reality.

The Haru Oni project uses wind power to produce hydrogen and direct air captured CO_2 to make e-methanol in a reactor from MAN Energy Solutions

The power of power-to-X

Power-to-X represents a range of climate-neutral energy solutions – often but not always centred on hydrogen – that mainly rely on renewables to create alternatives to conventional fossil fuels. Typically, renewables are used to drive electrochemical processes such as electrolysis to create hydrogen. Coupled with processes such as direct capture of atmospheric carbon dioxide, for example, the carbon and hydrogen can be used to recreate climate-neutral chemical analogues of liquid or gaseous hydrocarbon fossil fuels like kerosene, petroleum and natural gas.

Known as e-fuels, these synthetic fuels simply drop in to existing distribution and supply chains. They thus maximise the residual value of current and well-established systems and technologies such as combustion engines. Although power-to-X encompasses e-fuels it also holds far more scope to decarbonise the global economy with alternatives to conventional fuels. This includes new fuels like pure hydrogen, base feedstock chemicals like methanol and ammonia or direct energy resources. If developed at sufficient scale, the outcome of a power-to-X economy – coupled with other critical elements of the decarbonisation toolbox like a thriving renewables sector, carbon capture and sequestration, and the development of related industries like heat pumps – is a successful transition to a global green energy system.

The tri-part value chain

The technologies to create e-fuels, such as synthetic methane or e-methanol from green hydrogen already exist. A demonstration plant for a large-scale PEM electrolyser from Quest One is currently being built at the MAN Energy Solutions site in Augsburg, Germany, for example. The modular and scalable MHP PEM system being installed features 10 MW blocks that can be combined to create industrial green hydrogen production plants with an electrolysis capacity of several hundred megawatts. This project also models an important and desirable route for power-to-X project development worldwide.

Another important demonstration plant is located in Patagonia, Southern Chile. The Haru Oni project uses wind power to produce hydrogen and direct air captured CO_2 to make e-methanol in a reactor from MAN Energy Solutions. This e-methanol is then transformed into e-gasoline.

However, to create a sustainable and comprehensive low-carbon economy centred around green hydrogen, renewable electricity, and carbon capture for the hardest to abate industrial sectors, means creating more than the right technologies. There are in fact three critical elements to the value chain beyond the core technologies. In the first instance comes production of green hydrogen and its derivatives. This must be at the substantial scales needed to the extent that the economies of scale are brought to bear while delivering an abundant supply of carbon-free or 'carbon-neutral' alternative fuels to market. Secondly, these green products must be transported to their point of use.

This requires new infrastructure to be developed. As part of Germany's National Hydrogen Strategy, for example, measures are being taken to ensure the development of hydrogen infrastructure, including a total of 9040 km of pipelines – the so-called German Hydrogen Core Grid.

Finally, having delivered green hydrogen in bulk to consumption centres, the last piece of the puzzle is a large consumer base and the development of appropriate applications. Steel production is a suitable candidate for conversion to green hydrogen using a direct reduction process rather than using carbon-based agents such as coke.

Clearly then, these three critical elements are actually coming to fruition. But to meet our most pressing climate change targets and avert environmental catastrophe, all parts of the hydrogen value chain need to be simultaneously pushed much harder and quickly ramped up.

E-fuels that can rely on existing infrastructure are therefore more than a 'bridging technology', but a vital piece of the clean energy puzzle and an essential enabler for the ramp-up of a hydrogen economy. They also serve as an important factor in overcoming the huge challenge of ramping up both supply and demand simultaneously to build a pure hydrogen economy, the so-called chicken-or-egg dilemma.

Barriers to a power-to-X future

Despite the fact that the core power-to-X technologies are available, the three separate parts of the value chain are underway and the ultimate desire to avoid climate change is in ready abundance, it is nonetheless evident that actual development of the power-to-X economy is lagging behind most expectations. Under these circumstances it's reasonable to conclude that substantial barriers are preventing the rapid take-off and upscaling of power-to-x.

In Europe while there are very ambitious decarbonisation targets and programmes in place such as 'Fit for 55', the European Union's 2030 target of reducing net greenhouse gas emissions by at least 55 per cent, certain rules in place within the Union are acting as a barrier.

An example comes from legislation covering the validity of green hydrogen with some very restrictive parameters which have to be fulfilled in order for hydrogen to be considered as green with regard to the Renewable Energy Directives (RED II and III).

Similarly, carbon sources used for e-fuels or Renewable Fuels of Non-Biological Origin (RFNBO) can only be considered green after 2041 if they are effectively derived from biogenic sources and a few other options that in practical terms are scarcely available.

These highly restrictive measures rule out CO_2 captured from point sources at Europe's most polluting industrial sites – which may be in line with the ambitious targets but potentially kills the ramp-up due to long project lead times.

Developing a pragmatic approach to green hydrogen and sources of carbon used to create e-fuels will help foster the industry and the green transition far more than a dogmatic response to the perceived purity of feed stocks.

Existing legislation that can kill industrial investment and the momentum behind the sector before it has even started in earnest have to be rethought and adapted to effectively encourage the industry instead. This practical approach must also extend to all elements of the clean energy toolbox. E-fuels should be acknowledged as an important enabler for the hydrogen industry and wholly collaborative, it's simply not a case of either/or.

In addition, we must not forget that there is also the price issue with many green products. As long as green energy sources are significantly more expensive than their fossil counterparts, there can be no real and not purely publicly funded market development. Possible solutions and policy levers to address this 'elephant in the room' include ramping up green fuel quotas that cannot be circumvented and an effective CO_2 tax to pave the way for a level playing field.

At the same time, carbon capture and utilisation (CCU) should be embraced as a critically important element in the fight to address climate change and to supply the huge amounts of carbon that will be needed to produce e-fuels alongside green hydrogen in the power-to-X process.

Another aspect to consider is the opportunity for power-to-X to become an important wealth-generating industry for European economies based on this multi-pronged approach. The technologies are available, the production capacity potential is there and the desire for change cannot be denied.

We do not have to wait to embrace power-to-X but we do have to urgently establish the value chain as a sustainable and economically viable alternative to the status quo. Start now.

Dr.-Ing. Florian Gruschwitz LL.M., is Senior Business Development Manager, Power Segment at MAN Energy Solutions SE.

Dr Gruschwitz: E-fuels that can rely on existing infrastructure are a vital piece of the clean energy puzzle and an essential enabler for the ramp-up of a hydrogen economy

Junior Isles

Once more unto the breach…

Two recent studies published in the *Nature* journal have said that the exceptionally hot year of 2024 signals a sooner than expected breach of the Paris accord. Worryingly, the findings came as most of the world's big polluters missed a UN deadline for setting new climate targets.

Last year saw the global average temperature rise exceed 1.5°C for the first time annually, the threshold needed to avoid irreversible climate change. Examining 2024, the first study by Alex Cannon, a research scientist at the Environment and Climate Change Canada government department, found that if 18 consecutive months of temperatures at or above 1.5°C of warming occur, continued warming is virtually certain. This was under a so-called "middle of the road" scenario, where social, economic and technological trends do not shift markedly.

In the other study, German and Austrian researchers claimed that without deep cuts in emissions, the world was "most probably" now within the two decades where the global temperature rise, compared to pre-industrial levels, would exceed the 1.5°C limit set under the Paris agreement.

When the agreement was signed, the world was projected to reach the 1.5°C threshold by March 2045, but the Intergovernmental Panel on Climate Change (IPCC), has since said it expects the threshold to be passed around 2031.

Commenting on the two studies, Piers Forster, Professor of physical climate change at the University of Leeds, UK, and one of the authors of the IPCC report, said the world was now at the "start of a period of temperatures above 1.5°C of warming".

But despite the gloomy outlook, a handful of countries continue to lead the effort to keep a lid on global warming – unphased by US President Donald Trump's withdrawal from the Paris Climate Agreement.

The UK led a handful of countries that submitted carbon emission targets by the February 10th deadline, with its plan to reduce greenhouse gas to 81 per cent below 1990 levels by 2035. This is in line with its promise to reach net zero by 2050. Along with countries including Brazil, Japan, New Zealand, Switzerland and the UAE (Canada submitted a draft plan), the UK has made good on an important pledge. The Nationally Determined Contributions (NDCs) – commitments that countries make to reduce their greenhouse gas emissions as part of climate change mitigation – include the necessary policies and measures for achieving the global targets set out in the Paris Agreement and are crucial to progressing the actionable outcomes needed at the COP30 Climate Change meeting to be held later this year in Brazil.

As some countries begin to falter on climate commitments, demonstrating how targets can be achieved is now more important than ever.

Just weeks after submitting its NDCs, the UK Climate Change Committee (CCC), an independent, statutory body established to advise the government on emissions targets, presented its Seventh Carbon Budget detailing 'a new pathway to a decarbonised UK'. The CCC says that in order to decarbonise by 2050, the country must reduce emissions by 87 per cent (compared to 1990 levels) by 2040.

The CCC stressed that electrification must make 60 per cent of emission reductions by 2040. It also noted that investment this decade in electrification and technologies to cut emissions would create savings over time. These savings are realised on a cross-economy basis during the UK's Seventh Carbon Budget period (2038 – 2042) and grow to 2050 and beyond. It also estimates the net costs of delivering this are 0.2 per cent of GDP per year on average.

Importantly, Professor Forster, who is also the CCC's Interim Chair, said: "Our analysis shows that there is no need to pitch action on climate change against the economy. We will need government and business to deliver the investment, but we are confident that this Seventh Carbon Budget offers a secure, prosperous future for the UK."

The CCC's advice on the level of the Seventh Carbon Budget is based on its 'Balanced Pathway: an emissions reduction pathway from 2025 to Net Zero by 2050'.

Emissions in the UK in 2023 were around half the levels they were in 1990. The pace of emissions reduction has more than doubled since the introduction of carbon budgets in 2008, driven by the phase-out of coal and the ramp-up of renewable electricity generation.

By 2040, the 'Balanced Pathway' sees offshore wind grow six-fold from 15 GW of capacity in 2023 to 88 GW by 2040. Onshore wind capacity doubles to 32 GW by 2040 and solar capacity increases to 82 GW. Alongside renewables, "storable forms of energy" including nuclear, low-carbon dispatchable generation (either gas with carbon capture or hydrogen), and batteries, as well as interconnections to neighbouring markets, ensure a reliable supply of electricity even in adverse weather years. These technologies need to be accompanied by rapidly expanding the transmission grid, upgrading the distribution network, and speeding up the grid connection process.

While much of this appears feasible, making nuclear part of those plans is questionable especially when considering the timeframe. The CCC says nuclear and low-carbon dispatchable generation provide "a relatively small portion" of generation (14 per cent in 2040) and notes that the amount needed would be the equivalent of half a new large nuclear plant or around three small modular reactors. This, it said, would be "a challenge before the 2040s".

Sir Dave Lewis, Chair of Xlinks, commented: "The CCC report shows the opportunity for the UK is huge but the government needs change fast – and has to keep an eye on the cost. The UK can't afford to wait for nuclear projects struggling with massive delays and spiralling costs or pay really high prices for fledgling technologies."

Frazer-Nash Consultancy, a KBR-owned company, was more welcoming of nuclear but said the focus should be on to ready-to-deploy nuclear technology.

Kevin Murray, Senior Business Manager, Nuclear at Frazer-Nash Consultancy, said: "We welcome the Seventh Carbon Budget and its call for new nuclear energy facilities. However, we disagree that rolling out nuclear energy by the 2040s is unrealistic.

"The UK possesses a rich nuclear heritage, and a skilled supply chain that is ready to accelerate the deployment of new nuclear capacity. We urgently need a final investment decision on new large-scale nuclear at Sizewell C which is set to provide low-carbon energy to 6 million homes over its 60-year life."

Like the UK, Japan also sees nuclear as important to its climate ambitions. While setting a goal for renewables to be the country's largest source of production by 2040, in its latest energy plan the government also plans to see nuclear generation return to almost the same level as before the Fukushima accident.

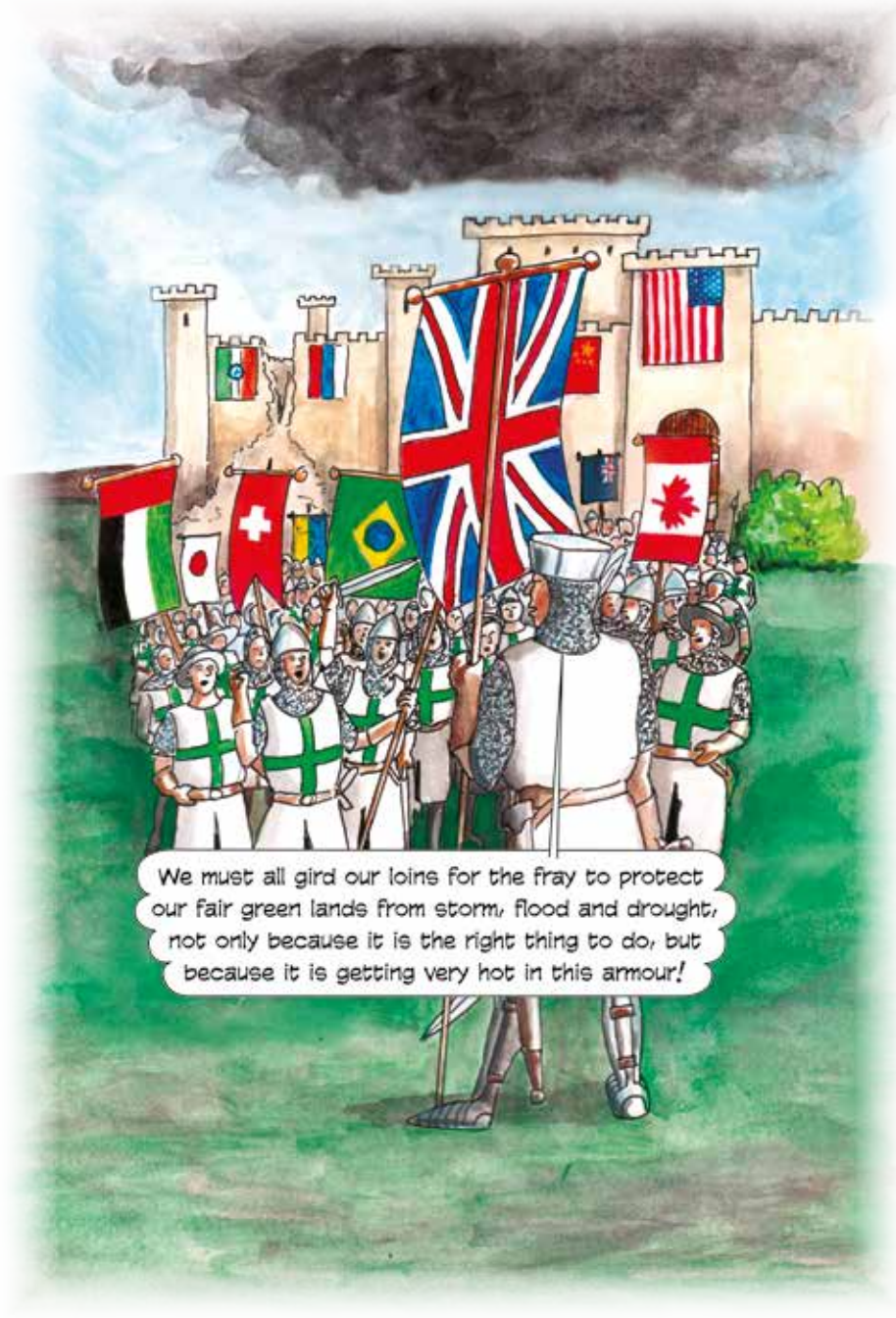
Putting renewables and nuclear at the heart of energy policy is increasingly being seen as a way of improving energy security, especially in the wake of Russia's invasion of Ukraine.

The UK CCC stated: "If the country decarbonises against our 'Balanced Pathway' and there was a spike in gas prices like the one following Russia's illegal invasion of Ukraine, average household energy bills in 2040 would be 15 times less sensitive."

But despite the sense this all makes, many governments still cannot still see past the immediate challenge.

With the withdrawal of the US from the Paris Agreement and industries that are struggling with high energy prices, even the EU appears to be faltering on climate commitments. European Commission Vice-President Teresa Ribera, who oversees the green transition and competition, spoke of the need to strike a balance between climate goals and improving the bloc's global competitiveness. She recently told the *Financial Times*: "The global reality has evolved, and we may need to think to what extent these things that were there need to be updated."

In the Shakespeare play 'Henry the Fifth', about the medieval king of England, Henry battle-cries to his soldiers "Once more unto the breach, dear friends, once more…" In these difficult times – some of the most geopolitically challenging we have seen in decades – the UK has stepped up to show its resolve in tackling climate change, as well as in its effort to support an embattled Ukraine. Let us hope the EU and the rest of the world remains equally stalwart on both fronts.



Cartoon by Jem Soar