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Flexing without breaking

The variability of renewables like wind and solar demands a radical enhancement in grid flexibility. The key is a system that flexes, rather than breaks. *Page 12*



Leveraging AI

Industrial AI will be a key enabler for most companies to navigate the decarbonisation journey, while maintaining operational excellence and business agility. *Page 13*



Final Word

Chinese medicine can be good and bad for your health, says Junior Isles. *Page 16*



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Record year for wind but more needed to get on "3X pathway"

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Developers await starting gun for offshore wind and hydrogen bonanza

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Cross-border energy networks can cut ASEAN decarbonisation costs

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Greece offers a variety of clean energy project opportunities for foreign investors and its investment profile for foreign investors has progressively been improving. *Page 14*

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An electrochemical cell-based direct air capture solution has been developed that can cut energy usage by 70 per cent for cost-effective carbon removal at gigatonne scale. *Page 15*

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World needs "reality check" on fossil fuel phase-out

JPMorgan's Christyan Malek, says net zero may take "generations"

Governments recognise the need to accelerate the move away from fossil fuels if it is to avoid disastrous global warming. But there is a growing belief that economic and geopolitical headwinds make rapid fossil fuel phase-out unrealistic. **Junior Isles**

There is growing sentiment that talk of a rapid fossil fuel phase-out are unrealistic. In a global energy strategy report sent out to clients last month, US investment bank JPMorgan said efforts to cut the use of coal, oil and gas had been set back by higher interest rates, inflation and wars in Ukraine and the Middle East.

The bank warned that the world needs a "reality check" on its move from fossil fuels to renewable energy, saying it may take "generations" to hit net zero targets.

"While the target to net zero is still some time away, we have to face up to the reality that the variables have changed," Christyan Malek, JPMorgan's Head of Global Energy Strategy and lead author of the report, told the *Financial Times*. "Interest rates are

much higher. Government debt is significantly greater and the geopolitical landscape is structurally different. The \$3 trillion to \$4 trillion it will cost each year come in a different macro environment."

JPMorgan's report said changing the world's energy system "is a process that should be measured in decades, or generations, not years".

The report highlights a growing movement that has seen both companies and governments rowing back on emissions targets. Just last month the Scottish government abandoned its target of cutting carbon emissions by 75 per cent by 2030.

JPMorgan's statement was largely echoed by global energy consultant Wood Mackenzie, which said in its own report that transitioning to a net

zero global economy will be even harder and more costly if high interest rates persist.

"Interest rates, which have risen sharply in the past two years, may not come down as far or as quickly as markets anticipate. This increased cost of capital has profound implications for the energy and natural resource industries, particularly the cost and pace of the transition to low-carbon technologies," said Peter Martin, Wood Mackenzie's Head of Economics and lead author of the report 'Conflicts of interest: the cost of investing in the energy transition in a high interest-rate era'.

Higher interest rates disproportionately affect renewables and nuclear power. Their high capital intensity and low returns mean future projects will

be at risk. In comparison, due to low gearing, many companies in the metals and mining and oil and gas sectors will be relatively unaffected by higher interest rates, stated the report.

In the US, Wood Mackenzie analysis shows that a 2-percentage point increase in the risk-free interest rate pushes up the levelised cost of electricity (LCOE) by as much as 20 per cent for renewables. The comparative increase in LCOE for a combined cycle gas turbine power plant is only 11 per cent.

In late March Saudi Aramco CEO Amin H Nasser criticised the energy transition strategy, saying that it is "visibly failing" on a number of fronts and called on countries to abandon the

Continued on Page 2

Europe falling short in climate race as elections loom

The European Union is behind target on its climate ambition, with the deadline for delivering detailed roadmaps ahead of parliamentary elections fast approaching.

EU governments must submit their plans on how to reduce their share of emissions by June, having committed to reducing carbon emissions by 55 per cent by 2030 compared with 1990 levels. At the end of March, however, EU Climate Commissioner Wopke Hoekstra said the bloc was currently on track to achieve only a 51 per cent reduction.

Although Hoekstra told ministers he remains "confident" of hitting the 55 per cent target, even his calculations,

based on draft plans put forward by member states, appear optimistic. The European Environment Agency has estimated that a 48 per cent reduction is likely.

As part of a mid-term review of climate progress published in March, the European Commission said that the speed of emissions cuts needed to meet its climate goals must "almost triple the average annual reduction rate achieved over the past decade".

The EU has the most advanced climate legislation in the world but as the global race for clean technology gathers pace, the bloc is struggling to compete globally and sell its ambitious climate agenda to an industrial

sector that has been suffering from high inflation, trade tensions and increasing regulation.

Data from Bruegel, the Brussels-based think-tank, shows that Europe is falling behind some of its global competitors in the rollout of the clean technologies central to decarbonisation efforts.

In an interview with the *FT* last month International Energy Agency Executive Director Fatih Birol criticised Europe for falling behind China and the US. He accused the EU of making "two historic monumental mistakes" in energy policy, by relying on Russian gas and turning away from nuclear power, and that European

industry was now paying the price for these errors. He told the *FT* that the bloc would need "a new industrial master plan" in order to recover.

The EU trails China and the US in areas such as manufacturing clean technologies thanks to a mix of burdensome regulations and higher energy prices. Electricity prices in the EU are typically twice to three times higher than in the US.

"The existing industries, especially the heavy industries, are experiencing, and going to experience, a significant cost disadvantage compared to other major economies such as China and the United States," Birol said.

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“fantasy” of phasing out oil and gas.

Nasser also said that despite the contribution of alternatives to reducing greenhouse gas (GHG) emissions, much better results were achieved when the focus was on reducing emissions from hydrocarbons.

Speaking at CERAWEEK in Houston, Texas, USA, in March, Nasser pointed out that despite the world investing more than \$9.5 trillion on the energy transition over the past two decades, alternatives had been unable to displace hydrocarbons at scale.

He said that wind and solar combined currently supply less than 4 per cent of the world’s energy while the share of hydrocarbons in the global energy mix had barely fallen from 83 per cent to 80 per cent.

He also noted that there is “significant demand growth potential in developing countries”, where oil consumption currently ranges from less than one to just below two barrels per person per year, compared with nine barrels for the EU and 22 barrels for the US; figures that see some predicting growth through 2045. Likewise, he said gas remained a “mainstay of global energy”, growing by about almost 70 per cent since the start of the century. “Even coal is at record highs,” he said.



Saudi Aramco’s Amin H Nasser said the energy transition is “visibly failing”

“This is hardly the future picture some have been painting; and even they are starting to acknowledge the importance of oil and gas security,” said Nasser. “All this strengthens the view that peak oil and gas is unlikely for some time to come, let alone 2030.”

Meanwhile, the US and EU are at odds over ending subsidies for oil and gas development.

A person familiar with closed-door OECD talks in Paris in late March told the *FT* that countries discussed proposals by the EU and UK to cut off most export credit agency loans and guarantees for oil, gas and coal mining projects, which are the biggest source of international public finance for the sector. This would follow an agreement in 2021 to stop providing such support for coal fired power.

The US, Canada, France, Germany and the UK were among countries that agreed around the UN COP26 climate summit in Glasgow, UK, in 2021 to align their public finance institutions with the Paris Agreement goal to limit global warming to ideally 1.5°C above pre-industrial levels.

But this could affect the role of Exim Bank, the US’s credit export agency, which will need to secure fresh funding from the US Congress in 2026. This would open it to political scrutiny from Republican lawmakers who are resistant to cutting off finance for oil and gas, and progressive lawmakers critical of the bank’s climate record.

Record year for wind but more needed to get on “3X pathway”

- Sector installs 117 GW of new capacity in 2023, but must reach at least 320 GW annually by 2030
- GWEC revises 2024-2030 growth forecast upwards by 10 per cent

Junior Isles

The global wind industry installed a record 117 GW of new capacity in 2023, but must still roughly triple its annual growth to at least 320 GW by 2030 to meet the COP28 and 1.5°C pathway targets, says the Global Wind Energy Council (GWEC).

According to its ‘Global Wind Report 2024’ published last month, the 117 GW in 2023 represents a 50 per cent year-on-year increase from 2022.

In the report GWEC has revised its 2024-2030 growth forecast (1210 GW) upwards by 10 per cent, in response to the establishment of national industrial policies in major economies, gathering momentum in offshore wind and promising growth among emerging markets and developing economies.

But despite the impressive numbers, annual growth must triple to meet the

targets recommended at the COP28 climate summit in Dubai in December.

“It’s great to see wind industry growth picking up, and we are proud of reaching a new annual record,” said GWEC CEO Ben Backwell. “However much more needs to be done to unlock growth by policymakers, industry and other stakeholders to get on to the 3X pathway needed to reach net zero. Growth is highly concentrated in a few big countries like China, the US, Brazil and Germany, and we need many more countries to remove barriers and improve market frameworks to scale up wind installations.”

“Geopolitical instability may continue for some time. But as a key energy transition technology, the wind industry needs policymakers to be laser-focused on addressing growth challenges such as planning bottlenecks, grid queues and poorly designed auctions. These are the measures that

will significantly ramp up project pipelines and delivery, rather than reverting to restrictive trade measures and hostile forms of competition. Enhanced global collaboration is essential to fostering the conducive business environments and efficient supply chains required to accelerate wind and renewable energy growth in line with a 1.5°C pathway.”

In its annual outlook report, Paris-based research group REN21 said global renewable capacity additions increased by 36 per cent in 2023 to reach about 473 GW. This falls far short of the almost 1100 GW per year required through 2030, stated in the International Renewable Energy Agency’s (IRENA) latest report.

“The reality is that energy demand has increased at the same time, especially in China, India and other developing economies,” said Rana Adib, REN21’s Executive Secretary.

REN21 said the renewables sector

was being held back by a lack of investment in grid infrastructure, with an estimated 3000 GW of projects still awaiting grid connections last year.

More effort was also needed to boost energy efficiency and phase out fossil fuel subsidies, which in G20 countries alone stood at a record \$1.3 trillion in 2022, it added.

Providing financial support for developing countries to build renewable capacity also remains a major challenge, with financing costs sometimes as high as 20 per cent, five times higher than those in richer nations, Adib said.

“The cost of capital has greatly increased globally, but increased in a disproportionately high way in developing economies,” she said, adding that development finance was also falling short, accounting for only 1.4 per cent of total global renewable investment last year.

Risk of disorderly energy transition driving uncertainty, says World Energy Council

The World Energy Council’s annual World Energy Issues Monitor has revealed that the risk of disorderly energy transitions, fuelled by a fragmented energy leadership landscape, is a key perception of uncertainty among business leaders.

Now in its 15th year, the 2024 edition shows that: competing global and regional geopolitical agendas; the evolution of energy security concerns to encompass critical minerals and demand driven energy shocks and disruptions; and the varying regional nature of climate action priorities have all converged to shape a distinctly

uncertain path to achieving net zero and beyond.

Dr Angela Wilkinson, Secretary General & CEO of the World Energy Council, said: “While the direction towards zero emissions energy systems is clear, the journey to a sustainable future is fraught with challenges. This year’s World Energy Issues Monitor edition reflects global uncertainty about the collective ability to manage clean and inclusive energy transitions at speed and scale. The context of an increasingly fragmented energy leadership landscape and competitive geopolitics is exacerbating uncertainties.”

Commodity prices were a key critical uncertainty across all regions of the world, save for North America, with 34 per cent of Europe respondents describing it as an area of very high uncertainty.

Stakeholder coordination, notably around engaging diverse communities to form new energy ecosystems and path finding, remains a priority, with 50 per cent of the respondents describing it as an area of high/very high impact. A third of respondents expressed that Risk to Peace is a very high uncertainty, of which 41 per cent were from Europe and 26 per cent

from Asia.

The report titled ‘Redesigning Energy in 5D’ assesses the global energy agenda based on the collective expertise and views of nearly 1800 energy leaders in over 100 countries. Leaders were surveyed in early 2024, following the conclusion of the COP 28 conference in Dubai.

Notably, the survey also included two distinct groups: the World Energy Council Future Energy Leaders, comprising energy professionals under 35 years of age, and innovative start-up companies founded less than 10 years ago.

EU Parliament adopts energy market reforms

The European Parliament has approved the reform of the EU electricity market in a move to provide stable and affordable bills for consumers following the energy price crisis.

The measures, composed of a regulation and a directive already agreed upon with the Council, were adopted with 433 in favour, 140 against and 15 abstentions for the regulation, and 473 votes to 80, with 27 abstentions for the directive.

Energy prices have been rising since mid-2021, initially in the context of the post-COVID-19 economic recovery. However, energy prices rose steeply due to gas supply problems following Russia’s war against Ukraine in February 2022. High gas prices had an immediate effect on electricity prices, as they are linked together under the

merit order system, where the most expensive (usually fossil fuel-based) energy source sets the overall electricity price.

The legislation provides for so-called Contracts for Difference (CfDs), or equivalent schemes with the same effects, to encourage energy investment. In a CfD, a public authority compensates the energy producer if market prices fall too steeply, but it collects payments from them if prices are too high. The use of CfDs will be allowed in all investments in new electricity production, whether from renewable or nuclear energy.

The text sets out a mechanism to declare an electricity price crisis. In a situation of very high prices and under certain conditions, the EU may declare a regional or EU-wide electricity price

crisis, allowing member states to take temporary measures to set electricity prices for small and medium enterprises (SMEs) and energy intensive industrial consumers.

There is also a new directive and regulation on the gas and hydrogen markets that aims to decarbonise the EU’s energy sector, enhancing the production and integration of renewable gases and hydrogen.

The new regulation, adopted with 447 votes in favour, 90 against and 54 abstentions, will beef up mechanisms for fair pricing and stable energy supply, and will allow member states to limit gas imports from Russia and Belarus. The legislation will introduce a joint gas purchasing system to avoid competition among member states and a pilot project to bolster the

EU’s hydrogen market for five years.

The regulation also focuses on increasing investments in hydrogen infrastructure, especially in coal regions, promoting a transition to sustainable energy sources like biomethane and low-carbon hydrogen.

Lead MEP on the regulation Jerzy Buzek said: “The new regulation will transform the current energy market into one based primarily on two sources – green electricity and green gases. This is a huge step towards meeting the EU’s ambitious climate goals and making the EU more competitive on global markets. We have introduced a legal option for EU countries to stop importing gas from Russia if there is a security threat, which gives them a tool to phase out our dependence on a dangerous monopolist.”

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Brazil developers await starting gun for offshore wind and hydrogen bonanza

- Enabling bill held up by fossil fuel amendments
- Onshore renewables developing at pace

Janet Wood

Debate in Congress is delaying Brazil's plan to be a green energy powerhouse and investment hub, says Bloomberg.

A bill has been held up by a series of amendments, including one that would allow coal fired thermal plants to operate as late as 2050 and one that would require compulsory contracting of gas fired power plants.

President Luiz Inacio Lula da Silva has pitched the green energy transition and decarbonisation as one of his

administration's biggest priorities and hopes it will attract billions of dollars in foreign investment.

"Brazil doesn't have time to waste, and it's particularly worrying that the law is being held up because of the inclusion of measures meant to prolong obsolete and dirty coal powered generation," said Ben Backwell, Chief Executive Officer of the Global Wind Energy Council. "If Brazil wants to be the green economic powerhouse of the future it needs to create the conditions now as these are big,

long term investments."

The government is willing to delay the bill to get cross-party consensus, observers say. But the bill has to become law before Brazil can start holding licensing rounds for large-scale wind projects. There is optimism that the bill will pass because lawmakers want to see these investments go forward, partly because building offshore wind will allow Brazil to become a major producer of green hydrogen.

If projects do not get off the ground, other countries in Latin America could

move faster and take control of the market before Brazil.

Brazil—with one of the longest coastlines in the world—has 190 GW of projects waiting for permits, and a total offshore potential of 70 GW, according to energy research agency EPE. Developers are hoping to get the first offshore wind farms running by around 2030.

Jonathan Cole, Chief Executive of offshore wind project developer Corio Generation Ltd, commented: "There are a lot of big players sitting with projects that they are very

excited and optimistic about."

Nevertheless Brazil's onshore renewable energy expansion continues at pace. In March the country put into operation 41 plants totalling 906 MW. Almost all was renewables: 13 solar plants (544 MW), 25 wind farms (316 MW) and two small hydro plants (19.75 MW), as well as a 26 MW thermal plant.

Overall, 2.6 GW of power generating capacity was added to the national grid in the first three months of the year to bring the total to over 201 GW.

DOE warns against gas lock-in to meet growing electricity demand

Building more gas fired generation in the USA "has the potential to result in higher costs and unexpected lower reliability during extreme weather events than alternative options", according to a new US Department of Energy (DOE) report, 'The Future of Resource Adequacy'.

The DOE expects that data centres, manufacturing and electrification will be among the users that boost annual electricity demand growth from 0.5 per cent in recent years to 5 per cent over the next decade.

It says technology options for electricity adequacy "must be considered as parts of a portfolio of technologies that together provide sufficient and timely quantities of power".

Natural gas provided more than 40 per cent of US electricity generation in 2023, but the DOE also said building new gas fired stations without a

strategy to address emissions "risks infrastructure lock-in and stranded assets".

The DOE recommended the power sector takes advantage of "the full range of technology, planning, and operational solutions" to meet electricity demand, including long-duration energy storage, hydropower, nuclear energy, geothermal, grid-enhancing technologies and demand-side resources." It also said energy storage can also be deployed more rapidly than traditional solutions, as can re-conducting transmission lines with advanced materials.

"It is undeniable that electricity demand is expected to grow over the next decade as the manufacturing sector experiences explosive growth and artificial intelligence requires more and more energy," Energy Secretary Jennifer Granholm said

US's largest offshore wind farm about to begin construction

- Sunrise Wind receives necessary permits
- US DOE study supports offshore grid to connect new wind farms

Janet Wood

The 924 MW Sunrise Wind offshore wind project is ready to go ahead after the US Department of Interior's Bureau of Ocean Energy Management (BOEM) sent a positive Record of Decision (ROD) to the project's developers, Ørsted and Eversource, and the developers took a final investment decision (FID).

Ørsted has agreed to acquire Eversource's 50 per cent ownership share, becoming the project's sole owner, subject to various agreements and regulatory approvals.

Eversource will remain contracted to lead the project's onshore construction. "We are poised and ready to start constructing the transmission system to connect Sunrise Wind's clean power to the New York electric grid," said Joe Nolan, Chairman, President and Chief Executive of Eversource Energy.

The US's largest offshore wind farm so far will be sited 48 km east of Montauk, New Jersey and it is expected to

be completed in 2026.

"New York is already home to the trailblazing South Fork Wind project, and with Sunrise Wind we'll build on that foundation, broadening the economic benefits of offshore wind while delivering far more clean renewable power," said David Hardy, Executive Vice President and Chief Executive of Region Americas at Ørsted.

Last year, Ørsted experienced financial losses within its US offshore wind portfolio and cancelled the development of the Ocean Wind 1 and Ocean Wind 2 offshore wind projects in New Jersey.

Sunrise Wind is the seventh commercial scale offshore wind project approved by the Biden administration. The projects total more than 8 GW towards the Administration's goal of deploying 30 GW of offshore wind energy by 2030.

BOEM has held four wind lease auctions offshore, including New York, New Jersey and the first-ever sales offshore of the Pacific and Gulf of Mexico coasts. The bureau is also

exploring offshore wind in the Gulf of Maine and offshore of Oregon and the Central Atlantic coast. "BOEM and our partners remain focused on implementing the Biden-Harris administration's vision of approving 30 GW of offshore wind energy capacity by 2030," said BOEM Director Elizabeth Klein.

A new Atlantic Offshore Wind Transmission Study by the US Department of Energy has highlighted additional benefits from offshore transmission if it connects grid regions that are currently separate. This would allow offshore wind transmission to provide energy to areas of high demand, reduce grid congestion and increase system reliability.

The study found the benefits of connecting offshore wind platforms with intra-regional coordination, shared transmission lines and an offshore network of high voltage direct current (HVDC) link, outweighs the costs when compared with each project having its own isolated transmission connections.

Chile auction sees low response with terms uncertain

A low response to a call for offers to supply electricity to residential consumers and small and medium enterprises in Chile has been blamed on the changes made during the process.

The Chilean national energy commission (CNE) launched a call for offers to supply electricity for 20 years starting in 2027 and 2028 in July 2023. But the auction saw several changes in the terms and conditions, such as extending power purchase agreements (PPAs) from 15 to 20 years and introducing incentives for energy storage and dispatchable renewables. In addition, the auction total was adjusted downwards, from an annual supply of 5400 GWh to 3600 GWh.

Early last month, CNE said it had

received five bids, from Enel Generation, Innergex Energia Renovable SpA, Inversiones La Frontera Sur SpA, FVR Development Chile SpA and GR Power Chile. The offering of 3600 GWh/year is divided into two blocks, block 1 of 1500 GWh and block 2 of 2100 GWh, due to begin in 2027 and 2028, respectively.

The number of bidders is lower even than in 2022, when 15 companies placed bids compared with 29 bidders a year earlier.

Marco Mancilla, Executive Secretary of CNE said: "Although the number of bids has been lower than in past processes, we will wait for the final result of the award to evaluate the process in view of future tenders."

Hydro generating countries see large swings in water resource

Ecuador President Daniel Noboa has announced an emergency in the electricity sector and asked for the resignation of Minister of Energy Andrea Arrobo, after drought in the country, which relies heavily on hydropower, led to outages. Similarly drought-stricken Colombia has also stopped exporting energy to Ecuador.

Low water levels, potentially a consequence of last year's El Nino weather system, have also affected hydro generation in the USA, which last year fell to its lowest since 2001.

However, the US DOE expects an

increase of 6 per cent in hydro generation this year. It expects hydropower to increase in nearly every part of the country, with "notable increases" in the Northwest and Rockies area – which produced 43 per cent of all US hydropower generation in 2023 – and in the southeast.

National Oceanic and Atmospheric Administration's Northwest River Forecast Center (NWRFC) forecasts suggest increased output from hydropower resources and non-hydro renewables to reduce electricity generation from natural gas and coal.

Canada's Ontario government, meanwhile, has backed plans to refurbish hydropower stations in the Niagara region, in a C\$1 billion (\$730 million) programme that would secure up to 1.7 GW of additional generating capacity.

"The modernisation of these power plants is expected to extend the life of the assets for over 30 years, and increase the generation of sustainable, reliable and affordable electricity," said Frederic Ribieras, Chief Executive of GE Vernova's Hydro Power business.

Cross-border energy networks can cut ASEAN decarbonisation costs by \$800 billion, says DNV

- Full resource sharing can cut 11 per cent from overall net present cost of ASEAN decarbonisation by 2050
- ASEAN Power Grid could be used to support decarbonisation efforts

Junior Isles

The cost of decarbonising the energy supply across the member states of the Association of South East Asian Nations (ASEAN) could be cut by as much as \$800 billion through comprehensive regional collaboration encompassing power interconnectors, hydrogen networks, and energy storage infrastructure, according to DNV.

In a white paper titled 'ASEAN Interconnector Study: Taking a Regional Approach to Decarbonization', DNV



Le Gallo: A key finding is that 'Moderate Interconnection' offers substantial cost savings

the independent energy expert and assurance provider evaluates the advantages of a unified regional strategy towards decarbonising the power sector, while also addressing hurdles such as efficiently integrating the substantial influx of renewable energy.

The DNV report models three scenarios for a decarbonised ASEAN power sector by 2050. In one ('Individual Approach'), countries try to fully decarbonise alone from their own resources. In another ('Moderate Interconnection'), based on the 'ASEAN RE Target Case' in the ASEAN Interconnection Masterplan Study Phase III, there are several cross-border power interconnectors but with limited transmission capacity and no hydrogen network. The third DNV scenario (Regional Cooperation) envisages full, unconstrained resource sharing between countries, involving power interconnectors and hydrogen networks.

The paper concludes, such collaborative efforts can yield substantial cost savings, optimise material resource utilisation, and reduce the land footprint required for renewable energy development. DNV estimates that 'Regional Cooperation' can cut \$800 billion (approximately 11 per cent) from the overall net present cost of

ASEAN decarbonisation by 2050 compared with the Individual Approach, and \$300 billion (approximately 5 per cent) compared with Moderate Interconnection.

"At DNV we aim to support the energy sector with insights to realise a clean, affordable and reliable energy transition," said Brice Le Gallo, Vice President and Regional Director APAC, Energy Systems at DNV. "Our study forecasts power flow between ASEAN countries and regions under different scenarios. A key finding is that Moderate Interconnection offers substantial cost savings and requires limited interconnectors, meaning less resources and investment. This can be seen as a moderate step towards decarbonisation as key stakeholders recognise the benefits of cross-border interconnectors."

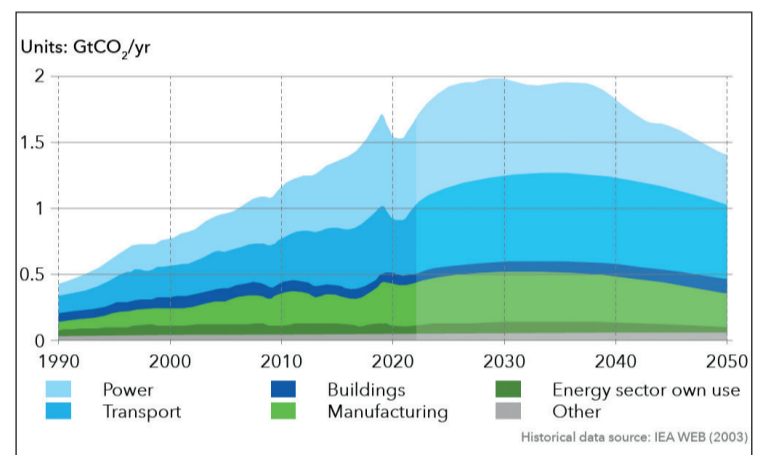
The study underscores that the primary advantage of 'Regional Cooperation' lies in minimising the necessary levels of renewable generation and energy storage to attain net zero, thanks to the enhanced utilisation and sharing of resources from regions abundant in renewable potential.

The aspiration to achieve net zero carbon emissions by 2050 is widely shared among the ASEAN member

states. Alongside this vision, there exists a longstanding goal to establish an ASEAN Power Grid, aimed at meeting the region's burgeoning energy needs while bolstering energy security. This ASEAN Power Grid could be used to support decarbonisation efforts by transporting clean energy from countries with excess renewable power to countries with shortages. However, most decarbonisation efforts to date

remain confined to individual nations.

The report was published as the Malaysian government agreed on a plan to establish Energy Exchange Malaysia (ENEGEM) for cross-border green electricity sales to neighbouring countries. An auctioning process using the ENEGEM platform will commence with a 100 MW pilot run, utilising the existing interconnection between Singapore and Peninsular Malaysia.



South East Asia energy-related carbon dioxide emissions by demand sector 1990-2050 (DNV, 2023a)

Climate group questions Indonesia's climate ambition under new leader

Indonesia's President-elect General Prabowo Subianto Djojohadikusumo should divest himself and close family members from ownership and investments in fossil fuels, including coal, oil and gas, to ensure that when he takes office he avoids conflicts of interest in industries that harm the environment, contribute to increased greenhouse gas emissions, and violate human rights, says Climate Rights International.

The organisation said Prabowo, who was announced as President-elect in March, should divest "to ensure that his personal interests do not influence Indonesia's efforts to combat the climate crisis and uphold the rights of Indonesians".

Brad Adams, Executive Director at Climate Rights International, said: "The financial interests of President-elect Prabowo Subianto's in fossil fuel companies raise serious questions

about his commitment to cutting greenhouse gas emissions in Indonesia."

According to local and international media reports, Prabowo has business interests in coal, palm oil, oil and gas, and pulp and paper companies.

Despite a pledge to be carbon neutral by 2060 or sooner, Indonesia's coal consumption grew a 33 per cent in 2022 from the previous year, and the country continues to be the world's

largest coal exporter. It is also one of the world's biggest emitters of greenhouse gases and Adams has called on Prabowo to "immediately stop" the permitting of new fossil fuel projects, including captive coal plants when he takes office in October.

Eddy Porwanto, Chief Financial officer at Indonesia Investment Authority (INA) told the *Financial Times* that the organisation is "actively helping Indonesia with its energy transition"

and is looking to fund the early retirement of coal fired power plants.

INA's focus comes as experts warned of a massive investment gap in south east Asian countries meeting their net zero goals. A recent report by Bain & Company, GenZero, Standard Chartered and Temasek said the region had seen \$45 billion in investments in green projects since 2021 but required an estimated \$1.5 trillion by the end of the decade.

World Bank to support India's clean energy drive

The World Bank is planning to provide a \$1 billion line of credit to the State Bank of India (SBI) to accelerate India's transition to clean energy.

Citing sources familiar with the development, *Mint* reported that the financing aims to support the expansion of battery storage systems and electric mobility initiatives across the country. A World Bank spokesperson said the proposed project is under preparation and the details are being finalised. It is expected that the funds will be disbursed in tranches to mobilise early investments and attract private capital in these green sectors.

Large-scale battery energy storage systems (BESS) are vital for integrating intermittent solar and wind power into India's electricity grid. As the government aims to install 500 GW of renewable capacity by 2030, requiring 50 GW of annual additions, grid-scale storage will be instrumental in managing fluctuations and ensuring stable power supply.

Energy analysts have welcomed the

World Bank's financing, stating that such multilateral support is crucial for accelerating India's energy transition.

"Subsidised financing can provide great impetus through pilot projects and contractual templates", said Vinay Rustagi, Senior Director and Global Head of Renewables at CRISIL, a ratings agency.

As India strives to achieve its updated Nationally Determined Contribution (NDC) of sourcing 50 per cent of its installed power generation capacity from non-fossil fuel sources by 2030, concerted efforts and strategic investments in clean energy solutions will be crucial.

The news came as two of India's largest energy companies unveiled significant clean energy investments.

In early April, Adani Green Energy, part of Indian conglomerate Adani Group, announced a significant investment plan totalling Rs2.3 trillion (\$27.6 billion) to expand its green energy production. The investment, as reported by the *Hindu Business Line*,

will be channelled until 2030 to boost the company's solar and wind power generation capacity.

Adani Green Energy plans to invest a further Rs500 billion in similar renewable projects across the country, as part of its broader strategy to reach an operating portfolio of 45 GW by 2030. This represents a significant increase from its current capacity of 10.9 GW.

At the same time, NTPC Ltd., India's largest integrated power utility, set a target to add 5 GW of installed capacity in fiscal year 2025, 3 GW of which will be renewable energy capacity. The company plans to have 60 GW of renewable capacity by 2032 out of a total portfolio of 130 GW.

A recent report by the Indian Institute of Management (IIM) said coal is projected to continue as the backbone of the Indian energy system until the next two decades. It said that net zero is not possible without substantial nuclear power and renewable energy generation by 2070.

China Energy accelerates green transition, as country dominates wind turbine rankings

China Energy Investment Corp also known as China Energy, saw a 34.7 per cent year-on-year increase in newly installed capacity for new energy during the first three months, with a corresponding 23.2 per cent rise in clean energy electricity generation compared to the same period last year.

China Energy has been stepping up investments in renewable energy projects, including wind, solar and hydropower. It has launched 80 key projects nationwide with a total investment of Yuan400 billion (\$55.27 billion).

The results reflect the country's strategy to grow its economy by channelling even more resources into decarbonisation. In early March Premier Li Qiang announced that

China would accelerate investment in clean energy projects, while at the same time increasing the supply of low-cost green products from China.

While Chinese players still rely heavily on their domestic market, they are also growing their footprint in foreign markets. Chinese firms commissioned 1.7 GW of wind projects in 20 markets overseas last year, including five EU countries. According to BloombergNEF (BNEF), Chinese-made wind turbines supplied outside mainland China are 20 per cent cheaper than those of US and European manufacturers.

A BNEF report published in late March showed that Chinese wind turbine makers dominated the top five spots in its global wind turbine supplier ranking.



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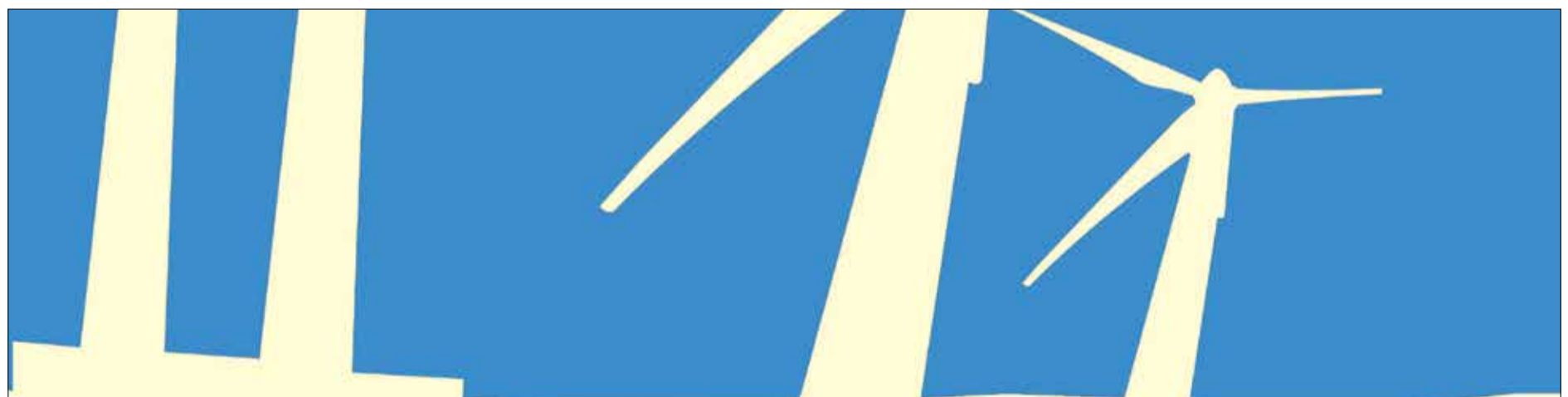
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Europe News

Europe's renewables push prompts wholesale grid expansion

- Upgrades required for large scale and distributed sources
- Initiative will strengthen Ukraine connection

Janet Wood

The world's longest subsea interconnector, the 760 km Viking Link between GB and Denmark, has been formally opened. The £1.8 billion (\$2.24 billion) project has a capacity of 1.4 GW.

Group Chief Executive of National Grid, John Pettigrew, said: "Physical connections to other countries are central to the international collaboration, which sits at the heart of the energy transition we are undergoing."

"Our existing fleet, Viking Link and our planned Nautilus and LionLink

projects will act as the cornerstone for North Sea nations to make the most of up to 300 GW of offshore wind generation." LionLink will connect GB with the Netherlands while Nautilus will connect with Belgium.

The huge expansion in offshore wind and the new connections needed to transport power have prompted new models for cooperation between network companies. For example TenneT, which expects to have 17 offshore grid connections with over 21 GW of offshore wind by 2031, recently announced plans to share resources in a bid to achieve greater efficiency,

sustainability and safety offshore.

Erik Hiensch, responsible for Operations & Maintenance offshore at TenneT, said: "We notice that many parties are facing the same challenges as TenneT, which is why we want to investigate whether we can develop a new cooperation model."

Onshore grids are also facing expansion to transport offshore wind energy to users. For example Germany's Amprion recently announced plans to invest €28 billion by 2028 – a 25 per cent rise on its original five-year investment plan. Since 2021, the company has tripled its investments in grid

expansion and brought forward investments to take place "ahead of need".

The A-Nord direct current link and Ultratnet projects to transport large volumes of renewable electricity from the North Sea to the west of Germany and as far south as Baden-Wuerttemberg. Amprion has succeeded in moving forward its construction date by a year, and the project should go into operation in 2027.

Similar expansion of distribution networks has to accommodate more distributed generation. For example the European Investment Bank (EIB) will lend €400 million for upgrade

and digitalisation of the electricity grid in Germany's Thuringia state.

Meanwhile, Kadri Simson, European Commissioner for Energy, has agreed with Ukraine that the ENTSO-E European transmission network organisation should help to increase the capacity of cross-border interconnectors that can transfer electricity between Ukraine and its European neighbours. The European Commissioner also emphasised the importance of the Ukraine Energy Support Fund for the procurement of equipment needed to restore and strengthen the resilience of the Ukrainian energy system.

Germany wins state aid clearance for green hydrogen production

The European Commission has given state aid clearance to a German scheme to support the production of renewable hydrogen through the European Hydrogen Bank's 'Auctions-as-a-Service' tool.

The €350 million scheme will support the construction of up to 90 MW of electrolysis capacity and is expected

to incentivise the production of up to 75 000 t of 'green' hydrogen from renewables.

It will help Germany achieve its ambition to have at least 10 GW of domestic electrolysis capacity by 2030. The aid, granted for up to 10 years, will take the form of a direct grant per kilogramme of renewable hydrogen

produced and beneficiaries will have to prove they comply with EU criteria, including contributing to the deployment or financing of the additional renewable electricity, which is needed to produce the hydrogen supported under the scheme.

The Commission found that the scheme is "necessary and appropriate

to facilitate the production of renewable hydrogen and thus the decarbonisation of the industrial, transport and/or energy sectors", and that the beneficiaries would not carry out the relevant investments without it. Support will be awarded through a competitive bidding process supervised by the European Climate, Infrastructure,

and Environment Executive Agency (CINEA).

"The scheme will support the most cost-effective projects in Germany, reducing costs for taxpayers and minimising possible distortions of competition," said Margrethe Vestager, the Executive Vice-President in charge of competition policy.

Netherlands auction set to double offshore wind capacity

The Dutch government expects to announce winning bids in June to build offshore wind farms totalling 4 GW in the Dutch part of the North Sea.

The Netherlands Enterprise Agency (RVO) said it had received multiple bids in a tender to build the wind farms, although Dutch energy firm Eneco said it had reversed its decision to participate in the tender, saying the business case had been eroded due to rising raw material costs, uncertain electricity prices and demand, high interest rates and supply chain problems.

The new wind farms will be at two locations in the IJmuiden Ver wind farm zone, with a capacity of 2 GW each, around 60 km off the Dutch

coast. Both are expected to be operational by early 2030 with a connection to the onshore grid delivered by state-owned grid company TenneT. The Netherlands currently has wind farms with a capacity of 4.7 GW in the North Sea and it wants to increase this to around 21 GW by 2031. A third 2 GW site at the IJmuiden Ver zone, Gamma, is due to be awarded in 2025.

"The wind sector is facing challenges such as recent price increases and high interest rates," said Rob Jetten, Minister for Climate and Energy. "I am pleased that despite these developments, several parties have shown interest in building these wind farms."

Baltic Sea countries will boost renewables and collaborate to maintain energy security

Energy ministers of eight Baltic Sea countries – Lithuania, Denmark, Estonia, Finland, Germany, Latvia, Poland and Sweden – have agreed on closer collaboration to secure critical offshore energy infrastructure. The new 'Vilnius Declaration' is a response to security concerns after Russia's invasion of Ukraine and acts of sabotage to energy infrastructure in the Baltic Sea.

Energy infrastructure in the Baltic Sea is increasing and 2023 commitments will increase offshore wind from 3.1 GW now to 19.6 GW by 2030. The Declaration commits Baltic countries to decarbonise their energy systems "as soon as possible"

and unlock the Baltic Sea's "vast untapped resources of offshore wind". They want to replace Russian fossil fuels with renewables with a resilient wind supply chain in the region.

The Declaration states that greater interconnectivity among the EU Baltic Sea countries will increase Europe's energy security so they want to enhance collaboration on offshore wind farms, new offshore energy hubs and a meshed offshore wind grid.

They also want to increase the security of offshore infrastructure and deter possible malign activities against offshore and underwater infrastructure within NATO and EU.

Nuclear makes faltering progress

- Flamanville set to load fuel
- Czechia and Slovakia make nuclear low-carbon workhorses

Janet Wood

As France gets set to commission its first new nuclear power plant this century, progress towards more nuclear plants in Europe remains mixed.

EDF has announced plans to load fuel in its new Flamanville reactor and connect it to the power grid this year – 12 years later than originally planned. France also plans to extend the operating life of the construction of 32 of the 56 existing facilities and build more than a dozen new plants.

Czechia has progressed its plans for new units. At the end of January, the government invited EDF and South Korea's KHNP to submit binding bids for the construction of up to four new reactors at two existing sites – Dukovany and Temelin. The government is expected to select a winner in the summer and construction of the first

one is due to start in 2029.

Environment Minister Petr Hladik said on Czech television that it is clear that the Czech Republic will need all four new reactors in the future. However, there will be a debate about the timeframe in which they will need to be built. Neighbouring Slovakia recently ended production at its last coal fired power plant and now plans for electricity to come almost entirely from nuclear and renewable sources.

Funding for capital-intensive new nuclear units remains problematic. Reports in the UK suggest it will look for foreign investors in its planned plant at Sizewell C. *The Mail on Sunday* reported that Phoenix, Abrdn and Aviva have all now said they are not in negotiations to take an equity stake in the power station. Some pension funds including BT, NatWest and Nest have also ruled out backing the plant,

which will cost at least £20 billion (\$25 billion).

But the newspaper reported that six groups remain in talks with the government, with at least one understood to be from the Emirates. Centrica, the owner of British Gas, is also thought to be in the frame.

The *NZZ am Sonntag* newspaper reported recently that France wants Switzerland to help foot the bill for building six new nuclear power plants by 2050. France argues that power from the French plants will be exported to neighbouring countries. The newspaper reported an official as saying: "France considers it opportune that countries that do not want to have new nuclear power plants themselves, but would like to import nuclear power from France, should contribute to the costs of building the planned new nuclear power plants in France."

South Africa's Eskom explores funding for major network expansion

- Transmission expansion planned amid wider market reform
- Red tape reduction to boost participation and innovation

Nadia Weekes

South Africa's state-owned power utility Eskom is in discussions with government ministries regarding private and foreign funding options for a significant expansion of its transmission network.

The expansion, estimated to cost R390 billion (\$21 billion), is required to accommodate the increasing amount of renewable generation coming online.

Eskom, which supplies 80 per cent of the country's electricity, has struggled to meet demand, leading to blackouts that have severely impacted the national economy.

Up to 2033, the utility aims to construct 14 218 km of power lines, more than three times the amount installed since 2015. The company is considering options including the use of funds pledged by wealthy nations for the energy transition and drawing on private sources.

In 2021, \$9 billion in climate financing was pledged to South Africa by France, Germany, the US, the UK and the EU through the Just Energy Transition Partnership (JETP) to assist the country's shift away from coal.

Eskom has not indicated whether it will seek approval to take on new debt. It has stated that it "will update the market as and when definitive decisions are made" regarding its funding options.

In his latest Energy Action Plan briefing, Electricity Minister Kgosientsho Ramokgopa pointed to fast progress towards wider market reforms saying that electricity will now be generated and sold on the open market with supply and demand factors determining tariffs.

Announcing reforms including accelerating water, procurement, grid access, environmental, gas industry and other approvals, Ramokgopa said his department had set up a one-stop shop for generation capacity.

"These are reforms of tectonic proportions. We are within touching distance of reaching our goals. Of course there will be moments of setbacks here and there, but we have concrete approvals from government," he said.

An overhaul of the Electricity Regulation Act (ERA), currently undergoing parliamentary approvals, will enable sweeping changes that remove all red tape from approval processes, according to Ramokgopa.

The changes included the establishment of a market platform that allows the trade in electricity by multiple participants, leading to an increase in electricity generation and innovation, resulting in greater reliability of supply, and enabling consumers to have more choice on who supplies their power.

"The benefits will be the lowering of tariffs," said Ramokgopa. "We are moving away from the monopoly situation, though Eskom will still be the dominant player, but we want to ensure the reliability of supply and

democratisation of producing and selling of electricity."

As part of the reform, South Africa is setting up a transmission system operator (TSO) managed by a newly formed entity, the National Transmission Company of South Africa (NTCSA), Ramokgopa explained.

Meanwhile, UK company Globeleq's Red Sands project in the Northern Cape has been awarded preferred bidder status in South Africa's Energy Storage Capacity Independent Power Producer Procurement Programme (ESIPPPP).

By storing energy at times of excess generation and releasing it into the grid when generation falls short of demand, battery storage can be used to mitigate the need for load-shedding, providing stability to the grid.

Energy storage could expand the reach of renewables and speed the transition to a carbon-free power grid, ultimately enabling South Africa's transition away from fossil fuels. This R5.7

billion investment is part of the UK's commitment under the JETP. Financial close is expected this year, with project completion due in 2026.

Globeleq is owned by British International Investment (70 per cent) and Norway's Development Finance Institution, Norfund (30 per cent). It is the leading developer, owner and operator of electricity generation in Africa.

In a separate development, Russia's state nuclear energy corporation Rosatom is developing a floating nuclear power plant (NPP) project for South Africa.

According to Rosatom CEO Alexei Likhachev, the company has received a number of applications from African countries to consider projects to construct new NPPs. Egypt is currently building its first NPP, El-Dabaa, with Rosatom's help. It will be the first in Africa to use Russian technology.

Rosatom is also considering the construction of a small-scale hydroelectric power station in an African country.

Thermal power to dominate UAE power mix up to 2035

Thanks to the presence of large oil and gas reserves, thermal power will continue to dominate the power generation mix in the United Arab Emirates (UAE) at least until 2035, according to a report by data and analytics company GlobalData.

According to its latest report, 'UAE Power Market Size, Trends, Regulations, Competitive Landscape and Forecast, 2024-2035,' the installed capacity share of thermal power in the UAE was around 80.4 per cent in 2023.

"With the discovery of new hydrocarbon reserves, the UAE is planning to invest heavily in hydrocarbon infrastructure and seek to develop new production techniques," explained Sudeshna Sarmah, Power Analyst at

GlobalData.

By 2035, it is anticipated that the cumulative thermal power capacity will expand to 46.1 GW, up from 41.2 GW in 2023. "Most of the increase in capacity is expected in gas-based thermal power rather than oil," Sarmah added.

Rapid economic and demographic growth over the past decade has pushed the UAE's electricity grid to its limits. The UAE is planning to add nuclear, renewable, and coal fired electricity generating capacity to accommodate rising demand. Despite its vast resource potential for renewables, particularly solar, the country has made "only small progress" towards harnessing renewable energy resources.

Ivory Coast bets on solar as part of renewables drive

Ivory Coast officially opened a 37.5 MW solar power plant in April in what the government said was the first step of a plan to integrate more renewable energy into the power sector.

Ivory Coast, the world's top cocoa producer, is seeking to become a major power supplier in West Africa. It currently produces most of its roughly 2250 MW of power from oil and gas. By 2030, the country wants 45 per cent of its energy mix to consist

of renewable energy.

Minister for Mines, Power and Electricity Mamadou Sangafowa Coulibaly said that Ivory Coast will add 678 MW from solar power plants to its power network by 2030.

The state-owned Boundiali Solar Power Plant, located about 660 km north of the commercial capital Abidjan, is to extend its capacity to 83 MW next year. The expansion will be supported by financing from Germany.

Fossil-fuel rich Azerbaijan eyes renewable energy surge

- Solar power boost to deliver cheaper electricity
- Investment in Croatia renewables mooted

Nadia Weekes

Azerbaijan, known for its rich oil and gas reserves, is making strides in the renewable energy sector, with a significant increase in solar and wind energy production observed at the beginning of 2024.

In January and February, Azerbaijan witnessed a remarkable increase in solar energy production, with output soaring to 50.7 million kWh, compared with 8.4 million kWh in the same period last year.

In the first two months of this year, wind farms contributed 9.5 million kWh of electricity and solid waste

incineration plants generated 41.7 million kWh, against 9.1 million kWh and 39 million kWh, respectively, in January and February 2023.

The potential for renewable energy in Azerbaijan is estimated at 27 GW of capacity, predominantly in solar (23 GW) and wind power (3 GW).

Economist and member of parliament Vyugar Bayramov has made the case for boosting renewable energy production, resulting in a more diversified energy mix and cheaper electricity for consumers.

Meanwhile, Azerbaijan has indicated a desire to invest in Croatia's renewable energy projects, according

to a source at the Croatian Ministry of Economy and Sustainable Development. The source believes there is an opportunity for cooperation in the geothermal sector especially, as Azerbaijan has significant know-how in that technology.

Azerbaijan, Romania, Georgia and Hungary signed an agreement in late 2022 to build a Black Sea submarine electricity cable from the Black Sea coast of Georgia to the Black Sea coast of Romania. It is anticipated that the project, with an initial budget of \$2.3 billion, will be operational by 2029. There is no indication that Croatia may join it.

Kenya to renegotiate power agreement with Ethiopia

Kenya is reportedly contemplating renegotiating a power purchase agreement (PPA) it signed with Ethiopia in 2022, following a deepening electricity crisis triggered by high rates from Addis Ababa.

Ethiopia is a major hydroelectric power supply in East Africa, with Uganda and Kenya heavily relying on

the country.

The Energy and Petroleum Regulatory Authority (EPRA) has cited concerns that the escalating energy situation in Addis Ababa poses a risk to Nairobi's power supply. If Ethiopia fails to deliver the agreed-upon power, Kenya may need to renegotiate the deal, despite the earliest possible re-

negotiation being in 2027.

The power deal aimed to provide affordable electricity to meet Kenya's peak demand by reducing reliance on expensive sources. However, Ethiopia is grappling with a significant electrification deficit, causing widespread outages and weak access in rural areas.

Companies News



Hitachi subsidiaries move to meet growing transformer demand

- Hitachi Energy to invest additional \$1.5 billion to expand global transformer capacity
- Mitsubishi Electric Corporation transfers Nagoya Works distribution transformer business to Hitachi Industrial Equipment Systems

Junior Isles

Hitachi Energy and Hitachi Industrial Equipment Systems Co., Ltd, two wholly-owned subsidiaries of Hitachi Ltd, have announced significant developments to serve the growing global demand for transformers.

In late April, Hitachi Energy said it would make investments of over \$1.5 billion to gradually expand the company's global transformer capacity by 2027. This is in addition to the \$3 billion already announced to progress on the electrification of the energy system. At the same time it also announced an investment of around \$180 million in a new state-of-the-art transformer factory in the Vaasa region, Finland.

"The demand for transformers and electrical equipment has grown at an unprecedented scale, and we are

investing to address our customers' mid- and long-term needs. We are developing our global footprint and capacity and progressing in digitalisation and technology to deliver even more sustainable and reliable solutions," said Bruno Melles, Managing Director of the Transformers Business.

The investments complement Hitachi Energy's broader growth efforts, which include the recently announced more than \$30 million expansion in Bad Honnef, Germany. Leveraging the company's global footprint, additional investments will follow in Europe, the Americas, and Asia to meet the growing demand for power and distribution transformers.

Hitachi Energy's transformer facility expansions include the ongoing project in South Boston, Virginia, US, and other recently completed projects at

Jefferson City, Missouri, US, and Dos Quebradas, Colombia. In addition, the company has inaugurated new cutting-edge factories in Chongqing, China, and Hanoi, Vietnam, together with a new transformer service centre in Welshpool, Australia.

The announcement followed news earlier in the month that Hitachi Industrial Equipment Systems Co., Ltd. and Mitsubishi Electric Corporation have agreed to transfer the distribution transformer business of Mitsubishi Electric's Nagoya Works, to Hitachi Industrial Equipment Systems and integrate their businesses.

Works will be transferred to Hitachi Industrial Equipment Systems in stages beginning in October 2024, with completion scheduled for April 1, 2026. The Business Transfer does not include the transformers manufactured

at Mitsubishi Electric's Transmission & Distribution Systems Center, Ako Factory.

Through this Business Transfer, Hitachi Industrial Equipment Systems will expand its portfolio of transformers and accelerate the growth of grid edge solutions centred on power distribution systems, mainly in the domestic market.

With the global diversification of power generation sources – due to the growth of renewable energy, and increasing electricity demand driven by the expansion of data centres and semiconductor manufacturing – the demand for power distribution transformers is expected to grow globally over the long term.

Explaining the transfer, Yasuhiro Takeuchi, President and CEO, Hitachi Industrial Equipment Systems, said:

"The desire to contribute to Japan's carbon neutrality in 2050 is behind this integration. Hitachi Industrial Equipment Systems globally provides industrial equipment that supports social infrastructure and manufacturing, and transformers are indispensable products for building a greener and more intelligent domestic power transmission and distribution network in Japan."

There is a growing need to ramp up global transformer manufacturing capacity to keep pace with demand driven by increasing electrification. Transformers play a key role in power systems, enabling efficient transmission and distribution of electricity. They are a key component for integrating renewables, grid interconnections, powering data centres and electrifying transportation, facilitating the decarbonisation of energy systems.



Private companies lag public counterparts on emissions targets

Less than 40 per cent (38) of the world's largest 100 private firms have net zero targets, compared with 70 out of 100 of their publicly-owned peers, finds the latest analysis by Net Zero Tracker (NZT).

The analysis, 'A Distinctly Private Pursuit: Not going net zero' compares the readiness of major companies for incoming climate regulation. It shows a widening gap between the climate targets of the world's largest 100 private companies, compared with their publicly-listed equivalents – creating an "uneven playing field" for companies, investors and policymakers alike.

The 38 private companies, with combined annual revenues of \$2.1 trillion, have net zero targets – from almost \$5 trillion of aggregate annual revenues earned by the top 100. By comparison, seven-tenths of publicly-listed firms (70), with combined annual revenues of \$13 trillion, have net zero targets (from a total of \$18.1 trillion of aggregate annual revenues earned by the top 100 public firms).

In October 2022, less than one-third

(32) of the largest 100 private companies had net zero targets. Eighteen months later, there were only six new net zero targets.

John Lang, Project Lead, Net Zero Tracker (The Energy and Climate Intelligence Unit), said: "If 'sunlight is the best disinfectant' for climate inaction, most private firms are operating nocturnally – beyond the glare of the civil scrutiny, investor pressure and disclosure requirements faced by listed companies.

"New measures being introduced in regions from the EU, to the US and Singapore – some with extra-territorial dimensions, are changing the rules of the game. What goes on in the EU does not stay in the EU. And what goes on in a regulated public company will not stay in a public company: one company's indirect emissions are another's direct emissions."

Camilla Hyslop, Data Lead at Net Zero Tracker, added: "The alarming reality that half of the largest 100 private companies, whose revenues make them 'too big to fail', have opted out of setting any climate targets, leaves

both their home countries and global supply chains exposed to serious transition risk."

According to NZT, the analysis reflects on the new EU Corporate Sustainability Reporting Directive (CSRD) and Corporate Sustainability Due Diligence Directive (CSDDD). The CSRD requires about 50 000 companies (both public and private) to report their climate impacts, including value chain greenhouse gas emissions (Scope 3), and action taken to address them, from January 1, 2025 for the largest private firms.

The CSDDD, once effective, is likely to require more than 5000 companies (both public and private) to provide information on the integrity of their strategies for achieving net zero emissions or other deep decarbonisation targets. Notably, the CSDDD is expected to require companies to have created transition plans to take emissions to net zero later this century.

However, of the 38 private firms with net zero targets, only eight have plans to deliver on them, "and even these have serious deficiencies", said NZT.

Shell sells US offshore wind interest as company refocuses on oil and gas

Shell New Energies US LLC has sold its 50 per cent equity share in South-Coast Wind – a 50:50 joint venture between Shell and Ocean Winds – to its joint venture partner Ocean Winds North America LLC.

The announcement follows Shell's energy transition strategy released in March, where the company revealed that it is reducing its 2030 emissions reduction targets to boost value for shareholders.

However, Shell still maintains its ambition to become a net zero company by 2050.

"In-line with our Powering Progress strategy, Shell continues to hone our portfolio of renewable generation projects in key markets where we have an advantaged position," said Glenn Wright, Senior Vice President, Shell Energy Americas. "We are grateful to Ocean Winds for their years of partnership within this venture, and continue to seek opportunities to provide more energy, with fewer emissions."

Shell has come under fire for weakening its emissions targets in order to keep growing its gas business and has been resisting pressure to do more to tackle climate change.

Last month the company launched an appeal against a landmark ruling compelling the oil and gas company to slash its emissions by 45 per cent by 2030, relative to 2019.

A historic win in the district court of The Hague in May 2021 for the Dutch wing of Friends of the Earth, Milieudefensie, spawned a series of copycat cases by non-profit groups against multinationals, including most recently BNP Paribas and TotalEnergies.

"This was the mother of all climate cases against corporations," said Klaas Hendrik Eller, an assistant professor at the University of Amsterdam's centre for transformative private law. "It fuelled this idea of courts being an important actor in combating climate change."

Rolls-Royce, Landmark and ASCO sign MoU on CO₂ recovery

Rolls-Royce, ASCO Carbon Dioxide Ltd (ASCO), and Landmark Power Holdings Limited (LMPH), have signed a Memorandum of Understanding (MoU) aimed at developing scalable solutions for clean power generation with carbon capture from mtu gas reciprocating engines.

The companies plan to make the captured CO₂ available for utilisation in various industries such as food production, Efuels, sustainable aviation fuel (SAF), cement and plastic production.

The captured CO₂ will also be ready for transportation should permanent

sequestration (storage) be preferred.

The partnership brings together the collective expertise of the three companies: Rolls-Royce is contributing its extensive experience and global network in the field of decentralised power generation; LMPH is a developer of combined heat and power (CHP) projects; and ASCO has over 50 years of experience in developing and building carbon capture (or CO₂-recovery) plants.

The first plant that will use the technology and expertise of the partners is already under construction in Rhodessa, Nottinghamshire in the UK.

10 | Tenders, Bids & Contracts

Americas

Turboden ORC technology for Cape Station

Fervo Energy, a pioneer in enhanced geothermal systems (EGS), is to draw on Turboden's expertise in Organic Rankine Cycle (ORC) technology. It has signed an agreement with Turboden for the engineering and procurement of power plant equipment for the initial 90 MW phase of its geothermal Cape Station project in Beaver County, Utah, USA.

The agreement covers the installation of three generators with six ORC turbines, ensuring optimal energy conversion from geothermal sources.

Cape Station will have an anticipated total project capacity of approximately 400 MW. The project will not only validate the efficacy of EGS technology but also unlock vast potential for future geothermal power projects across the United States.

Wärtsilä engines for Texas power grid

Wärtsilä has won a contract from the Lower Colorado River Authority (LCRA) based in Austin, Texas, which provides wholesale power to the Texas power grid, to supply a further ten 50SG gas engines for the Timmerman Power Plant.

The new order, which follows an order by LCRA for ten Wärtsilä engines with an output of approximately 190 MW in 2022, will double the plant's output.

The new Timmerman Power Plant, located near Maxwell, Texas, will supply additional capacity needed to support LCRA's customers and support the Texas power grid and ERCOT, the Texas electrical grid operator.

The additional capacity will help alleviate supply challenges created by load growth and the retirement of ageing plants in Texas.

LCRA's Timmerman plant will operate on natural gas and will have two blocks, each powered by 10 Wärtsilä engines. The first block is expected to come online in 2025, with the second scheduled to be completed in 2026.

Mill Creek to get 7HA.03 CCGT plant

Louisville Gas and Electric Company and Kentucky Utilities Company (LG&E and KU) has ordered a 7HA.03 gas turbine from GE Vernova for a combined cycle gas turbine (CCGT) plant at Mill Creek Generating Station in Louisville, Kentucky, USA.

LG&E and KU plans to retire two ageing coal fired units and build a new combined cycle plant at Mill Creek 5, along with solar energy projects, battery storage and energy efficiency programmes.

Mill Creek have will have an output of 645 MW, and will feature a GE Vernova 7HA.03 gas turbine, which will be fuelled initially by natural gas, with the ability to utilise up to 50 per cent hydrogen. GE Vernova will also supply a STF-D650 steam turbine and a W86 generator, an HRSG, and its Mark Vie control system.

TVA starts procurement for gas fired plant

The Tennessee Valley Authority (TVA) has started procurement proceedings for a 1.5 GW gas fired power plant in east Tennessee, valued at \$2.2 billion.

The plant will replace the 70-year-old nine-unit Kingston coal fired

power plant. TVA will also build 100 MW of battery storage and up to 4 MW of solar generation at the site. The new CCGT units are scheduled to begin operating before Kingston is retired in late 2027. They could burn up to 5 per cent by volume of hydrogen.

Allen Clare, Senior Vice President of Power Operations for TVA, said: "This energy complex is the most cost-effective option that offers the flexibility and reliability within the timeline to bring the replacement online."

Asia-Pacific

Iberdrola consortium to build offshore wind farm

A consortium, GK Hapco Noshiro, led by Iberdrola, and including Japan Renewable Energy and Tohoku Electric Power, has won a contract to develop a 375 MW offshore wind farm in Japan. The wind farm will be located off the coast of Hapco Town and Noshiro City in Akita Prefecture and will consist of 25 monopile turbines.

Construction is scheduled to begin in 2026, and operations will begin in 2029.

The consortium will be supported by Akita Bank in collaborating with local companies and organisations and in implementing regional development measures.

AFRY awarded solar contract in Philippines

Amatera Renewable Energy Corporation (ARECO) has appointed AFRY as the owner's engineer for the construction of a 65 MW solar PV plant and its electrical interconnection.

The Vista Alegre project will be a ground-mounted solar PV installation in Bacolod, capital city of the island of Negros.

AFRY will provide comprehensive services for the solar PV installation, including the interconnection facility for the 69 kV Bacolod substation. AFRY's scope of work includes assistance in project management, design review, and monitoring of the construction and commissioning phases.

Hong Kong to get CCGT equipment

An order for equipment for the natural gas fired combined cycle gas turbine (CCGT) at Lamma Power Station Unit 13, being built in Hong Kong by Hongkong Electric, has been awarded to Mitsubishi Power.

The new unit will have an output of 380 MW and is scheduled to begin operations in early 2029. The plant will be built on Lamma Island, located southwest of Hong Kong Island.

Mitsubishi Power will manufacture and supply its M701F gas turbine, a steam turbine, a heat recovery steam generator, and a Selective Catalytic Reduction System (SCR).

H-class gas turbine order for Gongju-si

GE Vernova's Gas Power business has secured an order from Korea Western Power, a subsidiary of Korea Electric Power Corporation (KEPCO), to provide a GE Vernova 7HA.02 gas turbine and a H65 generator for KOWEPO's power station in Gongju-si, Chungcheongnam-do, South Korea. GE Vernova is part of an international consortium, including the Korean EPC company Daewoo E&C.

KOWEPO's coal fired plant will be replaced with the 500 MW natural gas fired Gongju-si plant, which will be able to use a future fuel mix

combustion of up to 30 per cent hydrogen, subject to the development of a hydrogen manufacturing industry of an appropriate size and scale.

The plant is scheduled to start operation in 2027.

Vestas wins 77 MW order in South Korea

Vestas has won a 77 MW order from GS E&R for the YD1 Wind Farm in Gyeongsang-do, South Korea. The order includes supply and supervision of installation of 18 Vestas V136-4.2 MW wind turbines delivered in 4.3 MW operating mode.

Delivery of the turbines will begin in the first quarter of 2025, with commissioning scheduled for 2026.

Europe

Framatome secures Sizewell C contracts

Framatome has signed contracts with Sizewell C Ltd, laying out the scope of its involvement in the Sizewell C nuclear new build project in the UK, following the decision by the British government to approve construction of two EPR reactors there.

Framatome will be responsible for the delivery of the two nuclear heat production systems, from design phase (replicated from Hinkley Point C) and their supply, up to their commissioning. Framatome will also provide the plant's safety instrumentation and control systems.

A long-term fuel supply agreement, under which Framatome will fabricate the fuel needed to power the two reactors, as well as a contract for long-term services and maintenance to support the operation of the plant, are also part of the agreements.

The two EPRs at Sizewell will generate 3.2 GW.

Italian and Polish wind orders for Vestas

Italian renewables producer Edison Rinnovabili has placed an 81 MW order for repowering the Roio del Sangro, Monteferrante Guado, Monteferrante Casone and Montazzoli wind parks, in Abruzzo, Italy.

The contract includes the supply and installation of 18 V136-4.5 MW wind turbines, as well as a 10-year operation and maintenance service agreement.

In addition, Vestas has received a firm order from Energa Green Development, a subsidiary of the Orlen Group, for the Szybowice project in Opolskie, Poland.

The order consists of 17 V110-2.0 MW wind turbines in 2.2 MW power mode and includes supply, delivery, and commissioning of the turbines. Upon completion, Vestas will service the turbines under a 25-year service agreement.

Turbine delivery is expected to begin in Q3 2025 and commissioning is planned for completion in Q4 2025.

Valmet to deliver boiler rebuild in Scotland

Valmet will deliver a major boiler rebuild to E.On's Steven's Croft biomass power station in Lockerbie, Scotland. Delivery is scheduled for Q2 2024.

Steven's Croft's bubbling fluidised bed (BFB) boiler, originally delivered by Valmet, was started up in 2008. Valmet will renew the boiler's primary superheater, economisers, primary air preheater and screen tubes. Special corrosion resistant material will be used where

applicable to prolong the lifetime of the parts.

Netherlands to get new storage project

Fluence Energy will develop a 35 MW/100 MWh battery-based energy storage project at the Maxima power plant in Lelystad, Netherlands, for the French utility company Engie. The project is scheduled to be operational by 2025. Fluence will provide energy storage technology, software solutions and services for the project.

The Maxima power plant site, already housing a 900 MW gas fired power plant and a 32 MW solar farm, is well-suited for large-scale battery-based energy storage. Once operational, excess energy will be stored locally and released during peak demand, enabling Engie to integrate renewable energy generation with Maxima's electricity production, enhancing supply security and system flexibility.

International

World's largest WTE plant for Abu Dhabi

A consortium led by Marubeni Corporation, which includes Hitachi Zosen Inova and the Japan Overseas Infrastructure Investment Corporation for Transport & Urban Development, has been selected to design, build and operate a new ultra-large waste-to-energy (WTE) facility on behalf of the Emirates Water & Electricity Company and Tadweer Group.

Abu Dhabi's first WTE plant will be located near the Al-Dhafra landfill and will have a processing capacity of 900 000 tonnes of non-recyclable waste each year for the next 30 years.

The project will involve the financing, construction, operation and maintenance of the new WTE plant. The facility will utilise one of the largest and most advanced moving grate technologies ever made to convert municipal solid waste into electricity by using a highly efficient water-steam cycle.

The project will soon move into its three-year construction phase.

TAQA and JERA to build Saudi cogeneration plant

Abu Dhabi National Energy Co (TAQA), together with JERA of Japan, have entered into a Power and Steam Purchase Agreement with Saudi Aramco Total Refining and Petrochemical Co (SATORP), a joint venture company owned by Saudi Aramco and TotalEnergies.

They will develop a greenfield industrial steam and electricity cogeneration plant to produce electricity and steam for the Amiral petrochemical complex to be developed in Jubail in the Eastern Province of Saudi Arabia.

GE Vernova to strengthen Iraq's power sector

GE Vernova has launched multiple strategic initiatives with Iraq to boost generation and enhance the availability of power supply across the country.

The initiatives include a letter of intent with the Ministry of Energy to build 3 GW of CCGT plants, and to convert two sites, Samawa and Nasiriya from simple to combined cycle, and to expand capacity at the Al Mansouria gas fired power plant.

They also include a five-year service and upgrade agreements to enhance availability and efficiency of over 70 turbines and generators at 18 power plants, with a total capacity of 7.5 GW.



Hydrogen

US DOE advisory board finds hydrogen industry not growing fast enough

There will be many rivers to cross as the world finds its way to a net zero economy. Many industries are looking to hydrogen as the means to lead in the energy transition, but a new report delivered to the US Department of Energy says hydrogen development is not taking place fast enough.

Gary Lakes

A new report delivered last month to the US Department of Energy by the National Petroleum Council (NPC) has found that the 'clean' hydrogen industry is not growing at a rate that will enable the US to meet its 2050 climate goals.

Carbon-free, or green hydrogen is produced by using renewable energies such as wind or solar, and low-carbon hydrogen (such as blue or grey hydrogen) is generated by a means through which most of the carbon has been removed from the fossil fuel used to generate hydrogen through methods such as carbon capture and storage.

According to the report, current federal policies do not do enough to encourage the nascent hydrogen industry to generate sufficient supply or demand to hit the net zero targets.

US Secretary of Energy, Jennifer Granholm, who requested the report from the NPC in November 2021, and another examining ways to reduce greenhouse gas (GHG) emissions

across the US natural gas value chain in April 2022, remarked that the hydrogen report – 'Harnessing Hydrogen: A Key Element of the US Energy Future' – was "sobering."

The hydrogen and carbon dioxide/methane reports were made available to the DOE at the same time. The reports stem from the \$8 billion bipartisan infrastructure law funding passed in 2021, which provided funding for a number of projects meant to build hydrogen hubs across the US and reduce GHG emissions.

Indeed, the creation and use of hydrogen has been widely promoted in recent years as a promising fuel that will help solve many of the problems created by the use of fossil fuels and serve as an ever-available fuel supply well into the future. But gaining access to the electricity that will be needed to produce hydrogen on a large scale remains a problem in reducing its production costs, which thus impacts demand.

Regardless, hundreds of companies, universities, research labs and industries continue to pursue hydrogen with

the intent to eventually crack the obstacles that so far prevent hydrogen from being produced on a large and economical scale. The report calls for policymakers to take steps to boost hydrogen production and sales. One recommendation made by the NPC for the administration of President Joe Biden is that the 45V hydrogen production tax credit be extended from 10 to 20 years to incentivise investments that would result in making low-carbon hydrogen affordable.

The NPC is comprised of around 200 members, including the US energy giants, electricity companies, research groups, academic institutions, non-fossil fuel organisations and environmental groups.

According to the NPC, by 2050 green hydrogen would remain at around \$1.50-2/kg more expensive to use in Gulf Coast refining operations compared to grey hydrogen made with fossil gas. It would also be around \$0.50/kg more expensive to use blue hydrogen made with natural gas subjected to carbon capture and storage. Prices would be worse in the transport

sector, the NPC report said. The cost for grey hydrogen for heavy transport would be between \$1.50-\$4.00/kg, compared to \$8/kg for green hydrogen and \$6/kg for blue hydrogen.

Low-carbon hydrogen would achieve 8 per cent of emission reductions in the US, the report said, provided the industry was scaled up by seven times by 2050. Current policies allow for a scale-up of only twice the current size, the report said.

Most hydrogen production in the US is made using natural gas without capturing emissions. In a net zero environment, this would have to be greatly reduced.

Green hydrogen made with renewable-powered electricity needs \$1.8 trillion in capital investment between now and mid-century to meet 2050 targets, the NPC report said. Meanwhile, blue hydrogen made with fossils and carbon capture would require \$100 billion over the same time period to achieve the same goal.

Actions taken by the oil and gas industry show that they intend to continue their business in hydrocarbon

development and are relying on carbon capture, utilisation and storage (CCUS) to reduce carbon emissions. However, carbon capture is not viewed as a certainty by everyone.

Secretary Granholm said during a meeting with the NPC when the reports were presented, that there are parties that want to stick to the energy "status quo" and may "think that a fight is more productive than progress," but she added that the Biden administration does not agree with that line of reasoning, adding that she hopes that members of the NPC don't either.

"Because we all know this, that in five years or 10 years, 20 years, the energy status quo is going to be obsolete. For those who are proclaiming the future with certainty, I think a little humility is in order," Granholm said. She said secure supplies of traditional energy would be needed, but added: "Consumers and communities and countries and investors who are calling for change today will have fundamentally reshaped the markets tomorrow."

Gas

Growth in artificial intelligence expected to boost demand for natural gas

The AI revolution is going to lead to a demand for natural gas in coming years – just at a time when efforts are increasing to reduce reliance on the fossil fuel.

Gary Lakes

Surging demand for electricity at data centres that are using and developing artificial intelligence (AI) is expected to result in a huge growth in demand for natural gas by the end of the decade, according to research compiled by analysts at Tudor Pickering Holt & Co. The analysts predict that an additional 8.5 billion cubic feet per day (bcfd) of natural gas may be needed in the US to meet this growing demand.

News agency *Reuters* and other media picked up on the investment bank's report late last month, which said that data centres are likely to create a significant boost in natural gas demand during the second half of this decade. The data centres have a high demand for electricity, and this demand is expected to leap as AI is developed and deployed further.

The forecast is good news to gas producers who insist that only natural gas will be able to provide a steady supply of electricity. But steps taken by the administration of US President Joe Biden show a resolve designed to reduce the use and demand for natural gas and encourage the transition to renewables. Furthermore, there are those who argue that AI will be able to assist in developing renewable energies and help in the quest to combat climate change and environmental degradation.

According to the *Reuters* report, US power and technology companies are concerned that US power systems are not expanding fast enough to meet rapidly growing demand brought about by AI research. It said that some data centres have gone so far as to skip utility companies and make direct deals with power producers or build their own electricity supply. *Reuters* reported

that requests for power generation and energy storage projects to connect to the grid have soared. Citing data from the Lawrence Berkeley National Laboratory, the news agency said these requests have increased from 2000 GW in 2022 to 2600 GW in 2023.

The amount of energy needed to train AI is surprising and tech companies are not taking it lightly. A report last month in *Tech Republic* said that the amount of energy that generative AI consumes depends on factors including physical location, the size of the model and more.

Data centres currently need about 11 GW of power, the TPH report said, adding that by 2030 this is projected to grow to 42 GW in a base case scenario. It also estimates that an additional 2.7 billion cubic feet per day of natural gas will be necessary to support this increased power demand.

The growing number of data centres

isn't the only player in this demand for power. Cloud storage facilities and the crypto mining will contribute to the scenario. A report in the *Financial Times* on the subject cited data from S&P Global showing that technical and data-driven businesses will use more than 480 TWh of electricity by 2035, nearly a tenth of total US power demand, which for 2025 is calculated at 4.5 per cent.

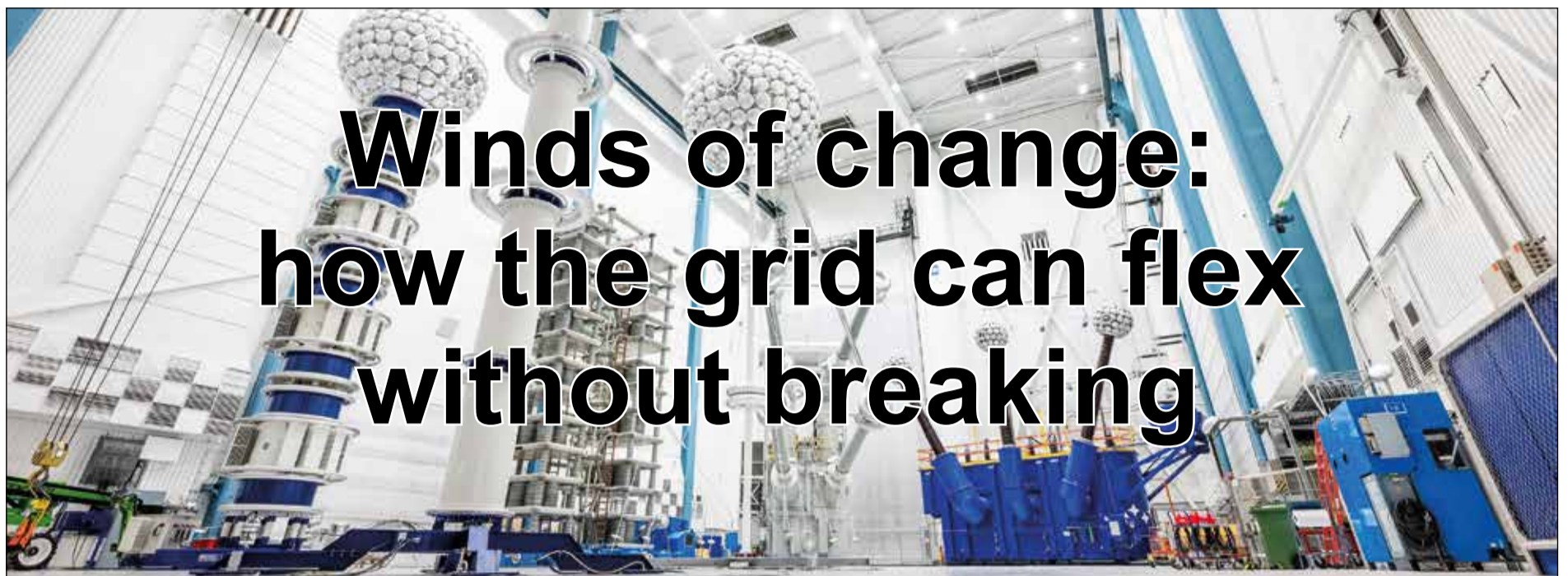
Growing demand will certainly impact prices. The TPH report forecast a natural gas price average of \$4/million Btu during the latter half of this decade. This compares with \$1.61/million Btu in February when prices were at a three-and-a-half-year low, mainly due to mild weather during the winter, subsequently leading some gas producers to cut back on output.

The AI revolution is being viewed by gas producers and power suppliers as a new market that will assure natural

gas a place in the future, despite warnings by experts that fossil fuels must eventually fade from the energy mix. And many of the big tech firms have pledged to base their operations on renewable energy systems. But much will depend on just how fast demand grows and whether renewables can keep up. Another issue concerns new power generation systems getting hooked up to the grid.

However, while there exists the possibility that demand for power may cause some high-tech companies and AI generators to back-track on pledges to stay with renewables, there are those who see renewables as able to meet power market demand.

According to S&P, most of the new demand growth will be met by carbon-free generation resources. The group forecasts that power generation by gas will decline by 2030 while green energy generation will soar.



Winds of change: how the grid can flex without breaking

The inherent variability of renewable power sources like wind and solar demands a radical enhancement in grid flexibility. The key is a system that flexes, rather than breaks, to accommodate different sources, each working at different times and at different speeds. Hitachi Energy's Gerhard Salge, explains.



Salge: flexibility can be substantially realised through strategic implementation of digital technologies and power electronics

If all you read over the past year were headlines, you'd think that the place of wind in the energy transition has been eclipsed by solar. Solar has continued to out-pace analysts' most optimistic scenarios for its growth. And several factors have contributed to headwinds that – in the headlines, at least – threatened to slow down offshore wind expansion in the US and UK.

But at WindEurope's annual conference this year in Bilbao, the industry conversations reflected the "can do" optimism and confidence that the sector needs in order to play its part. The reason being that behind the headlines, there are three big factors pushing in the opposite direction and driving wind forward.

First, the COP28 global commitment to 3x renewables by 2030 is a boost across the board and gives confidence to investors, manufacturers and developers about the direction of travel.

Second, while solar will play a much bigger role than even the most optimistic forecasts believed possible a few years ago, even its most-respected analysts, like Jenny Chase from Bloomberg NEF, stressed the need for solar to be balanced with investment in wind across wide geographies to meet those climate-related goals.

And third, the role of a flexible grid to integrating those renewables is now clearer than ever before.

Electricity will be the backbone of the entire energy system. In the global power system of 2050, we need around four times the power generation capacity and we will need to transfer up to three times as much electrical energy compared to 2020.

At the conference this year, together with WindEurope we launched our most recent report, 'Maximising the Power of Wind through Grid Flexibility'. The report provides a comprehensive analysis and strategic insights into adapting our energy systems to this new era. There were several key points in the study, but in a nutshell – the need for increased grid flexibility has been facilitated by advancements in digitalisation and power electronics. With the right business models and regulatory environments, they can be deployed rapidly to help meet our renewables goals.

As the penetration of renewable power sources like wind and solar intensifies, the inherent variability of these sources demands a radical enhancement in grid flexibility. By 2050, it is projected that the flexibility requirements in the EU will need to increase from 11 per cent to 30 per cent of total electricity demand – reaching 24 per cent by the crucial 2030 milestone. This substantial rise underscores the critical importance of evolving our grid systems to effectively manage the variability associated with renewable power sources, ensuring stability and continuity in energy supply.

Despite decades of news around the growth of renewables, however, outside of expert circles the implications of moving from the old model of centralised fossil-fuel power generation to more decentralised and more variable renewables is not widely understood. The hunks of metal in turbines turning at a constant speed driven by steam was a straightforward way to get a stable frequency for power grids. But when sources of power generation either have variable speeds of turning metals (wind) or basically no moving parts at all (solar) – we need to have a system that can accommodate all those different types of generation, and still keep the lights on at any point in time during normal operation as well as during disturbances.

The key is a system that flexes, rather than breaks, to accommodate different sources, each working at different times, at different speeds.

Our research shows four key levers to achieve the necessary flexibility:

supply-side flexibility; demand-side response; energy storage solutions; and the advancement of active grids including interconnectors. The optimal balancing of these four levers requires a cohesive strategy that involves all sectors of the energy industry, underpinned by a commitment to innovation and infrastructural advancement.

Interconnectors play a pivotal role in this transformation, enabling energy transfer across geographical and political boundaries, thus enhancing complementarity and consequently, the overall resilience and stability of the power systems. When wind is blowing on the North Sea the sun may not be shining on solar farms in Italy or Spain. Or when the sun is at its peak in California it could be powering offices and factories in New York, three hours ahead. To get the most from the potential of renewables, the grid needs to be bigger than the weather.

The European Network of Transmission System Operators for Electricity (ENTSO-E)'s initiative to double the capacity of cross-border connections by 2030 is a testament to the critical role these infrastructures play. Such enhancements not only improve the reliability of energy supply but also foster a more integrated and sustainable European energy market.

Digital technologies and power electronics emerge as game-changers in the quest for grid flexibility. These technologies allow for real-time grid management and adaptability to fluctuating energy inputs from renewable sources. By incorporating advanced monitoring systems, predictive analytics, and automated control mechanisms, grid operators can anticipate and respond to changes in energy production and consumption with unprecedented precision.

Decarbonisation will transform our energy system in the future, leading to a 'system of systems', which must be integrated and managed. The only way to manage this is through digitalisation, while managing and optimising today's operations. Digitalisation in grid management involves the deployment of smart sensors, advanced metering infrastructure, and IoT devices that provide data-driven insights into grid operations. This real-time data is crucial for making informed decisions on energy distribution and for optimising grid performance.

Power electronics play a critical role in managing the quality and flow of electricity through the grid. These technologies facilitate the conversion

and control of electric power from variable renewable sources, ensuring that the energy supplied is stable and reliable. Inverters, converters, and controllers are examples of power electronics that adjust the electrical characteristics of the power generated from renewable sources to match grid specifications, thereby mitigating issues related to voltage fluctuation and phase alignment.

The full potential of digitalisation and power electronics can only be realised through supportive policy and regulatory environments. Innovative policies are essential to encourage investment in these technologies and to facilitate the integration of advanced grid management solutions. Adaptive and forward-thinking regulatory frameworks will be capable of anticipating future challenges and fostering an environment conducive to technological innovation.

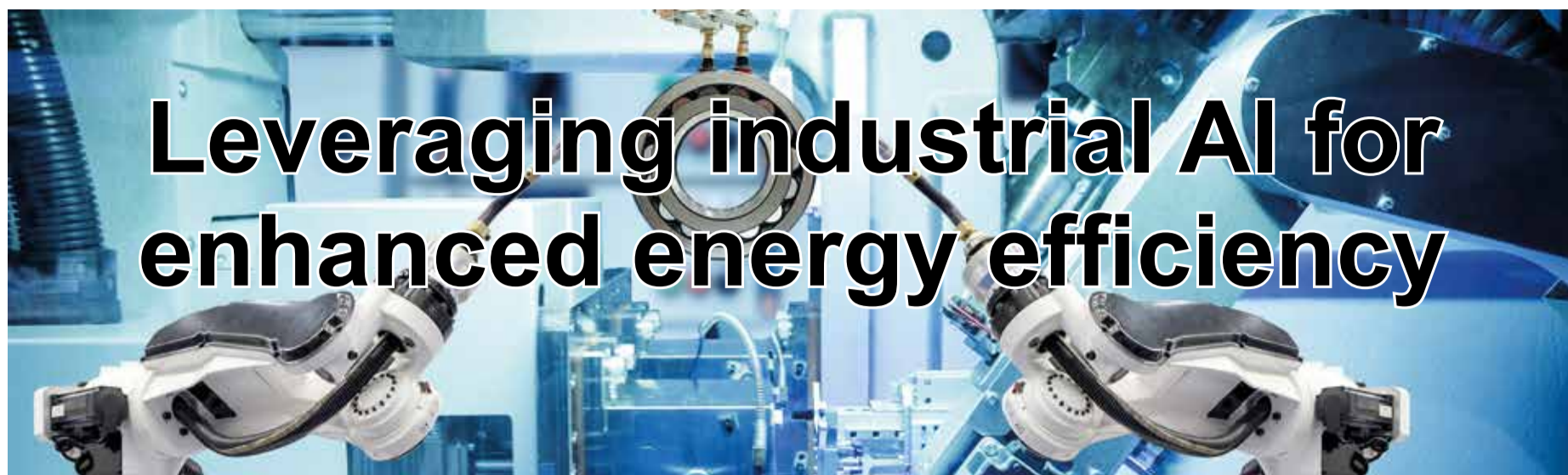
Developers and investors need certainty that the technology they commit to deploying today will be future proof, since consumers won't receive the long-term benefits of lower prices and energy security without those investments. The flexible grid enabling the rapid incorporation of the renewables necessary to meet our goals requires an unprecedented level of innovation not just in technology but in collaboration, education, research, new business models, global standards, investments, political and regulatory framework.

As outlined in our report, the renewable-powered future we all need can only be achieved when it is built on a grid for this model of power generation. And that means flexibility, which can be substantially realised through the strategic implementation of digital technologies and power electronics.

The challenges are significant, but the technologies and strategies to address them are available and advancing. It is imperative that all stakeholders collaborate to drive the adoption of these transformative solutions. By doing so, we not only enhance the resilience and efficiency of our grids but also make significant strides towards our global sustainability goals. In this critical decade of action, let us commit to a future where our energy systems will become much more sustainable, flexible and secure.

The urgent energy transition is a global challenge and together we can make a difference. We need to act now and deploy technology at scale and with speed, so that we can continue to advance a sustainable energy future for all.

Gerhard Salge is CTO, Hitachi Energy.



Leveraging industrial AI for enhanced energy efficiency

Reducing carbon intensity is a major challenge for industrial companies. AspenTech's Dr. Rasha Hasaneen believes industrial AI will be a key enabler for most companies to navigate the decarbonisation journey, while maintaining operational excellence and business agility.

Dr. Hasaneen: the role of AI in driving energy efficiency cannot be overstated



Asset-intensive and industrial companies such as refining, petrochemicals, fertilisers, cement, mineral processing and power generation have much in common. They are all major energy users and all face challenges in progressing towards net zero. To reduce their carbon intensity, they can follow a three-pronged strategy: electrify as much as possible across the business; strategically pursue energy efficiency; capture the carbon they continue to emit or identify new, reliable and clean energy sources.

Each of these is challenging and industrial AI will be a key enabler for most companies to navigate the decarbonisation journey while maintaining operational excellence and business agility.

Energy efficiency is, for most companies, the fastest route to early success in reduced carbon intensity. Strategically adopting energy-efficient practices creates value not only by ensuring compliance with environmental mandates but also by the economic and operational advantages that such measures offer.

Many companies have set their sights on enhancing energy efficiency by 10-20 per cent. However, a closer look will reveal the opportunity to achieve more – up to 20 per cent and 50 per cent is possible. The burning question is how will that be accomplished in the next 10 years? The integration of artificial intelligence (AI) into energy-efficient digital technologies holds the promise of speeding up and reducing the cost of achieving these gains, creating more business value.

For sectors that are heavily dependent on energy consumption, such as oil, chemicals, steel, and power generation, the push for enhanced energy efficiency presents

unique challenges.

First, most assets and the processes in which they operate are complex, both because of the mix of products being made, but also due to the living nature of the assets, which have evolved, changed and expanded over time, leaving a complex interdependency between energy supply and use, and production. Adding to that complexity, the increasingly volatile economic and business environment globally requires higher levels of operational agility and operational excellence.

And economics, technology and sustainability are causing business leaders to put this all in the context of industry convergence, where business threats and opportunities are emerging in adjacent sectors.

Digital and AI will have a profound impact on a business's opportunity to make order out of that complexity in improving operational excellence.

Here are four ways to think about this:

- Fact-based prioritisation of carbon reduction programmes. In a typical energy or chemical setting, there are many plants, assets, and supply chain routes. Most companies today are flying blindfolded in terms of knowing which investments will have the biggest impact on decarbonisation and the least on profit (or even a corresponding positive on profit). Here is where digital can have a surprisingly fast and easy role. A systems-wide risk and availability model can rank the carbon emissions "bad actors" and quantitatively predict which investments will have the biggest benefit fastest. Industrial AI can rapidly evaluate available options and propose the best solutions (often new ones). Our company, together with Saudi Aramco, has introduced a generative AI solution that can do this strategic "optioneering" rapidly.

- Electrification of equipment, tied closely to ensuring 100 per cent reliability through smart microgrids and hardened power distribution. Electrification should be a multi-year programme that starts now. This should be coupled with an early focus on a microgrid, to control the reliability of your assets through 100 per cent power certainty and working with electrical suppliers for a "grid of grids" to improve the resiliency and intelligence of the surrounding regional power grid. Advanced microgrids, that offer strong cyber security and management, are key here. Industrial AI plays an important role. AspenTech has introduced the ability to forecast renewable power available to an asset from hours to days in advance, taking advantage of the available weather models, within distributed energy resource management (DERMS) and microgrid solutions.

- Applying industrial AI hybrid models for operational excellence.

Highly-precise models can help quantitatively prioritise and benchmark the highest emitting sites and plants and provide optimisation strategies. Industrial AI helps to accelerate the deployment of these models as digital twins to monitor the effectiveness and conformance to the agreed strategies – as advanced process control, to automate operations and push the limits and run more energy efficiently, and as planning and scheduling models to plan operations not only for profit, but also for reduction in carbon intensity.

- Manage asset reliability to minimise environmental releases. Industrial AI powered predictive maintenance solutions can provide 30 to 90 days advance notice of equipment degradation. Taking action on this advance notice can avoid the kind of releases that can become major carbon emissions events for energy intensive plants. AspenTech has introduced workflows that tie AI-based predictive maintenance with operational scheduling systems, to turn the AI provided information into actionable guidance for plant schedulers, supply chain planners, and maintenance teams.

Industrial AI is creating value for industrial companies today. AspenTech has already released over 25 different AI capabilities incorporated in 18 different digital software solutions, that span a company's entire value chain. The measurable value that these AI capabilities provide fall into three main areas: (1) agility – to more quickly adapt to business conditions and opportunities, (2) guidance – providing guidance to operations and knowledge workers that enables better decision-making in the face of complex trade-offs and that also enables the "next generation" of workers to perform in an effective way with less depth and length of experience, and (3) automation – performing appropriate tasks without human intervention (but with human supervision).

Here are a few examples drawn from companies that have implemented and are using AspenTech industrial AI solutions.

Sardeolica, an operator of 171 MW of wind turbine capacity, uses AI-based predictive maintenance (Aspen Mtell) to reduce maintenance costs by 10 per cent, increase renewable power production and availability by a significant amount, and extend effectively the lifetime of these zero carbon assets.

Nissan Chemicals is using industrial AI hybrid models, to apply an Aspen Plus digital twin to its steam methane reforming ammonia process, which previously was difficult to operate consistently, and reduce steam use by 2 per cent, with a corresponding reduction in energy use.

Tupras is using industrial AI hybrid models, to employ a digital twin model of its heat exchanger

networks, employing tens of thousands of data points to monitor heat exchanger fouling and more effectively schedule heat exchanger cleaning, saving over \$1 million/year in energy costs, and corresponding energy use and carbon emissions.

The journey to integrate AI into energy management practices is not without its challenges. Concerns over data privacy, the need for substantial initial investments, and the requirement for specialised skills to develop and manage AI systems are among the hurdles to be overcome. However, these challenges are surmountable with the right strategies, including fostering partnerships between tech companies and industry, investing in new approaches to agile workforce training, and adopting best practices for data governance and for cyber security.

The process and power industries are in some ways a special case, because of the overriding need for safety, in the face of complex chemical processes and the importance of 100 per cent availability for power and electricity. A key element of "industrial AI" that AspenTech uses as a governing principle for the AI solutions it develops, is the notion of "guardrails" provided by the laws of chemistry, physics, geosciences, and electricity. These guardrails, when implemented in software systems such as hybrid models, ensure that results provided by data science and AI are evaluated to stay within the boundaries of heat, material balance, chemical equations, and electrical flow principles and produce consistent results time and time again.

For asset-intensive industries, the message is clear: the time to harness the power of AI in pursuit of energy efficiency is now. By leveraging AI's capabilities, companies can not only meet their environmental commitments but also unlock new avenues for innovation and growth. It calls for a collaborative approach, where industry leaders, technology providers, and policymakers work together to create an ecosystem that nurtures and propels the adoption of AI-driven energy efficiency solutions.

As we stand at the cusp of a technological revolution in energy management, the role of AI in driving energy efficiency cannot be overstated. Its potential to transform operations, reduce carbon footprints, and pave the way for a more sustainable future is immense. For asset-intensive industries, the integration of AI into their energy efficiency strategies represents not just a step toward achieving environmental goals but a leap into a future where technology and sustainability go hand-in-hand.

Dr. Rasha Hasaneen is Chief Product and Sustainability Officer at AspenTech.

Greece: an abundance of clean investment opportunities

Greece offers a variety of clean energy project opportunities for foreign investors and its investment profile for investors has progressively been improving. This is the second in a series of country analyses where *TEI Times* looks at generation and consumption profiles, policy, emissions targets and ability to attract the investment needed to meet government targets.

Greece, like other EU nations, is on a decarbonisation path. Its abundant solar, wind and other renewable energy resources offer investors a variety of opportunities.

Commitments

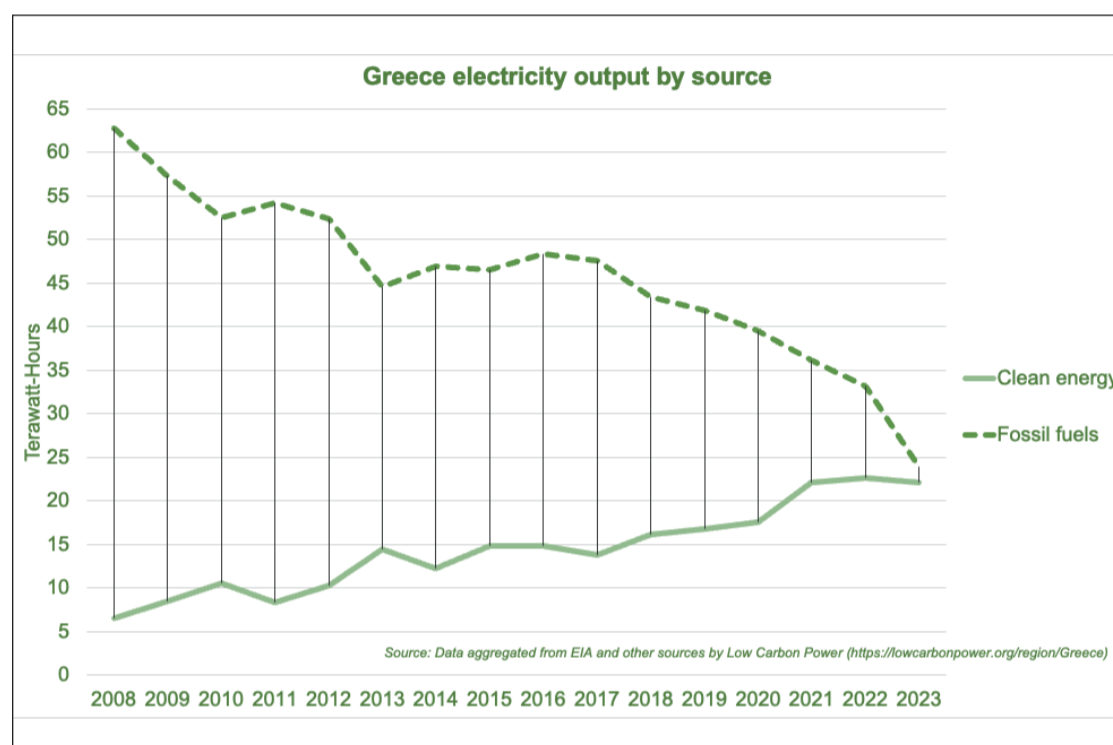
The national decarbonisation pledges of Greece are intimately linked to those set by the European Commission (EC). The government has found it challenging meeting EC climate action related directives, such as the 90 per cent reduction in GHGs. This is due to the weak state of the national economy and the EC-mandated fiscal restrictions, which limits how much it can spend on the energy transition.

Greece's existing National Climate and Energy Plan (NECP) envisages €192 billion (\$204.7 billion) in spending through 2030. While the NECP's renewable energy capacity ambitions are currently being toned down by the government, it had envisaged adding nearly 13.5 GW by 2030. This would have included solar PV reaching 13.4 GW, onshore wind power rising to 7.6 GW, offshore wind getting to 1.9 GW, and other renewables totalling 0.8 GW. This would be backed by energy storage facilities touching 5.3 GW including 3.1 GW for batteries-based storage and 2.2 GW for pumped storage. The final version of Greece's NECP is currently expected to be submitted to the ECB in the next few months, according to *Balkan Green Energy News*.

Energy profile

Greek energy consumption has been highly reliant on oil. It was responsible for over 54 per cent of the total in 2022. Non-fossil fuels accounted for less than 20 per cent. The electric power market landscape is different as clean energy plays a central role. Large additions of renewable energy capacity in the past few years, especially solar PV and wind power, led output from clean energy sources to represent 48 per cent of the total in 2023, compared to less than 10 per cent in 2008.

In part, this was thanks to less lignite-fired power production, a generation source that will be fully phased out over the next few years. Electric-



Clean sources delivered almost half of power output in 2023, compared to under 10 per cent in 2008

ity consumption in Greece declined by over a third since 2008, from 70 TWh to an estimated 46 TWh in 2023. Reasons for the drop include a weak economy, a declining population, and energy efficiency improvements. The government expects demand to drop 6.2 per cent by 2030 from the 2020 level. This, however, is in no way a negative factor for the growth of renewable energy capacity and related facilities, such as energy storage. A large amount of new clean energy capacity is being constructed and more is under planning to replace fossil fuel facilities.

Investment environment

Greece offers a variety of clean energy projects opportunities for foreign investors and its investment profile for foreign investors has progressively been improving. The nation's sovereign credit rating has been rising. Its S&P rating is now BBB- positive, a

lower medium investable grade, as of April 2024 compared to BB+ stable, which is the 'best' non investable grade, just two years ago. Ratings were even lower a few years earlier, well into the 'junk' or 'speculative' grade.

Greece also has other business encouraging rankings. It was 42 out of 132 countries in the Global Innovation Index and ranked 18 out of 40 in the EY Renewable Energy Country Attractiveness Index. The current government, whose Prime Minister was first elected in July 2019, got a fresh mandate in June 2023 and has been highly focused on aggressive investment and economic reform, which have managed to attract foreign investment through such measures as cutting red tape. One of several ways the country will be financially supported is, for example, through access to €35.9 billion (\$38.4 billion) in grants and loans by the EC – The Recovery and Resilience Facility – which will also cover public infrastructure, including some energy transition related investments.

Investment policy

The nation is blessed with a favourable geographic location with high levels of irradiation for solar PV and wind resources among the most attractive in Europe, which offer investors many opportunities. In recent years, the government of Greece has established beneficial legal frameworks and financial environments, along with regulatory measures, to draw investments into the renewable energy sector.

According to Tsaks Consulting, project licensing procedures have been simplified to facilitate solar PV, wind, geothermal, biomass, and marine energy projects. The streamlining included revising the licensing framework aimed at avoiding regulatory delays, issuing a new licensing code to avoid territorial overlaps, amending the definition of 'strategic

investments' in energy and offer fiscal, expedited licensing processes, and government funding incentives. This, in particular, for projects involving energy storage, green hydrogen, offshore wind farms, solar PV, and laying of submarine cables. Apart from funding from the government, there are also EU-related grants and loans available for projects in Greece. An example is the €400 million (\$428 million) support from the European Investment Bank for Mytilineos S.A., a Greece-based industrial and energy conglomerate, to invest in solar PV and battery storage systems announced in January 2024. Mytilineos targets to add 2.6 GW and invest €2.5 billion (\$2.7 billion) through 2027 in Greece and across the EU.

Investors

There are a large number of companies investing in renewable energy projects in Greece. Some of the major domestic investors include Ellaktor, Hellenic Petroleum Renewable Energy Sources, Motor Oil Corinth Refineries, PPC Renewables, and Terna Energy. Investors from other European countries include France's TotalEnergies, Germany's RWE (via a JV with PPC Renewables), Italy's Enel Green Power, and Spain's Iberdrola and Ecoener. Investments from outside Europe have lagged. Chinese investors were early investors but have not expanded their footprints. State Grid Corp. of China took a stake in the national grid operator in 2016 and China Energy Investment Corp. took a 75 per cent stake in a wind farm in 2017. Private equity is also interested in the Greek renewables market. Australia's Macquarie Asset Management took a 50 per cent stake in Enel Green's assets in Greece for €250 million (\$267.6 million) in January 2024.

Prepared for *The Energy Industry Times* by Joseph Jacobelli at aCTEi.

RENEWABLES INVESTMENT PROFILE	RANK/RATING	YEAR	SOURCE
Business			
Moody's sovereign credit rating	Ba1 stable	2024	tradingeconomics.com/
S&P sovereign credit rating	BBB- positive	2024	tradingeconomics.com/
Global Innovation Index	42/132	2023	wipo.int/global_innovation_index/
EY Renewable Energy Country Attractiveness Index	18/40	2023	ey.com
Other			
Global Corruption Perceptions Index	59/180	2023	transparency.org/
Reporters Without Borders Press Freedom Index	107/180	2023	rsf.org/en/index
World Justice Project Rule of Law Index	47/142	2023	worldjusticeproject.org/rule-of-law-index/

Greece ranked 18 out of 40 in the EY Renewable Energy Country Attractiveness Index

Answering the urgent call for negative emissions

There is an urgent need for a comprehensive global carbon-negative strategy, one that includes removing excess carbon dioxide out of the atmosphere using technologies such as Direct Air Capture (DAC). RepAir Carbon Capture's Amir Shiner, describes an electrochemical cell-based DAC solution that cuts energy usage by 70 per cent for cost-effective carbon removal at gigatonne scale.

Schematic representation of a 100 ktpa DAC facility. RepAir plans to launch a 1 ktpa commercial pilot by 2025



Every year, over 40 gigatonnes of CO₂ are released into the atmosphere, according to TheWorldCounts. This poses a significant challenge to achieving the global goal of reaching net zero by 2050 through emissions reduction alone.

Industries such as air travel, as well as those deemed "hard to abate", including cement, iron, and steel production, generate carbon dioxide emissions through process reactions that cannot be entirely eliminated by transitioning to renewable energy sources.

Even if all industries capable of adopting renewable energy were to do so, data from the International Energy Agency's (IEA) 'Global Energy Review 2021' shows a persistent 10-20 per cent gap of unpreventable emissions would remain. Additionally, historical carbon dioxide emissions, stemming from global fossil fuel combustion and industrial processes since the industrial revolution, stresses the need for substantial progress through offset measures.

All these reasons outline an urgent need for a comprehensive global carbon-negative strategy, that includes removing excess carbon dioxide out of the atmosphere to mitigate the escalating climate crisis.

One of the paramount objectives in the direct air capture (DAC) industry is the strategic reduction of the cost per tonne of CO₂ removal. According to a 2023 report on DAC by IEA, the cost of direct air capture (the end-to-end cost of CO₂ removal including final storage) will need to fall from \$600 to \$1000 per tonne of CO₂ today to below \$200 per tonne and ideally closer to \$100 per tonne by 2050, and preferably earlier. Central to this pursuit is the difficult challenge faced by DAC companies, as they attempt to curtail costs to align with the industry benchmark of \$100 per tonne.

Additionally, a pivotal facet integral to the cost equation involves the imperative need for scalability to be economically viable. Conventional DAC solutions have yet to develop a technology that is economically viable at scale that addresses factors, such as, low energy consumption, continuous functionality, location flexibility, minimal maintenance requirements, and overall cost-effectiveness in both setup and operation.

In recent years, efforts to enhance conventional DAC methods have

seen significant strides, with advancements spanning from the utilisation of novel materials like Metal Organic Frameworks (MOFs) as adsorbents with improved efficiency and stability, to improved engineering design concepts, such as rotating filters.

While these endeavors have been ongoing for the past decade, the emergence of electrochemical-based DAC approaches represents a paradigm shift within this landscape. Electrochemical methods, including electro dialysis (liquid-membrane), liquid pH swing techniques, and RepAir's electrochemical cell-based solution, offer promising avenues to address the inherent limitations, such as energy efficiency and cost-effectiveness, of existing DAC technologies.

Among these, RepAir Carbon stands out as a transformative solution, strategically engineered to tackle key challenges at a gigatonne scale, emphasising low energy consumption and a fast path to seamless scalability. Notably, RepAir's approach distinguishes itself by operating in a solid-state configuration, sidestepping the logistical complexities associated with liquid handling and maintenance. Additionally, its robustness against the presence of other atmospheric gases sets it apart from other emerging electrochemical alternatives.

RepAir's DAC design represents a leap forward in carbon removal technology, offering a viable solution for the immediacy of the climate crisis.

The technology behind RepAir's DAC system involves a series of electrochemical principles. Like a battery, the process employs two electrodes placed on either side of a selective separator creating a cell. These cells are 'stacked' to multiply the carbon-removal capacity. Atmospheric air is drawn into the cathode, where an electrical current generates hydroxide ions that bind to CO₂ molecules, forming carbonate and bicarbonate ions. Only these ions cross the separator into the anode, wherein the binding process is undone, the hydroxides are consumed, and pure CO₂ gas is drawn out. Achieving a continuous process is realised by systematically switching cell polarity approximately every few hours.

Lab results demonstrate impressive energy efficiency, using only 600 kWh/t of CO₂ removed. This is significantly lower than other DAC



"StackDAC" modules enable seamless stacking of interlocking modules for ease of deployment and the fastest time to capture carbon at scale

technologies. Electrochemical processing enables operation at ambient temperatures, distinguishing it from solvent-based or solid-based capture methods that often require high temperatures and significant water usage.

RepAir's low energy consumption and efficient, continuous process, leads to minimal operating expenditures (OpEx). Additionally, the straightforward, modular design further contributes to its scalability, resulting in low capital expenditures (CapEx). This combination positions RepAir's solution as highly conducive to large-scale production, offering maximum potential for swift and sustainable implementation.

RepAir's electrochemical technological approach has key differentiators that yield notable benefits compared to other carbon capture solutions:

- **Low energy consumption:** RepAir's DAC consumes 70 per cent less energy than conventional solutions, with core units exhibiting energy consumption of less than 0.6 MWh/t CO₂, including regeneration.

- **No heating required:** The electrochemical process achieves regeneration without the need for heating, further streamlining operations and lowering costs.

- **Continuous process:** Unlike DAC technologies operating on a capture and release system, RepAir's continuous process enhances efficiency by providing a streamlined carbon capture solution. Continuous separation is achieved through the swift collection of separated CO₂ in a matter of seconds during polarity switching.

- **Mass manufacturability:** Capacity expansion is achieved by stacking multiple cells into a single stack and combining several stacks into a basic unit, simplifying both manufacturing and scalability. These building blocks are called, "StackDAC" modules enabling seamless stacking of interlocking modules for ease of deployment and the fastest time to capture carbon at scale.

- **Low cost at scale:** Facilitated by a low-cost approach, RepAir's solution will be easy to scale up with estimated figures of \$50/t CO₂ at the gigatonne scale. Additionally, the system's compact footprint of approximately 15 t CO₂/m³ underscores its efficiency and scalability.

- **Liquid-free technology:** RepAir's

technology eliminates issues associated with liquid usage in other technologies, resulting in minimal maintenance requirements, enhanced safety, and environmental responsibility.

- **Quick ramp-up/shutdown:** Without the use of solvents or liquids, RepAir's solution operates instantly at the flip of a switch. This allows for a rapid response to intermittencies, which may occur when transitioning to renewable energy sources.

- **No platinum group metals (PGMs) or rare materials:** RepAir's electrochemical solution is based on abundant materials, eliminating the need for expensive rare-earth metals or PGMs, enhancing affordability and sustainability.

- **Renewable electricity usage:** Driven by renewable energy sources, RepAir's process ensures high net capture and overall efficiency.

Recently RepAir took its technology out of the lab and on to the roof with the launch of an outdoor pilot, demonstrating the technical performance of its carbon capture solution in an operational environment for the first time. This marks a shift in RepAir's electrochemical solution to Technology Readiness Level (TRL) 6, a significant step forward on the road to scale up and market viability. The launch of the prototype serves as an excellent tool for R&D to continuously assess results and to verify that the energy consumption is indeed 600 kWh/t. RepAir plans to launch its 1 ktpa commercial pilot by 2025.

On the commercial front, RepAir is actively engaging sequestration partners to create a comprehensive solution throughout the value chain. Simultaneously, it is recruiting off-setters for the purchase of carbon credits.

RepAir's groundbreaking electrochemical approach not only addresses the fundamental drawbacks of conventional DAC methods but also offers a multitude of benefits critical for adopting a carbon-negative strategy.

With significantly lower energy consumption, unparalleled mass manufacturability, and low costs, RepAir's technology presents a paradigm shift poised to transform the carbon capture landscape.

Amir Shiner is CEO, RepAir Carbon Capture.



Junior Isles

Chinese medicine

Chinese medicine can be effective, even if sometimes unpalatable. No doubt that must be the thinking of many western countries as they observe China's transition to a green energy economy and the impact of its efforts in tackling climate change on the rest of the world.

The importance of the country cannot be understated; its energy transition affects us all. Accounting for one quarter of the world's energy use, not only is China the world's highest emitter of carbon emissions, it is also the largest investor in clean technologies. Good reasons for DNV to publish last month its first standalone transition report for China.

According to its 'Energy Transition Outlook China 2024', which gives the most likely forecast to 2050, last year China was responsible for a third of the world's energy-related CO₂ emissions. But at the same time, the country is establishing itself as a green energy leader with an unrivalled build-out of renewable energy and export of renewable technology.

Launching the report Remi Eriksen, DNV's Group President noted: "It is impossible to understand the forecast for the global energy transition without understanding and forecasting the transition in China. China's emission reduction trajectory and its position as a leading supplier of clean energy technology worldwide are central aspects of the global transition."

At the COP28 climate conference late last year it was made clear that much more needs to be done if the world is to curb carbon emissions

sufficiently to stay within the 1.5°C rise in global temperature, agreed in Paris in 2015 as the limit to avoid disastrous climate change.

So where is China in its journey to fulfilling its pledge for carbon neutrality by 2060? According to DNV, by 2050 the country will have cut its carbon emissions by 70 per cent, thereby reducing its share of global CO₂ emissions from one third to one fifth.

This will largely be achieved by replacing coal with renewables in the power generation mix and the electrification of end-use demand. Today, coal accounts for about 60 per cent of China's electricity production use. According to DNV, by mid-century that will fall to just 3 per cent, as solar and wind become the cheapest form of electricity in the country.

The increase in solar and wind is phenomenal. DNV forecasts that solar will account for 38 per cent of all electricity produced in China by 2050, up from about 5 per cent today. More than a third of installed solar capacity will be combined with storage, mainly batteries, says the report.

Wind growth is slightly more sluggish but still grows from delivering about 8 per cent in 2022 to 38 per cent in 2050.

As Eriksen noted: "The scale of change is hard to picture: mountains of coal will be replaced by square kilometres of solar PV and thousands of wind turbines."

He added: "Together with energy storage, renewables will do the job of making China's energy use not only

cleaner but greatly more efficient. And more independent. But no one should underestimate the scale of the challenge of what China is undertaking to move its economy off coal dependence. China's goal is carbon neutrality by 2060. Our forecast shows China falling a little short of this goal. However, we believe with more focus and effort the goal is achievable."

DNV says China will still have a sizeable reliance on coal and oil by the end of the forecast period, which leaves "room for accelerated progress". Eriksen notes that since energy security and decarbonisation pull in the same direction, "there is a logic for moving faster".

Its rapid transition to renewables means China is not only producing solar panels and wind turbines for domestic use but is also producing a significant amount of clean energy technology for the rest of the world. In that sense it is a key enabler for the global energy transition.

For some countries, this is a headache. China's success is in some ways proving to be a double-edged sword for the rest of the world.

Sverre Alvik, Vice President, Energy Transition Research Director, said: "The large majority of the world's solar panels, wind turbines, electric vehicles and batteries are produced in China. We see that the geopolitical realities are a challenge in this respect and protectionism is growing in North America and Europe. We see EU politicians looking to see if there are unfair subsidies that are changing the competitive landscape."

Just last month the EU Commission announced that it will launch an inquiry into Chinese suppliers of wind turbines under the new Foreign Subsidies Regulation.

Announcing the new inquiry, Commission Executive Vice-President for Competition Margrethe Vestager said that the large excess capacities of subsidised Chinese wind turbines "is not only dangerous for our competitiveness. It also jeopardises our economic security". She added that the EU must not repeat the mistakes it did in losing its solar manufacturing industry.

The EU wants to increase its wind energy capacity from 220 GW today to 425 GW by 2030 and 1300 GW by 2050. Currently, nearly all the wind turbines built in Europe today are European wind turbines—produced by European manufacturers and assembled in Europe. But there is a very real risk that the expansion of wind the EU wants will be made in China, not in Europe.

The EU is keen to avoid this. More broadly, it wants to strengthen its energy security and understands the dangers of an over-reliance on China for strategic clean technologies like wind. In her State of the Union speech last September Commission President Ursula von der Leyen said: "The future of our clean tech industry has to be made in Europe."

The Commission has also launched two investigations into Chinese manufacturers of solar panels suspected of benefitting from "distortive" state subsidies and gaining an "unfair advantage".

China hit back at Europe's recent wind turbine subsidy investigation labelling such a move as "typical protectionism". Ministry of Commerce (MOC) spokesperson He Yadong said at a press conference that Chinese new energy companies, including those in the wind power sector, have rapidly developed to gain competitive advantages and secured a leading position globally through continuous technological innovation, a sound production and supply chain system, and full market competition. "This could not be achieved through subsidies," said He.

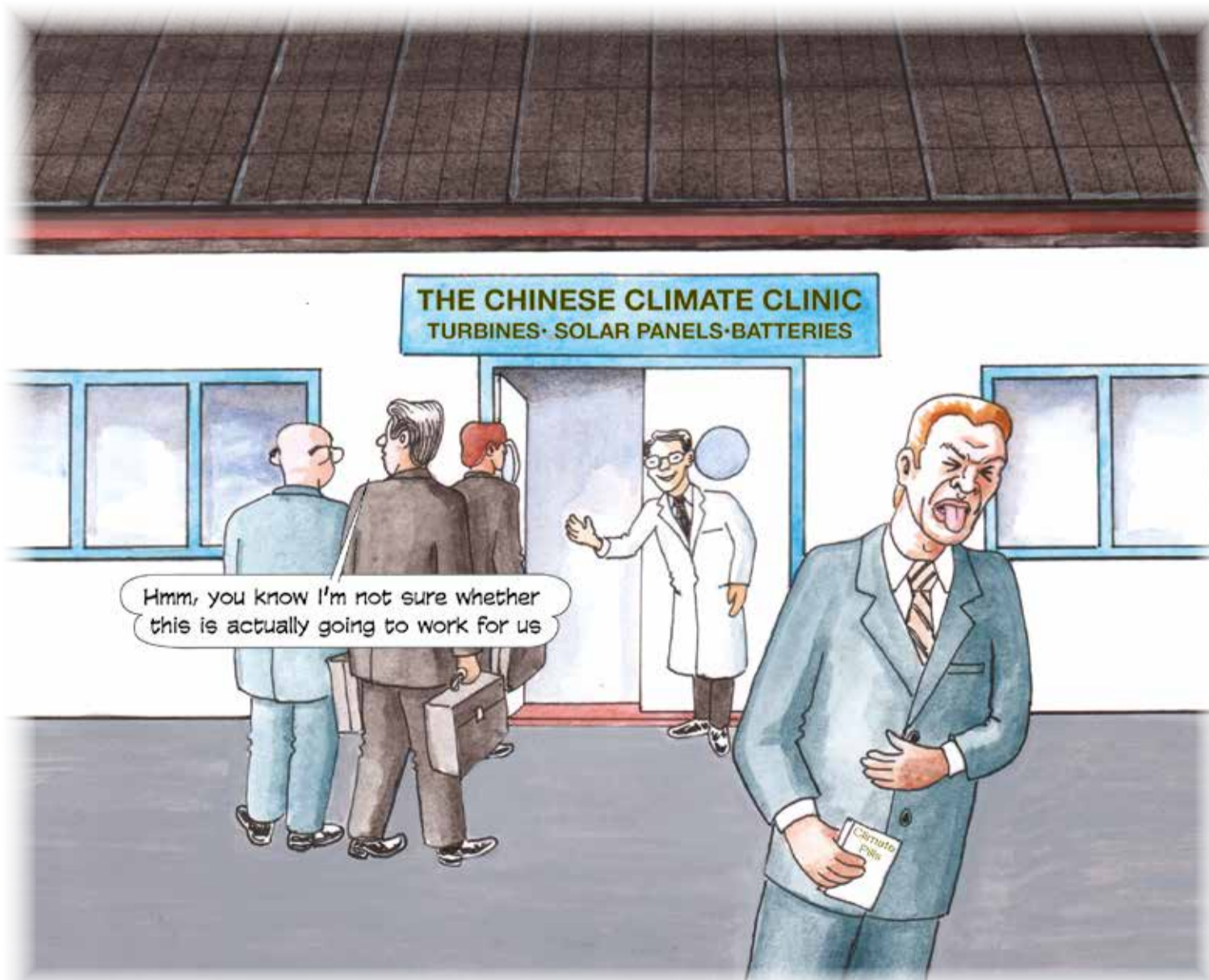
"Committed to providing high-quality products for the global efforts in coping with climate change, the Chinese new energy sector has made positive contributions to the green transformation of countries worldwide, including the EU," He added.

Speaking at the World Energy Congress in Rotterdam last month, Saudi Aramco's Chief Executive Amin Nasser defended China against accusations that it was "dumping" cheap solar panels and electric vehicles on Europe.

"China really helped by reducing the cost of solar energy," he said. "A lot of what happened in solar panels is because of what China did in terms of reducing [prices]. We can see the same now in electric vehicles. Their cost is one-third to one-half the cost of other electric vehicles. So we need globalisation and collaboration if we are going to achieve our energy targets by 2050."

No doubt Nasser's stance is influenced by Aramco's desire to serve China's continuing need to import oil. Yet it is a fair point.

The Paris Agreement is a shared undertaking by the world's nations and China's success in tackling climate change is crucial to all of us. If China fails, the world fails. Yet its leadership in the green energy sector could prove to be a bitter pill for the rest of the world to swallow.



Cartoon: jemsoar.com