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Pivoting away from Russian gas

Utilities take centre stage as Europe pivots away from Russian gas. *Page 13*



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Technology Focus: Developing a 'Virtual Energy System'

National Grid ESO has launched an industry-wide programme to develop a Virtual Energy System – a digital twin of Great Britain's entire energy system. This centralised tool offers the potential to create a collective view of the UK's entire energy system. *Page 15*

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Putin: "unfriendly" countries must pay for gas in roubles

Energy war escalates as EU bans coal imports and Russia imposes first blocks on gas

Russia has fired its first serious salvo of strikes against the European Union, as energy becomes a weapon of war. **Junior Isles**

The unfolding energy war between Europe and Russia escalated last month, as the Europe Union began efforts to ban Russian fossil fuel imports. With relations worsening between the two sides as a result of Russia's ongoing war in Ukraine, Moscow retaliated by demanding payment for gas in roubles and cutting gas supplies to Poland and Bulgaria.

In early April the EU proposed a ban on Russian coal imports in what would be the first sanctions targeting the country's lucrative energy industry. The Polish parliament had already passed a ban on import and shipment of coal from Russia and the Russia-

controlled Donetsk and Lugansk regions in eastern Ukraine.

The EU-wide coal embargo is expected to come into effect from August. After a wind-down of existing contracts, new contracts will be banned.

Ursula von der Leyen, European Commission President, said the embargo, worth around €4 billion, "will cut another important revenue source for Russia".

In line with its climate ambitions, the EU has been moving away from coal. Coal use fell from 1.2 billion tons a year to 427 million tons between 1990 and 2020, but imports

rose from 30 per cent to 60 per cent of coal use.

Germany's association of coal importers said in March that Russian coal could be replaced "in a few months". Indeed replacing Russian coal would not be too difficult because coal is transported by ship and there are multiple global suppliers.

JPMorgan Chase & Co warned, however, that banning Russian coal imports will further hurt the continent's energy markets, and countries will have to pay more for supplies elsewhere.

The bank said in a report that Russia will be able to find buyers for its coal,

but Europe will have to turn to supplies from South Africa, Australia and the US in an already tight coal market. That will increase the price at which it is more profitable for power companies to burn coal rather than natural gas.

Europe is also trying to wean itself off Russian gas, a move that will be far more difficult. The EU gets about 40 per cent of its natural gas from Russia, and many EU countries, including Germany – the bloc's largest economy – are opposed to cutting off gas imports.

The decision, however, may have

Continued on Page 2

Germany's Easter package sees profound changes to wind energy policy

The German government has passed the so-called "Easter Package", setting out the most profound changes to German energy policy since the introduction of competitive auctions in 2017.

At the heart of the package are changes to Germany's Renewable Energy Law (EEG) to enshrine a new renewable energy target of 80 per cent in total electricity consumption by 2030.

From 2025 onwards Germany wants to install 10 GW of new onshore wind energy every year. To deliver this expansion in onshore wind the government proposal increases annual auction volumes to up to 12 GW. The package also increases offshore wind targets. This will see the country achieve 30 GW of operational offshore wind by 2030, 40 GW by 2035, and at least 70 GW by 2045.

To this end, the package adjusts annual auction volumes as well as annual wind energy installation targets. Auction volumes will increase to up to 12 GW per year. On this trajectory, Germany would have 115 GW of

onshore wind by 2030.

Giles Dickson, WindEurope CEO, called the Easter Package "an outstanding package of measures" that will drive the expansion of wind energy, both onshore and offshore. "Big auction volumes. A clear long-term auction schedule. And crucially, major steps to simplify the permitting of wind farms – without which the targets would be purely academic. It's a great example for the rest of Europe," he said.

Since the war in Ukraine the government has repeatedly stressed the essential role of renewables for Germany's energy security. Finance Minister Christian Lindner had described renewables as "freedom energies".

The Easter Package is not the last legislative change for wind energy in this political term. To reduce Germany's dependence on Russian fossil fuel imports, Germany's Economy and Energy Minister Robert Habeck has pledged to move forward the announced "Summer Package" to May.

This package will include a national repowering strategy, new measures to ensure sufficient sites for wind energy, improvements to permitting, and a new strategy to harmonise the expansion of wind energy with biodiversity and nature protection.

Minister Habeck identified supply chain disruptions, rising international prices for raw materials and components as well as a potential shortage in sufficiently skilled workers as the main challenges to the expansion ahead. He pledged to collaborate closely with the German wind industry to overcome these challenges and to ensure the delivery of the ambitious new volumes.

Tim Holt, Member of the Managing Board of Siemens Energy, and TenneT's COO, Tim Meyerjürgens, both commented on the challenges during a recent press tour of the DolWin kappa offshore platform, being built by Siemens as part of TenneT's DolWin6 grid connection project.

Holt said: "Currently we are really ramping up our engineering capacity.

In terms of manufacturing capacity we can handle the volume... what Ukraine is now triggering is a focus on the supply chain. How do we now meet increased demand with a resilient supply chain? We need to sit down and ask: do we continue the strategy of global, compact, interconnected supply chains or do we also build-in additional resilience? These are the discussions we are having because it will mean a fundamental shift in supply chain strategy."

Meyerjürgens added: "The targets are very ambitious, some say overly-ambitious if we look at the 2030 targets, since these projects take 6-7 years to construct. What is still lacking, is the decisions we need to accelerate. Licensing is one of the bottlenecks. Another is caused by changing the scope of ongoing projects. We were asked by the government to come with a proposal on how the 30 GW can be connected by 2030. We have done a proposal with the other two German TSOs on how it's feasible."

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been taken out of EU hands when Russian President Vladimir Putin signed a decree demanding that nations deemed “unfriendly” must pay for gas deliveries in roubles from April, using an account in the Russian currency at Gazprombank, or face a halt in supplies.

Poland and Bulgaria became the first victims of the decree when Russia halted gas supplies to the countries following their refusal to pay in roubles. Supplies from Gazprom cover about 50 per cent of Poland’s consumption and about 90 per cent of Bulgaria’s.

Commenting on the Kremlin’s decision, von der Leyen said Russia was using gas “as an instrument of blackmail”.



Piper: halting gas supplies is “the start of exerting economic pressure on Europe”

Nathan Piper, head of oil and gas research at Investec, told the *BBC* the halting of supplies to Poland and Bulgaria was the “start of Russia exerting economic pressure on Europe”, and a move which could “escalate” with other EU nations.

Poland’s Deputy Foreign Minister said the country could cope without Gazprom’s gas and had “taken some decisions many years ago to prepare for such a situation”. Its climate ministry said the country’s energy supplies were secure. Climate Minister Anna Moskwa said there was no need to draw gas from reserves, and gas to customers would not be cut.

Poland was already planning to stop importing Russian gas by the end of the year, when its long-term supply contract with Gazprom expires.

Marcin Przydacz, Poland’s Undersecretary of State for Security, the Americas, Asia and Eastern Policy, told the *BBC* there were “options to get the gas from other partners”, including the US and gulf nations. “I’m pretty sure that we will manage to handle this,” he said.

Elsewhere, other countries have been taking steps in preparation for suspension of gas from Russia.

At the beginning of April Lithuania became the first EU country to cut off Russian gas supplies completely, with the two other Baltic states also temporarily stopping their flow in response to Moscow’s invasion of Ukraine. Russian gas also stopped flowing into Estonia and Latvia on April 1.

The three Baltic states have been among the loudest voices urging the EU to end its members’ dependence on Russian oil and gas.

Meanwhile, in late April the Danish government made a new proposal to accelerate and expand the development of new energy islands. Denmark already plans to build the world’s first energy island in the North Sea, with a maximum capacity of 10 GW. Another energy hub will be established on the island of Bornholm in the Baltic Sea with a capacity of 2 GW. A provisional estimate shows an initial demand for at least 35 GW of offshore wind from the Danish parts of the North Sea.

IPCC urges immediate action to halve emissions by 2030

- “Almost inevitable” the temperature threshold will be exceeded temporarily
- Right policies, infrastructure and technology can result in a 40-70 per cent reduction in emissions by 2050.

Junior Isles

The Intergovernmental Panel on Climate Change (IPCC) has issued a report saying the world has the tools and know-how required to limit warming and halve emissions by 2030, but the world must act now.

The report notes that major transitions in the energy sector will be required to reach this target. This will involve a substantial reduction in fossil fuel use, widespread electrification, improved energy efficiency, and use of alternative fuels (such as hydrogen).

Without this, the IPCC warns that limiting global warming to 1.5°C is beyond reach.

“We are at a crossroads. The decisions we make now can secure a livable future. We have the tools and know-how required to limit warming,” said IPCC Chair Hoesung Lee.

“I am encouraged by climate action being taken in many countries. There are policies, regulations and market instruments that are proving effective.

If these are scaled up and applied more widely and equitably, they can support deep emissions reductions and stimulate innovation.”

The report also demonstrates that while financial flows are a factor of three to six times lower than levels needed by 2030 to limit warming to below 2°C, there is already sufficient global capital and liquidity to close investment gaps.

However, it relies on clear signalling from governments and the international community, including a stronger alignment of public sector finance and policy.

Without taking into account the economic benefits of reduced adaptation costs or avoided climate impacts, global Gross Domestic Product (GDP) would be just a few percentage points lower in 2050 if we take the actions necessary to limit warming to 2°C or below, compared to maintaining current policies, said the IPCC.

According to the report, having the right policies, infrastructure and

technology in place to enable changes to lifestyles and behaviour can result in a 40-70 per cent reduction in greenhouse gas emissions by 2050.

The IPCC says the next few years are “critical”.

“It’s now or never, if we want to limit global warming to 1.5°C,” said IPCC Working Group III Co-Chair Jim Skea. “Without immediate and deep emissions reductions across all sectors, it will be impossible.”

In the scenarios assessed, limiting warming to around 1.5°C requires global greenhouse gas emissions to peak before 2025 at the latest, and be reduced by 43 per cent by 2030; at the same time, methane would also need to be reduced by about a third. It says, however, that even if this is achieved, it is “almost inevitable” that the temperature threshold will be exceeded temporarily but could return to below it by the end of the century.

It noted that the industrial sector accounts for about a quarter of global emissions. The reports stresses that

achieving net zero will be challenging and will require new production processes, low and zero emissions electricity, hydrogen, and, where necessary, carbon capture and storage.

Notably, at the end of March the European Commission allocated €1.1 billion to seven large-scale climate projects, including a “CCS value chain” scheme based in Belgium to capture, liquefy, ship, and permanently store carbon.

Sushil Purohit, President of Wärtsilä Energy said the IPCC report would give the carbon removal industry a “bit of a boost”. Wärtsilä Energy has invested in one so-called direct air capture start-up, Soletair Power. “We will keep looking at this space with some interest,” he said.

Meanwhile, following the release of the IPCC report, Swiss-based Climevents, which builds direct air capture systems said it had raised \$600 million from investors including the Singaporean fund GIC, and Edinburgh-based Baillie Gifford.

Economists question efforts to protect energy users from high prices

Economists have warned that many of the measures to protect consumers and businesses from soaring energy prices, made worse by Russia’s invasion of Ukraine, could backfire.

Germany, France, Italy and Spain – the EU’s four largest countries – plan to cut taxes or fund rebates on fuel, electricity or natural gas, in an attempt to shield their economies from spiralling costs.

However, some economists argue that the series of measures, amounting to €80 billion, may exacerbate the problem by reducing the incentive for households and businesses to reduce their consumption of electricity and fuel, thus making it harder to reduce dependence on Russian fossil fuels.

Rüdiger Bachmann, Economics Professor at the University of Notre-

Dame, said: “You want the price mechanism to have its effect, by signalling that a good is scarce, so people decide if they want to change their behaviour.”

The Bruegel think-tank found that 17 countries were also cutting taxes or duties on energy, while 10 countries were regulating retail energy prices and three were regulating wholesale prices.

The French government has capped the increase in household electricity bills, a move expected to slash French state-owned energy group, EDF’s earnings by €10 billion when combined with a requirement to sell its nuclear power below wholesale rates.

Klaus Adam, Economics Professor at the University of Mannheim, stated in the *Financial Times*: “The subsidy on household energy is crazy – it reduces

the incentive to reduce energy consumption. Give everyone an amount each month and let them decide if they want to use it to pay the higher gas prices or if they want to save energy consumption and spend it on something else.”

Veronika Grimm, a member of the council of economic experts, which advises the German government, criticised the latest package of measures announced last month to help businesses with high energy prices.

The package will include a time-limited and “narrowly defined cost subsidy” for companies whose electricity costs have at least doubled since last year. “It is very unfortunate to subsidise the use of fossil fuels by directly subsidising energy consumption,” Grimm told *Die Welt* newspaper.

“Ultimately, this keeps the gas price high on the exchanges.”

At the end of March Spain and Portugal submitted a proposal to the European Commission requesting permission to set a maximum reference price for gas of €30/MWh and thus force a sharp reduction in the price of electricity. If accepted, experts estimate that the price of electricity would fall from over €200/MWh at present to around €100/MWh. The proposal has been met with concern by the European Commission, which believes such a low ceiling could distort the market beyond what is acceptable.

The President of the European Commission, Ursula Von der Leyen, has committed to “special treatment” for Spain and Portugal due to the Iberian peninsula energy island status.

Energy transition is key to tackling global energy and climate crisis

Short-term interventions addressing the current energy crisis must be accompanied by a steadfast focus on mid- and long-term goals of the energy transition, according to the World Energy Transitions Outlook (WTO) 2022.

Launched by the International Renewable Energy Agency (IRENA), the WTO sets out priority areas and actions based on available technologies that must be realised by 2030 to achieve net zero emissions by mid-century. It also takes stock of progress

across all energy uses to date, clearly showing that the current pace and scale of the renewables-based transition is inadequate.

“The energy transition is far from being on track and anything short of radical action in the coming years will diminish, even eliminate chances to meet our climate goals,” said Francesco La Camera, Director-General of IRENA.

The Outlook sees investment needs of \$5.7 trillion per year until 2030 including the imperative to redirect

\$0.7 trillion annually away from fossil fuels to avoid stranded assets. But investing in the transition would bring concrete socioeconomic and welfare benefits, adding 85 million jobs worldwide, it said.

Meanwhile, a new first-of-its-kind modelling commissioned by Carbon-Free Europe claims that the optimal energy mix for Europe to achieve its net zero goals at lowest cost would be to generate 20 per cent of its electricity from nuclear, 18 per cent from offshore wind, 27 per cent from

onshore wind, 27 per cent from solar, and 8 per cent other resources like biomass, geothermal, and hydropower by 2050.

Pursuing a 100 per cent renewable energy strategy would cost the EU at least €80 billion (\$84.3 billion) more a year by 2050, it says, and require the bloc to quadruple its electricity generation compared to a tripling in other net zero pathways.

The modelling also calculates the EU needs to add over 2000 GW of clean energy by 2050.

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Biden administration to underwrite nuclear power plants at risk of closure

- Need for 'low carbon' generation prompts £6 billion programme
- Opponents say money would be better spent on renewables and storage

Janet Wood

The Biden administration is launching a \$6 billion programme to support nuclear power plants.

US nuclear electricity generation declined by 1.5 per cent in 2021 – a second year of decline for the technology, according to the US Energy Information Administration. Nuclear provides nearly a fifth of US power, but six units totalling 4.8 GW have closed since the end of 2017 and three more totalling 3GW of capacity are

set to shut down. A quarter of the fleet is said to be at risk of closure.

The administration has set up the civil nuclear credit programme to allow financially distressed nuclear power plant owners or operators to apply for credits if their reactors are expected to shut down early for economic reasons.

The first round of awards will prioritise reactors that have already announced plans to close and a second round will be open to other economically at-risk facilities. The programme

is funded through the \$1 trillion infrastructure deal signed into law last November.

Energy Secretary Jennifer Granholm said: "We're using every tool available to get this country powered by clean energy by 2035, and that includes prioritising our existing nuclear fleet to allow for continued emissions-free electricity generation and economic stability for the communities leading this important work."

About two-thirds of US states say they expect to use nuclear but reactors

have closed early in the past decade due to competition or escalating costs. If reactors close early, fossil fuel plants will fill the void and emissions will increase, said Andrew Griffith, acting assistant secretary for nuclear energy at the Department of Energy.

Climate scientist and former director of NASA's Goddard Institute James Hansen said: "Nuclear power has the smallest land footprint and lowest life cycle carbon emissions of any energy source," he said. "It can generate electricity around the clock or as needed.

It is also among the safest forms of energy on the planet."

Others disagree. David Schlissel of the Institute for Energy Economics and Financial Analysis, said the government should have assessed whether the money would be more effectively used to roll-out renewables, battery storage and energy efficiency projects.

The plan appears to be too late to save some reactors, such as California's Diablo Canyon, due to close in 2025. The state wants to replace it with solar, wind and battery storage resources.



Paraguay questions Brazil's easing of power tariffs

Brazil has announced a reduction of up to 20 per cent in tariffs for electricity consumers. President Bolsonaro said the reduction follows dramatic changes in hydropower production compared with 2021, when Brazil faced its worst drought in 91 years.

Bolsonaro said that reservoirs now are much fuller than they were last year. "With the reduction of the most expensive thermoelectric generation, and the increase in production from hydroelectric and other renewable sources, costs will be lower during the next dry period, which runs from May to November, which will translate into lower tariffs for consumers," explained the

Brazilian President.

However, Paraguay says the reduction has come at its expense, because Brazil is paying less than its neighbour for power from the shared Itaipu hydroelectric plant.

Paraguay agrees that there is more water in the Brazilian reservoirs, which lowers the costs of electricity generation, but believes Brazil has benefitted unfairly from an ill-defined tariff.

One ex-minister said: "We had a provisional tariff for 12 years, which is how the spurious debt was generated... How can we make Brazil go back after this and tell them that they owe us \$186 million?"

US gas turbines step up hydrogen blending

GE and Long Ridge Energy Terminal recently announced they had successfully taken the first step in switching a Long Ridge power plant to hydrogen. The 485 MW combined cycle plant conducted a successful demonstration using a hydrogen-blended fuel using hydrogen produced as a byproduct from a nearby industrial facility.

"Our Hannibal power plant is the first GE H-class plant worldwide in commercial operation to blend hydrogen successfully and we will continue to work with GE to lead the deployment of utility-scale hydrogen solutions and sustainable energy storage," said Bo Wholey, President of Long Ridge Energy Terminal.

Other plants may follow suit. GE

and Tampa Electric Company (TECO) recently announced the start of commercial operation for TECO's Big Bend 5 & 6 gas turbine at Apollo Beach.

The 1090 MW plant will replace existing 50-year-old coal fired units at the site. The GE gas turbines can burn 15-20 per cent hydrogen by volume now and are expected to be able to transition to 100 per cent hydrogen over the next decade.

The growing hydrogen use cases are driving hydrogen development across the Americas. Uruguay is the latest country to publish a national green hydrogen roadmap. Its research agency ANII is set to offer \$10 million in R&D grants on green hydrogen and its derivatives.

Obrador's power sector reform fails to win legislative support

- US emphasises Mexico's renewables opportunity
- Obrador announces plans for national lithium company

Janet Wood

Mexican President López Obrador has hit a roadblock in attempts to radically change the country's energy industry when opposition politicians denied the two-thirds majority he needed to change the constitution to implement the change. Meanwhile Mexico has come under pressure from a number of international companies, who say Obrador's changes would bring to a halt the country's opportunity to become a renewable energy powerhouse.

The planned sector reform would have guaranteed state electricity group Federal Commission of Electric Energy (CFE) 54 per cent of the market against 38 per cent that it currently manages. But critics argued that cancelling power generation permits and prioritising CFE power over private renewables would be bad for investment, the economy and the environment.

Obrador, who grew up in an oil-producing state and is a firm believer in state control of oil and electricity, thinks liberalisation of the sector was plagued by corruption and was too favourable to private companies.

But after a day of debate Mexico's lower house voted 275-223 in favour of the reform, well short of the two-thirds majority required for a constitutional change.

Obrador responded with plans to nationalise the country's lithium industry, saying: "There will be a company to explore for it, extract it, commercialise it." He said that change can be completed with a simple majority in Congress but the value of Mexico's lithium, which is mostly in clay deposits that are difficult to mine, is unclear.

The result of the energy reform vote will be welcomed by most investors but analysts expect political and regulatory uncertainty in the sector to continue.

Carlos Ochoa, a lawyer in Holland

& Knight's Mexico City office who has worked in state companies CFE and Pemex said the vote was important for the broader economy and investment climate. "It is a good message for other industrial sectors to know that at least there are checks and balances," he said.

The American Chamber of Commerce in Mexico complained about Obrador's reform, saying it would halt investment in renewables, which have the capacity to supply 100 times Mexico's electricity needs.

A report by the US National Renewable Energy Laboratory said Mexico "is in an ideal position to become a clean energy power" with potential for 25 GW of solar photovoltaic, 3.7 GW of wind, 2.5 GW of geothermal and 1.2 GW of additional capacity in existing hydropower.

Spain has also warned against the energy reform. Spain has around \$70 billion investment in Mexico in more than 7000 Spanish companies.

PV targets get more ambitious

New York's Public Service Commission has approved a target of 10 GW distributed solar by 2030.

The proposed expansion of the state's so-called NY-Sun initiative was first proposed in September last year, as the US state began to approach an initial target of 6 GW by 2025.

The extension will be supported by \$1.5 billion in ratepayer-funded incentives, which are expected to spur about \$4.4 billion in private investment and

create 6000 additional solar jobs. The new distributed solar goal aligns with the state's aim of getting 70 per cent of its electricity from renewables by 2030.

The US state's goal will bring its distributed solar PV level with that across the whole of Brazil, which announced recently that installed distributed generation (DG) capacity had passed the 10 GW milestone – the vast majority (9.9 GW) of it being solar PV.

Minas Gerais is currently the state with the largest DG capacity with 1.73 GW, followed by São Paulo with 1.29 GW, and Rio Grande do Sul which has 1.17 GW.

The Brazilian Ministry of Mines and Energy said the sector can power supplies equivalent to the needs of five million homes. Power sector regulator Aneel said residential units were the largest group of DG users with three quarters of a million systems installed.

Philippines accelerates decarbonisation but coal will remain king

- Coal still represents nearly two thirds of electricity mix in 2031
- DOE and World Bank map offshore wind potential

Syed Ali

The Philippines power sector is ramping up its decarbonisation efforts with a fast-growing pipeline of renewable energy (RE) but coal will still remain the dominant generating source for the next decade due to exemptions in the government's coal moratorium, according to Fitch Group's research arm.

In a commentary last month Fitch Solutions Country Risk & Industry Research slightly revised down its coal generation forecasts due to strong opposition against the fuel source and initiatives to lessen the use of coal. It said, however, that coal will still remain the dominant fuel source by 2031, citing the Philippine government's earlier statements and noting that coal is "still the cheapest source of power needed to energise a developing economy like the Philippines".

Around two years ago, the Philippine

government declared a ban on the construction of new coal fired power plants, but those that have already received environmental compliance certificates as well as permits from local government units are exempted.

"Coal generation will continue to grow strongly over the coming years in absolute terms, as projects in the current pipeline continue to progress," said the report.

Fitch Solutions said coal will therefore represent 61 per cent of the country's power mix by 2031. Meanwhile, natural gas will take up 19 per cent, hydropower will account for 7 per cent, while non-hydropower renewables will make up 12 per cent in nine years' time.

Fitch Solutions expects the Philippines to accelerate the decarbonisation of its power sector over the coming years in line with energy policy shifts. It has made a significant upward revision to its non-hydro renewables

forecasts, amid "rising investor interests and a rapidly expanding" project pipeline.

"We now forecast non-hydro renewables capacity to total 10.2 GW by 2031, from an estimated 4 GW, as of the end of 2021, driven largely by wind and solar projects," it said. Wind power projects in the pipeline have grown by over 407 per cent on-year in March.

The report came as the Department of Energy (DOE) and the World Bank Group (WBG) released the Offshore Wind Roadmap detailing the country's offshore wind power potential.

In the low growth scenario, the roadmap states that the Philippines has the potential to install 3 GW of offshore wind by 2040, which would make up 3 per cent of the country's electricity supply. This capacity requires a capital expenditure of about \$7.5 billion. In the high growth scenario, the country has the potential to install 21 GW

by 2040, accounting for 21 per cent of its total electricity supply and requiring \$50 billion capex to realise. According to WB, the country has the potential to develop 178 GW of offshore wind projects in total.

By 2050, the Philippines can have as much as 40 GW of offshore wind installations, which could make up 45 per cent of the country's electricity supply, DOE Undersecretary Felix William Fuentesbela said during the roadmap's launch in late April.

"This could help offset fossil fuel generation by 42 per cent by 2040, helping our country to accelerate decarbonisation and achieve greater energy security and independence," he said.

DOE Secretary Alfonso Cusi, added: "The Philippines has a rapidly growing demand for power. It is clear from this roadmap that offshore wind can play a major role in meeting our country's energy demand indigenously, while

also accelerating decarbonisation."

At the end of March, the DOE said it is undertaking a study to repurpose coal fired power plants into biomass waste-to-energy (WTE) power plants after issuing the policy to move away from new coal developments

In a separate move, also at the end of March, the private sector arm of the WBG and the power distribution firm of the Aboitiz Group said they would explore the shift to renewable energy (RE) and help support the country's climate goals. The International Finance Corp. (IFC) and Aboitiz Power Corp. signed an agreement aimed at assessing the viability of renewable energy as a source of baseload power in the Philippines.

Under the partnership, IFC and AboitizPower will conduct a joint in-depth study to explore a mix of technologies that can displace fossil fuel-based power sources and reduce carbon emissions.



South Korea signals nuclear fuel U-turn as global energy crisis looms

South Korea's incoming government says it will reverse the country's nuclear phase-out plan in a move aimed at increasing energy security, while tackling climate change.

Kim Yong-soo, Professor of nuclear engineering at Hanyang University in Seoul, said that the war in Ukraine had exposed outgoing President Moon Jae-in's nuclear policy as unviable.

"Energy security and soaring energy prices have come to the fore since the Ukraine crisis," said Kim.

Won Hee-ryong, Policy Chief on President-elect Yoon Suk-yeol's transition committee, said that President Moon's drive to cut the share of nuclear power in the energy mix had increased greenhouse gas emissions and threatened to increase energy bills.

South Korea is among the world's top-five importers of fossil fuels. More than 20 per cent of the country's coal imports in 2020 came from Russia, according to environmental think-tank, Ember.

MHIENG to perform CO₂ capture demonstration test

Mitsubishi Heavy Industries Engineering, Ltd. (MHIENG), a group company of Mitsubishi Heavy Industries, Ltd. (MHI), has signed a memorandum of understanding (MoU) with Tokuyama Corporation, one of Japan's leading chemicals/cement manufacturers, on the implementation of a CO₂ capture demonstration testing programme at their cement plant.

The programme will take place for a period of nine months commencing in June 2022, and will be the MHIENG's first implementation to perform a demonstration test at a cement plant in operation.

A mobile CO₂ capture test unit manufactured by MHIENG is to be installed at Tokuyama's existing cement

plant in Shunan, Yamaguchi Prefecture, where Tokuyama is based. Flue gas from a cement kiln, which contains CO₂ and other components would be introduced to the mobile unit for the demonstration test.

MHIENG will evaluate its performance and study optimum technology and design suited for cement application. Insights gained from the demonstration will enable MHIENG to realise CO₂ capture in the cement industry, and will also contribute to achieving the industry's decarbonisation goals.

MHIENG's CO₂ capture technology has already been successfully used in commercial applications at chemical and coal fired power plants.



TotalEnergies, Eneos tie-up will boost India's flagging solar effort

TotalEnergies SE of France and Eneos Holdings Inc. of Japan have teamed up to develop onsite solar for commercial and industrial (C&I) customers in Asia with the aim of developing 2 GW over the next five years.

The companies have signed a 50/50 joint venture (JV) agreement, and plan to leverage their respective expertise to lower the costs of decentralised solar and become one of the most competitive providers in the region.

The JV will target customers in Japan, India, Thailand, Vietnam, Indonesia, Philippines, Cambodia, Singapore and Malaysia. The partners expect to finalise the deal in the second quarter of 2022, after securing competition clearance.

The tie-up could provide a much needed boost to India, which looks increasingly likely to fall short of its

target to reach 100 GW of solar by the end of this year.

According to a report by the Institute for Energy Economics and Financial Analysis (IEEFA) and JMK Research, India looks set to miss this target by 27 per cent and on the current course will likely be short by about 86 GW of its solar target of 300 GW by 2030.

India had 55 GW of installed solar capacity at the end of 2021 and is forecast to add 19 GW this year, including 15.8 GW of utility-scale systems and 3.5 GW of rooftop solar.

The 100 GW target is split between 60 GW of utility-scale and 40 GW of rooftop solar capacity. While the utility-scale solar sector will miss the mark by 1.8 GW, the 40 GW rooftop solar target will be 25 GW short by December 2022.

According to the report authors, roof-

top solar and open access, or offsite, solar installations have been handicapped by challenges such as pandemic-related supply chain disruption and policy restrictions.

"Central and state government policies and regulations must be aligned to support the solar sector overall, and especially the ailing rooftop and open access segments of the market," said co-author Akhil Thayillam of JMK Research.

The report makes a number of recommendations to get solar targets back on track. For example, it proposes consistent regulations for net metering and banking facilities in the short-term and long-term measures such as stricter enforcement of the renewable purchase obligation (RPO) and reduced cross-subsidy surcharge for commercial and industrial consumers.

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Investments announced across Europe's nascent hydrogen supply chain

■ Germany plans storage, electrolysis, transport ■ UK pursues conversions in industrial clusters

Janet Wood

Uniper has announced plans to store 100 per cent hydrogen in the former Krummhörn natural gas storage salt cavern in northern Germany. A demonstration project will open in 2024.

The energy company says that Krummhörn is close enough to connect to its Green Wilhelmshaven hydrogen project, which will house an ammonia import terminal that will be able to convert the ammonia into hydrogen and later a 1000 MW electrolysis plant to produce green hydrogen.

The store is one of several new

hydrogen developments in Germany. Siemens Energy has now announced plans for industrial-scale production of electrolysis modules in Berlin with the start of production scheduled for 2023.

New production lines for the electrolyzers are being set up at a site that currently manufactures gas turbines. These can already be operated with up to 50 per cent hydrogen, and Siemens Energy says by 2030 complete hydrogen operation should be possible. Christian Bruch, President and CEO of Siemens Energy, said: "For us, hydrogen is an important component of the future energy world. For this to be

economically viable, the manufacturing costs for electrolyzers must be significantly reduced. With our new production facility, we are helping to make hydrogen competitive sooner."

Meanwhile, Gasunie, Germany's gas grid operator, has joined with Danish grid operator Energinet to develop a possible hydrogen transmission network between Germany and Denmark. It is thought that natural gas pipelines could be converted. A technical study is already complete and the two companies now want to bring forward initial plans and complete the pipe by 2030 instead of the initial 2035 date.

Germany's initiatives put it in competition with the UK at the forefront of developing a hydrogen industry. Recently the UK Minister of State for Business, Energy and Clean Growth Greg Hands said: "We've set ambitious targets for hydrogen production in our British Energy Security Strategy and are investing £360 million in innovative energy technologies to get us there."

In the UK hydrogen is focused around several 'industrial clusters' where there are potential industrial users, combined with carbon capture and storage development. Following an agreement between Uniper and Shell last year to

explore hydrogen opportunities the two companies have now announced plans to produce so-called 'blue' hydrogen at Uniper's Killingholme power station site in the East of England. The 720 MW Humber Hub Blue could produce hydrogen for industry, transport and power throughout the Humber region.

"The development of a hydrogen production hub at Killingholme represents a significant step towards decarbonising the UK's largest industrial cluster," said Mike Lockett, Uniper UK Country Chairman and Chief Commercial Officer for Power.



UK plans to speed up new nuclear

The UK has promised to set up a new government body, Great British Nuclear, hoping a dedicated organisation will speed up delivery of new nuclear units. In a new Energy Security Strategy Prime Minister Boris Johnson promised the new body would be backed by substantial funding, including a £120 million Future Nuclear Enabling Fund. He wants nuclear to produce a quarter of UK electricity.

The government recently promised to take a 20 per cent stake in the UK's next planned nuclear unit, Sizewell C, alongside EDF, and the proposed delivery body would also control any such government stake. Legislation is currently going through Parliament aimed at easing financing decisions

on new nuclear.

Charlotte Childs, National Officer at union GMB, welcomed the plans but said: "This should be the start, not the end, of investment in new nuclear." She wanted government commitment to nuclear at sites including Wylfa, Moorside and Dungeness, and to Small Modular Reactors.

The nuclear initiative comes alongside plans for more offshore wind and solar PV.

Business and Energy Secretary Kwasi Kwarteng said: "The simple truth is that the more cheap, clean power we generate within our borders, the less exposed we will be to eye-watering fossil fuel prices set by global markets we can't control."

Short-term nuclear revival to support Belgium's green agenda

Belgium needs strong efforts to reduce fossil fuels, cut carbon emissions and reduce energy imports, according to a new review by the International Energy Agency.

The country's energy sector has been hit by Russia's invasion of Ukraine, which has thrown policy objectives off course. However, since the IEA's previous review of the country in 2016 Belgium has become a major player in offshore wind, despite its limited offshore territory.

Belgium has the sixth highest offshore wind capacity in the world and steps to further expand deployment were announced recently. It is also working with other North Sea countries to develop a combined offshore electricity grid.

Belgium had been working to reduce its reliance on gas from the Netherlands, as production is phased out at the Netherlands' field, which once supplied around half of Belgium's needs. But the Netherlands has suggested it may delay Groningen's closure in light of the invasion.

Plans to phase out nuclear by 2025 may also be delayed after the Belgian federal government recently decided to allow 2 GW of nuclear capacity to extend its life by a decade.

"Belgium has shown leadership on clean energy transitions – not only through its impressive deployment of offshore wind power but also by punching well above its weight in international cooperation efforts," said IEA Executive Director Fatih Birol.



European countries raise renewables ambition further

■ Offshore wind the key technology
■ Grid expansion needed

Janet Wood

European governments, industry and networks have agreed to fast forward offshore wind as part of an even faster expansion of renewables, in response to the Ukraine invasion.

The EU had already established ambitious targets for offshore wind, which called for 60 GW by 2030 and 300 GW by 2050. Including the UK and Norway, Europe could have up to 450 GW of offshore wind in operation by 2050.

Now 25 parties, including national governments, transmission networks and major companies, have committed to work together to accelerate deployment, by providing a visible pipeline of wind projects and hybrid interconnectors, and removing regulatory and permitting barriers.

Some countries had already increased their ambition. In a revised

energy programme Denmark recently announced that it wants 35 GW of offshore wind – 15 times the country's current capacity. The UK also used its new Energy Security Strategy to announce a new offshore wind target of up to 50 GW by 2030 – five times current capacity – of which it wants up to 5 GW to come from floating turbines in deeper seas.

Danielle Lane, Vattenfall's UK Country Manager and co-chair of the UK's Offshore Wind Industry Council said: "To achieve this the planning process needs to be far more agile than it is currently," and added, "We also need to see faster progress on installing vital new grid infrastructure so that we can make the most of the enormous amounts of clean electricity we're generating offshore."

As developers roll-out turbines offshore, European countries are racing to install the grid needed to support

them. Dutch network operator TenneT now says it plans to reach 3500 MW of grid connection capacity for offshore wind farms in the Dutch North Sea by the end of next year. It recently completed the 700 MW Hollandse Kust (zuid) Alpha grid that will allow the Hollandse Kust (zuid) I and II wind farms to be connected and it expects the Hollandse Kust (zuid) Beta connection to be in operation later this year. Meanwhile, several key offshore wind farms have taken important steps forward.

France has begun installation of turbines at its first commercial-scale offshore wind farm, the 480 MW Saint-Nazaire project. It is due to be commissioned this year. And offshore construction has started on Dogger Bank A, the first of the three 1.2 GW phases of the 3.6 GW Dogger Bank wind farm, the world's largest offshore wind farm under construction.

Greece steps up clean energy ambition

Greece wants to revise its National Energy and Climate Plan (NECP) to step up renewable energy capacity to at least 25 GW by 2030, up from 19 GW in the current target, it announced recently. It has also announced plans to increase its energy storage target from 1.4 GW to 3 GW by the end of the decade.

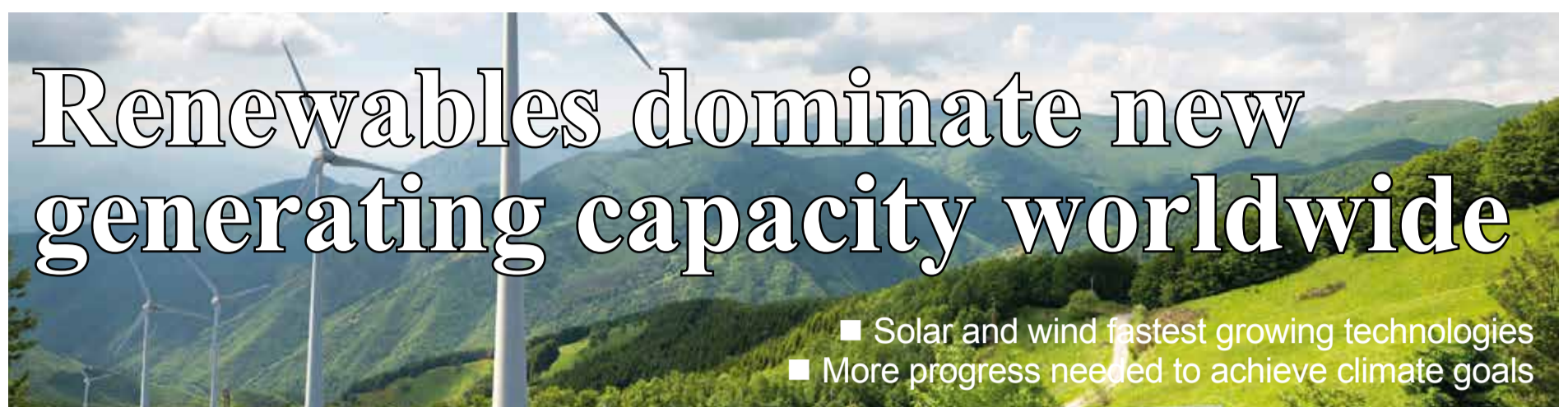
Greece's Regulatory Authority for Energy (RAE) received 3.2 GW of renewable energy projects in response

to a recent application window in February – over three times the 960 MW submitted in the previous window in October.

More than half the projects proposed in February were for solar parks but wind remains a key technology. Greece has recently taken a first step into floating wind in a joint venture between Hexicon and local company EAMAA. "Greece has great potential for floating offshore wind power with some of the

best winds in Europe", said Marcus Thor, Hexicon Chief Executive.

Among onshore wind projects, Iberdrola has begun construction of wind farms at 50.4 MW Askio III (50.4 MW) and Mikronoros (33.6 MW) and plans to start construction this year on Rokani (18 MW) and Askio II (37.8 MW). Greek construction group Ellaktor is developing 696 MW of wind projects in partnership with Portugal's EDP Renovaveis.



Nadia Weekes

New data released by the International Renewable Energy Agency (IRENA) shows that renewable energy continued to grow and gain momentum despite global uncertainties. By the end of 2021, global renewable generation capacity amounted to 3064 GW, a 9.1 per cent increase on the previous year.

Hydropower accounted for the largest share of total renewable generation capacity, with 1230 GW, but solar and wind dominated new generation, with a combined 88 per cent share of all

renewable capacity added in 2021.

“This continued progress is testament to renewable energy’s resilience. Its strong performance last year represents more opportunities for countries to reap renewables’ multiple socio-economic benefits,” said IRENA Director-General, Francesco La Camera.

Despite the encouraging global trend, the energy transition was far from being fast or widespread enough to avert climate change, he said, adding that renewables must outpace energy demand if climate goals are to be achieved.

IRENA’s ‘Renewable Capacity Statistics 2022’ reveals that Asia reached 1.46 TW of renewable capacity in 2021, with China alone adding 121 GW. Europe took second place with 39 GW of new renewable capacity, and North America followed with additions of 38 GW.

Renewable energy capacity grew by only 3.9 per cent in Africa and 3.3 per cent in Central America and the Caribbean, indicating the need for stronger international cooperation to optimise electricity markets and drive massive investments in those regions.

Hydropower grew steadily in 2021, while wind energy grew less than in 2020 (+93 GW, against +111 GW the previous year).

In its Global Wind Report 2022, the Global Wind Energy Council (GWEC) said wind energy growth would have to quadruple by the end of the decade for the world to stay on course for a 1.5°C pathway and net zero by 2050.

The offshore wind market enjoyed its best-ever year in 2021, with some 21.1 GW commissioned – three times more than the previous year. China’s mammoth year of offshore wind

installations accounted for 80 per cent of that growth, helping it pass the UK as the world’s largest offshore wind market in cumulative installations.

Solar capacity was the frontrunner in 2021, however, surpassing wind capacity for the first time thanks to an increase in new capacity (+133 GW) in all major world regions.

Bioenergy (+10.3 GW) and geothermal (+1.6 GW) both saw additional capacity being installed. Off-grid electricity saw capacity grow by 466 MW in 2021 (+4 per cent), to reach 11.2 GW.

SHI to develop floating nuclear power plants

Samsung Heavy Industries (SHI) from South Korea and Denmark’s Seaborg have signed a partnership agreement to develop floating nuclear power plants based on Seaborg’s compact molten salt reactor (CMSR) technology. The agreement includes development of hydrogen and ammonia production plants.

The aim of the strategic partnership is to manufacture and sell turnkey power plants, ready to be moored at industrial harbours and connected to the electric grid onshore.

An optional solution is to place a hydrogen or ammonia production plant next to the floating nuclear power plant utilising the CO₂-free fission energy to produce hydrogen and ammonia.

The floating nuclear power plant design is modular, delivering up to 800 MWe for a 24-year lifetime.

“CMSR is a carbon-free energy source that can efficiently respond to climate change issues and is a next-generation technology that meets the vision of Samsung Heavy Industries,” said SHI President, Jintaek Jeong.

“When an abnormal signal occurs inside the reactor, the liquid nuclear fuel, molten salt, is solidified to prevent serious accidents at the source, and provides high safety and high efficiency power and hydrogen production at the same time,” he added.

The South Korean conglomerate has also developed an onboard carbon capture system in association with compatriot scrubber manufacturer Panasia.

SHI has received an approval in principle for the system from verification and certification body Korean Register, with a view to commercialising the product by 2024.



South Africa solicits solar and wind energy capacity

- Bids sought for 2.6 GW of wind and solar
- Exit from coal still a distant prospect

Nadia Weekes

South Africa’s Department of Mineral Resources and Energy has issued a request for proposals (RFP) for 2.6 GW of wind and solar photovoltaic capacity in the country.

The tender aims at awarding 1 GW of solar and 1.6 GW of onshore wind power projects. The deadline for the submission of proposals is August 11, 2022.

In a recent meeting in Pretoria, African Development Bank President Dr Akinwumi Adesina told South Africa’s Minister for Mineral Resources and Energy, Gwede Mantashe, that the bank was in the process of setting up an African Energy Transition Facility to help South Africa secure adequate financing for its energy transition.

The African Development Bank estimates that South Africa would need more than \$30 billion to transition to renewable energy.

The bank is also preparing a \$400 million package to support the country’s electricity utility company, Eskom, as it transitions to renewable energy. South Africa currently relies on coal for 75 per cent of its energy needs.

According to Mantashe, the government is committed to achieving a 15 per cent reduction in coal power production and an 18 per cent increase in renewable energy by 2030.

The minister said gas and nuclear were also part of South Africa’s energy mix, while Adesina highlighted the leading role that solar power could play. “Be bold about solar power,” he said. “Africa today has no choice but to transition out of coal.”

Responding to questions in the National Assembly, South Africa’s Deputy President David Mabuza said that, while the country was committed to forging a low-carbon growth path, there were currently no plans to discontinue the use of coal as part of

South Africa’s energy mix.

Nine coal fired power plants are scheduled to be shut down by 2035, he added. “This is inevitable because, in the main, these plants are approaching the end of their lifespan and have become uneconomical, unpredictable and costly to run,” he said.

In a separate development, the African Development Fund has approved a \$5.5 million technical assistance grant to kick-start the roll-out of the flagship Desert to Power initiative in the Eastern Sahel region countries of Djibouti, Eritrea, Ethiopia and Sudan.

The project will develop technical studies for regional solar parks and associated battery storage near regional energy interconnectors.

Desert to Power will ultimately add 10 GW of solar generation capacity and provide electricity to around 250 million people in the 11 Sahelian countries by 2030.

Uzbekistan plans energy efficiency and capacity push

The Uzbek authorities are planning to increase the energy efficiency of the economy by 20 per cent by 2026 and reduce emissions of harmful gases into the atmosphere through the active introduction of green technologies in all areas.

Under the plan, Uzbekistan plans to build 15 new hydroelectric power plants (HPPs) and modernise five existing HPPs in 2022-2026, targeting an additional 868 000 kWh of electricity

per year.

Seven HPPs with a capacity of 173 MW are to be built this year in the Samarkand, Surkhandarya and Tashkent regions. In 2023, the modernisation of one HPP in the Tashkent region will be completed and two HPPs with a capacity of 29 MW will be put into operation in Kashkadarya and Andijan.

In 2024, four HPPs with a capacity of 127.4 MW will be modernised and put into operation in Andijan, Naman-

gan, Surkhandarya and Tashkent, while 2025-26 will see four HPPs with a capacity of 544 MW coming online in Kashkadarya and Tashkent.

Meanwhile, the commissioning of a new 240 MW thermal power plant (TPP) was celebrated at a ceremony in Tashkent attended by the President of the Republic of Uzbekistan, Shavkat Mirziyoyev, and the Turkish President, Recep Tayyip Erdogan.

The TPP, which was built by Turkish

company Cengiz Enerji in the Kibray district of the Tashkent region, cost \$150 million and will produce 1.9 billion kWh of electricity per year. It employed 600 specialist workers during construction and has created 100 long-term jobs for the operating phase.

The Presidents also announced launching construction by Cengiz Enerji of a separate 220 MW gas piston power plant in the Khavas district of the Syrdarya region. This plant will

produce 1.76 billion kWh of electricity per year and 600 construction jobs. Total project cost is estimated at \$140 million, with commissioning expected in September 2022.

Two further new TPPs were commissioned by Turkey’s Aksa Enerji in January of this year. A 270 MW plant in the Bukhara region and a 240 MW facility in Tashkent’s Kibray district will add 4.2 billion kWh of annual electricity production.

Companies News

National Grid oversight operations to be renationalised

- Future System Operator will manage GB electricity system
- “Whole system” approach could deliver up to £2.5 billion in value and secure reliable energy supplies

Junior Isles

Critical oversight operations of UK grid operator National Grid are to be essentially renationalised, with the announcement of plans to create a new public body to oversee Britain's energy system.

The UK Department for Business, Energy & Industrial Strategy (BEIS) is to form a publicly owned Future System Operator (FSO), which would take on the main responsibilities for managing Britain's electricity system currently carried out by National Grid, plus some of its work in overseeing the gas network.

The FSO, to be launched once legislation is passed and timelines have been discussed with key parties, will look at Great Britain's energy system

as a whole, integrating existing networks with emerging technologies such as hydrogen.

The FSO will be founded on the existing capabilities of the Electricity System Operator (ESO), and, where appropriate, National Grid Gas (NGG). It will work with energy suppliers and networks to balance the UK's electricity systems and ensure continued energy resilience and security of supply for households and businesses. It will also provide strategic oversight of the UK gas system by taking on longer-term planning in respect of gas (but not real-time operation, which will remain with NGG).

The proposals were published ahead of a wider UK energy security strategy. UK Business Secretary Kwasi Kwarteng described the overhaul as

“vital” for reaching the UK's 2050 net zero emissions target as well as to the country's national security, and to “becoming energy independent in the long-term”.

The FSO will take a whole-system approach to coordinating and planning the network, looking across electricity, gas and other emerging markets such as Carbon Capture Usage and Storage, as well as offshore wind networks.

According to an energy transition expert at EY, adopting a “whole system” approach will enable the FSO and its partners to make more efficient, more sustainable, and more equitable decisions, delivering up to £2.5 billion (\$3.14 billion) in value and securing reliable energy supplies for this and future generations.

Ofgem, the UK energy regulator, said a fully independent system operator will help to transform Great Britain's energy system and cut customers' energy bills. Jonathan Brearley, Chief Executive of Ofgem, said: “Critically, the FSO will ensure that we will build a smart, efficient and flexible system that will mean that Britain moves to a secure low carbon and low-cost system.”

National Grid had previously fought to maintain its oversight roles following a previous review in 2016. But its Chief Executive John Pettigrew said the creation of a FSO would lay “the foundations for the regulatory reform necessary to deliver a clean, fair and affordable energy transition”.

In addition to its management roles, National Grid owns electricity and gas

pipes and wires in Britain and has in recent years been developing a number of subsea cables to trade power with the rest of Europe.

In a strategic shift towards the electricity sector, in late March the company unveiled plans to sell 60 per cent of its UK gas transmission and metering business to a consortium led by Macquarie, the Australia-based infrastructure investor, for £4.2 billion.

The company said in November that higher electricity prices would deliver a £100 million boost to its full-year operating profit. Last month it noted that the improved profitability, however, would be partly offset by an additional tax charge of about £100 million for the year. National Grid's full earnings report is due to be released on May 19.

Westinghouse prepares for nuclear renaissance

Westinghouse Electric Company has signed a series of agreements that could see it capitalise on a potential nuclear renaissance.

As several countries in Europe turn to nuclear as part of their plans to ultimately end dependence on fossil fuel imports from Russia, the US-based nuclear plant constructor signed memorandums of understanding (MoUs) with nine companies in the Czech Republic.

The MOUs cover cooperation on the potential deployment of an AP1000 plant for the Dukovany 5 project as well as other potential AP1000 projects in Central Europe. These MoUs add to the seven agreements signed with local companies in the Czech Republic in January 2022.

“Partnering with local suppliers reinforces our execution approach to expand and maximise in-country procurement for the benefit of the nuclear project and the local economy,” said Elias Gedeon, Senior Vice President of Commercial Operations, Westinghouse Energy Systems.

Westinghouse Electric Company is one of three finalists in the Dukovany nuclear power plant tender.

Last month, the company also signed a definitive agreement to acquire BHI Energy that will expand its global capabilities and expertise in nuclear plant maintenance and modification services. The transaction is fully funded by Westinghouse and is subject to customary closing conditions and regulatory approvals. BHI serves customers mainly across the United States and Canada with more than 8500 team members during peak seasonal activity.

“Creating customer value and supporting the complete lifecycle of nuclear operations is a key part of our strategy,” said Patrick Fragman, Westinghouse President and CEO. “Combining these complementary organisations will further strengthen our ability to serve the nuclear operating fleet through an expanded presence in our core business while setting a new standard in outage and maintenance efficiencies.”

E.On accelerates move to hydrogen

In an effort to drive the ramp-up of the future hydrogen economy, German energy company E.On and Tree Energy Solutions (TES) have agreed on a strategic partnership to import green hydrogen at scale into Germany.

Within the framework of the partnership the companies will investigate potential joint engagements along the entire hydrogen value chain to build a source for secure, long-term green hydrogen supply.

TES is developing a green energy hub in the German port of Wilhelmshaven. The energy hub will feature a receiving terminal, storage facilities and a clean, zero-emissions oxy-fuel combustion power plant.

In addition, TES is developing the production of green hydrogen in solar belt countries and investing in the supply chain and relevant infrastructure.

TES will efficiently transport green hydrogen produced from solar electricity to Europe, where it is investing in infrastructure.

The tie-up follows E.On's signing of a Memorandum of Understanding (MoU) with Australian renewable green energy company Fortescue Future Industries (FFI) at the end of March, aimed at delivering up to 5 million tonnes per annum of green hydrogen to Europe by 2030.

Each side has committed to a research and study partnership, with further detailed documentation and steps required related to supply. It is intended that the large amounts of green hydrogen will be powered by Australia's immense renewable resources as well as FFI's other planned global projects, and will be distributed by E.On.



Siemens Energy AG is now reassessing the group's guidance for fiscal year 2022 following poor preliminary second quarter results from Siemens Gamesa Renewable Energy (SGRE).

SGRE's management is now reassessing its expectations on SGRE's performance for financial year 2022. According to SGRE, it will continue to work to achieve revenue within its year-on-year revenue growth range of -9 per cent to -2 per cent, and profitability towards the low end of its previously communicated EBIT.

The news came as SGRE entered into an agreement with SSE to sell South European renewables development assets for a total cash consideration of €580 million (\$630 million). This sale includes a pipeline of on-shore wind projects with a total capacity of 3.9 GW in various stages of development in Spain, France, Italy

and Greece, with the possibility to develop up to 1 GW of co-located photovoltaic projects.

The positive impact of the sale was included in SGRE's overall negative growth figures.

Siemens Energy's Gas and Power segment (GP), meanwhile, had a very solid performance during the first six months of fiscal year 2022. Management therefore believes that the GP segment remains on track to reach the current guidance for fiscal year 2022 (comparable revenue growth in a range of 1-5 per cent and an adjusted EBITA margin before special items of 4.5-6.5 per cent).

The company said that the war against Ukraine and the sanctions imposed on Russia have created a more challenging operating environment. It said it has started to see an impact on revenue and profitability and is

“experiencing an aggravation” of existing supply chain constraints.

“Due to the dynamic development of the sanctions regime, management is not able to fully assess the potential impact for the remainder of the fiscal year at this point in time and can therefore not rule-out further negative effects on revenue and profitability,” it said in a statement.

Commenting on the supply chain issues during a press a tour last month of the DolWin kappa offshore platform, being built by Siemens as part of the DolWin6 grid connection project, Tim Holt, Member of the Managing Board of Siemens Energy, said: “Every morning there's a new crisis. It started with Covid-19; the war in Ukraine put additional pressure on; and then the Covid lockdown in China. At the moment we are still looking for other suppliers.”

10 | Tenders, Bids & Contracts

Americas

Peruvian order for Nordex

The Spanish project developer Acciona Energía has placed an order with Nordex for 131 MW wind turbines in Peru. Nordex will supply 23 N163/5.X turbines from the Delta4000 series for the San Juan de Marcona wind farm. Commissioning is scheduled for completion by the end of 2023.

Acciona Energía is responsible for transport and installation.

The project will be built near San Juan de Marcona, the capital of the Marcona District of Nazca Province, located in the Ica region in the southwest of Peru.

This is the third order for Nordex from Peru.

SNC-Lavalin to support Darlington refurbishment

Candu Energy, a member of the SNC-Lavalin Group, has been selected to provide integration engineering support to GE Steam Power Canada for turbine generator refurbishment work on Units 1, 2, and 4 at Ontario Power Generation's (OPG) Darlington Nuclear Generating Station. The \$20 million contract runs until 2026, and includes support during installation, commissioning, and close-out work.

As part of the project, the steam turbine generators and associated auxiliary and control systems are being refurbished with technology upgrades. SNC-Lavalin will provide design, integration, and engineering execution services to GE in the refurbishment of the turbine generators.

Ian Edwards, President and CEO of SNC-Lavalin said: "This refurbishment work will allow Darlington to supply low-carbon electricity to Ontario for an additional 30 years."

Panamanian CCGT equipment order for GE

GE has won an order to supply generating equipment capable of producing 670 MW for the Generadora Gatún combined cycle gas turbine (CCGT) plant in Panama. The plant, owned and operated by Consortium Group Energy Gas Panama will be built on Telfers Island, near Colón, next to the Panama Canal. It is due to be operational in 2024.

GE will supply two 7F.05 gas turbines with A63 generators, two heat recovery steam generators, and one STF-D600 steam turbine with A63 generator. GE will also provide a 20-year service agreement.

The plant will use natural gas provided by AES's LNG storage and regasification facility built for Panama and Central America in 2018.

Asia-Pacific

GE gas turbines to stabilise Taiwan grid

GE has won an order from Taiwan Power Company (TPC) for six LM2500XPRESS gas turbine packages to bridge the power gap during blackouts or energy shortages. GE expects to build TPC's 175 MW Tung Hsiao Power Plant Renewal Project in less than 10 months, with an official dispatch date of the end of 2022.

The six units will support the flexibility needed as renewables penetration continues to grow in Taiwan, in alignment with Taiwan's target of achieving net zero emissions by 2050. Taiwan is targeting a 25 per cent share of renewables in its power mix in 2025, compared with 5.4 per cent last year.

Each of GE's LM2500XPRESS power package comprises a GE

LM2500 aeroderivative gas turbine modular package, and emissions control system.

Toshiba wind turbines head for Fukushima

Fukushima Reconstruction Wind Power GK, a joint venture of nine firms including Sumitomo, has awarded a contract to Toshiba Energy Systems and Solutions to supply turbines for a 147 MW onshore wind farm in the eastern part of Japan's Fukushima prefecture.

Other firms in the JV include JR-East Energy Development, Fukushima Mirai Kenkyukai, Japan Wind Engineering, Fukushima Electric Power, Shimizu, Obayashi Clean Energy, Renova, and Shinobuyama Fukushima Power.

Under the terms of the contract, Toshiba will supply 46 GE 3 MW wind turbines. The wind farm is due to be complete by Q1 2025.

Vestas wins offshore wind orders from Taiwan

Vestas has secured two orders in Taiwan for a combined 590 MW of offshore wind turbines. The first was a 295 MW order for the Zhong Neng project off Taiwan's Changhua County. This will comprise 31 units of V174-9.5 MW turbines. This project is being jointly developed by Taiwan-based China Steel Corporation and Danish fund manager Copenhagen Infrastructure Partners (CIP). The order includes a 15-year Active Output Management deal. Turbine deliveries are due to start in 2023, with project completion planned for 2024.

Vestas also won a 295 MW order for 31 units of V174-9.5 MW turbines from Foxwell Energy Corporation for the TPC Offshore Wind Generation Project Phase 2, also located off Changhua County. This project is developed and owned by Taiwan Power Company (TPC) and will be built by Foxwell. Deliveries are expected to start in 2024 and the wind farm to become commercially operational in 2025.

In addition, Vestas has won a 51 MW wind turbine supply order from O2 Power in India for a project in the state of Karnataka.

Vestas will supply, install and commission 23 units of the V120-2.2 MW turbines for the project. Deliveries are expected to start in Q3 of this year, while completion of the facility is planned for Q4 2022.

Europe

Valorem orders wind turbines from Nordex

Valorem, a French operator of green energy projects, has commissioned Nordex to supply 57 N163/5.X wind turbines for two projects in Finland. The orders also include a 35-year service contract.

Thirty N163/5.X turbines of the Delta4000 series are planned for the Kalistanneva wind farm, sold by Valorem to a Finnish Consortium comprised of HELEN Oy and the Bank of Ålands's Wind Power Fund. Nordex is supplying a further 27 of the same turbines to the Matkussaari wind farm. Valorem has developed, will build and operate the wind farm. Both wind farms are in the Ostrobothnia region.

The wind farms form part of the larger Viitatti project, one of the five largest wind farms in Finland currently being built. Infrastructure works will start in spring 2022. The turbines will be delivered and installed by 2024 on tubular steel towers with a hub height of 148 m

and equipped as a cold climate variant with a capacity of 5.5 MW.

Greenlink Interconnector to join Ireland and Britain

Jan De Nul Group has signed a contract with Sumitomo Electric for the installation of two subsea HVDC cables and one fibre optic cable linking the existing electricity grids in Ireland and the United Kingdom. The subsea cable route for the 500 MW Greenlink Interconnector is about 160 km long between County Wexford in Ireland and Pembrokeshire in Wales.

Jan De Nul is responsible for the end-to-end subsea cable laying and cable protection works. At the shore sides, Jan De Nul will perform the Horizontal Directional Drillings starting later this year in 2022. The offshore installation campaigns will be performed in 2023 and 2024. Jan De Nul's cable-laying vessel Connector will install the subsea cables, which will predominantly be buried in the seabed.

Romania launches nearly 1 GW renewables tender

The Romanian Ministry of Energy has launched a tender for the deployment of 950 MW of renewable energy capacity.

The government has allocated a budget of €457.7 million for procurement, which will be open to wind and solar projects, with the possibility of links to storage. Around €372.7 million of the total will be devoted to projects exceeding 1MW in size and €75 million to wind and solar plants with a capacity between 200kW and 1MW.

Selected projects will have to begin commercial operations in June 2024. Interested developers will have until May 31 to submit their project proposals.

Romania will grant a rebate of €750 000 per MW installed to PV projects with a power of 200 kW to 1 MW and of €425 000 per megawatt installed to solar arrays over 1MW. For wind power, the rebates are €1.3 million and €650 000, respectively.

Germany and Britain to get power link

Siemens Energy and the NeuConnect consortium have signed a contract for the supply of a turnkey HVDC transmission system for the NeuConnect Interconnector, the first power link between Britain and Germany. The 1.4 GW HVDC link will increase security of supply in both countries and allow more efficient use of renewable energy. Germany and Great Britain are among the world leaders in terms of installed wind power capacity. However, due to grid bottlenecks, excess wind energy in Germany often cannot be fed into the grid.

Siemens Energy said that the order value is in the "high three-digit million euro range."

Siemens Energy will build two turnkey HVDC converter stations to connect the two power grids, one in the Isle of Grain in England, the other in the Wilhelmshaven region in north Germany. The stations will be connected via a 720 km HVDC submarine cable.

GE to supply 53 MW wind turbines to Spain

GE Renewable Energy will supply and install 53 MW of wind turbines for Saudi Arabia's Alfanar Group in Spain. GE will deliver 15 units of its 3.X-4.0 MW turbines, which will be used to form a cluster of wind farms

near the towns of Miranda de Arga and Berbinzana in Spain's Navarre region.

The turbine supply contract comes with a 15-year full-service agreement. The project is scheduled to be completed in 2023.

International

Wärtsilä performance agreement for Malicounda

Wärtsilä signed a 10-year Guaranteed Asset Performance agreement with Malicounda Power SAS of Senegal. The contract covers the 130 MW Malicounda Melec power plant located in Mbour, south of Senegal's capital Dakar, scheduled to be commissioned in June 2022.

The Wärtsilä Flexicycle power plant will operate with seven Wärtsilä 50 engines. The agreement will provide operational reliability with scheduled maintenance and spare parts, as well as heat rate and power output guarantees after major overhauls.

Commissioning of the power plant is scheduled for June 2022. The plant will initially operate with heavy fuel oil (HFO) but there is an option to convert to gas fuelled operation as soon as a gas supply becomes available. Currently, there is an inter-governmental cooperation agreement between Senegal and Mauritania to develop significant gas resources, which will be shared by the two African countries.

The power plant is expected to help Senegal bring down energy costs and integrate more renewable energy.

Acwa EPC contract for green H₂ project

A consortium of Saudi Arabia's Acwa Power and US-based Air Products has signed a \$900 million EPC contract for the planned \$5 billion green hydrogen and green ammonia project at Neom in Saudi Arabia. The project is scheduled to begin commercial operation in 2026.

Acwa Power said that the project will be powered by 4 GW of renewable energy, and will have a production capacity of 1.2 million tonnes per year of green ammonia.

Acwa Power and Air Products each hold a 33.3 per cent stake in the Neom Green Hydrogen Company, with Neom Company holding 33.4 per cent.

Electrolysers with a capacity of 2GW will be supplied by Thyssenkrupp Unde Chlorine Engineers, a joint venture between Germany's Thyssenkrupp and Italy's Industrie De Nora.

Air Products will be the offtaker for the produced green ammonia, and will invest a further \$2 billion in distribution.

Worley to support green hydrogen project in Oman

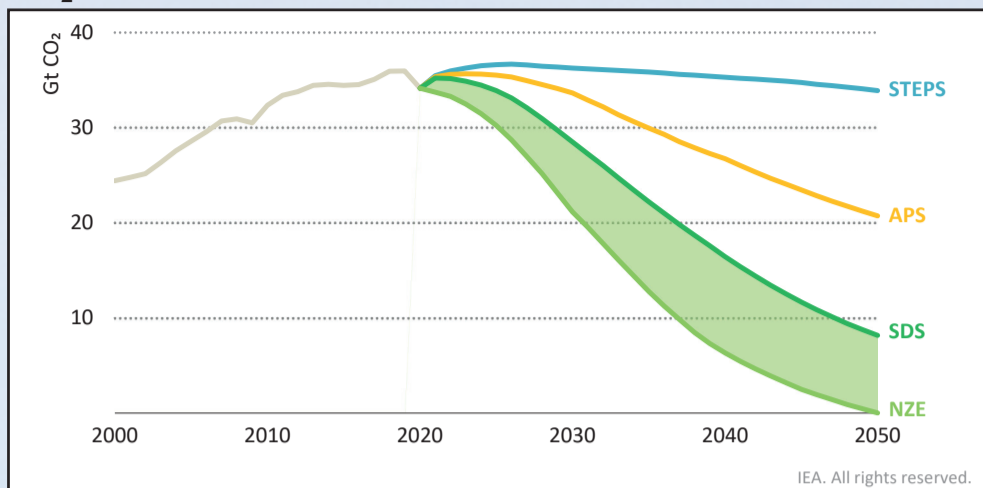
Green Energy Oman has selected Worley to support its project for the production of green hydrogen from 25 GW of solar and wind power.

Worley will provide concept feasibility study services for the project. The study includes defining the project components and identifying opportunities for employment and development for Omani nationals as well as manufacturing and supply opportunities for local companies across the supply chain.

With the power from the 25 GW wind and solar complex, GEO plans to produce 1.8 million tonnes of green hydrogen and up to 10 million tonnes of green ammonia per year.



CO₂ emissions in the WEO-2021 scenarios over time



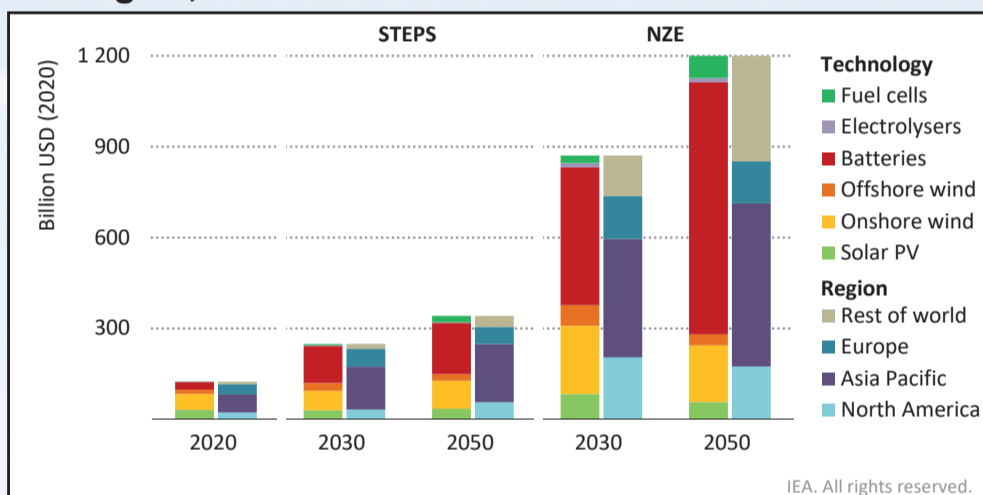
The APS pushes emissions down, but not until after 2030; the SDS goes further and faster to be aligned with the Paris Agreement; the NZE delivers net zero emissions by 2050

Note: APS = Announced Pledges Scenario; SDS = Sustainable Development Scenario; NZE = Net Zero Emissions by 2050 Scenario.

For more information, please contact:
International Energy Agency
 9, rue de la Fédération
 75739 Paris Cedex 15
 France.
 Email: bookshop@iea.org
 website: www.iea.org

World Energy Outlook 2021, © IEA/OECD, Figure 1.4, page 33

Estimated market size for selected clean energy technologies by technology and region, 2020-2050

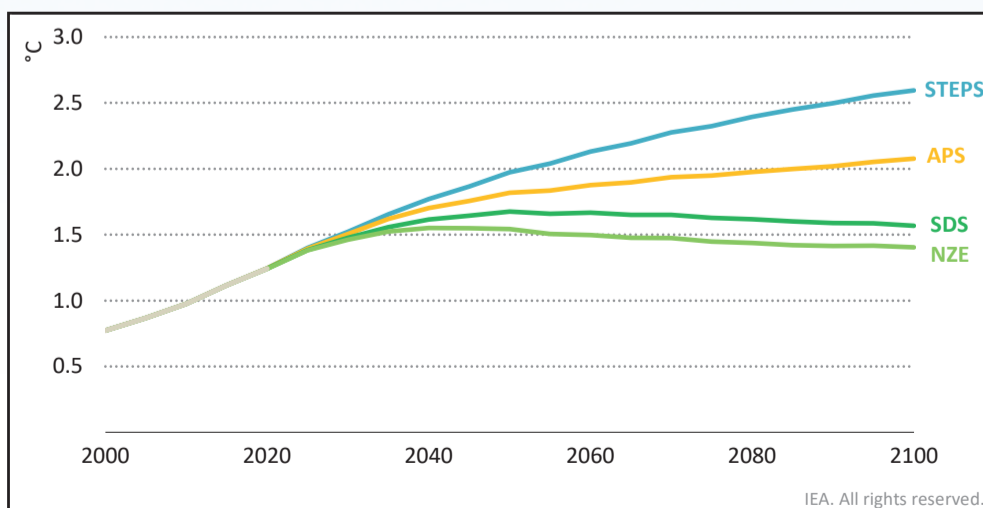


There is explosive growth in clean energy technologies over the next decade in the NZE, leading to a clean energy market worth a cumulative USD 27 trillion by 2050

Note: Market share estimates are the product of anticipated average market prices and sales of tradeable units of the core technologies: solar PV modules; wind turbines; lithium-ion batteries (for EVs and grid storage); electrolysers and fuel cells. This differs from investment or spending estimates that include, for example, installation costs.

World Energy Outlook 2021, © IEA/OECD, Figure 1.3, page 30

Global median surface temperature rise over time in the WEO-2021 scenarios



The temperature rise is 2.6 °C in the STEPS and 2.1 °C in the APS in 2100 and continues to increase. It peaks at 1.7 °C in the SDS and 1.5 °C in the NZE around 2050 and then declines

World Energy Outlook 2021, © IEA/OECD, Figure 1.5, page 34

Hydrogen

Green hydrogen gains in the face of rising natural gas costs

Producing blue and grey hydrogen would continue to make some manufacturers dependent on gas imports and subject to the price that such dependence would demand. This has caused a big shift in the way that countries and investors view hydrogen production.

Gary Lakes

Russia's invasion of Ukraine has brought numerous unexpected consequences, among them a boost for green hydrogen, which is showing itself to be a viable investment in the face of rising gas prices.

It is not only the Russian invasion of Ukraine and the urgent desire of European countries to end their dependence on Russian energy that has pushed up the price of gas to surprising levels. Economic recovery from the Covid-19 pandemic has played its part. Gas prices were moving upward before Vladimir Putin ordered his army into Ukraine in late February.

Those rising gas prices are having an impact on the global economy and also on renewables, making green energy a subject of keen interest. Since the midst of the pandemic, when demand for hydrocarbons began to slump, investment in hydrogen and ammonia as alternatives for the sake of climate change and energy security

has been steadily growing. Now the green side of these fuels is receiving an added boost as it becomes clear that using hydrocarbons to produce hydrogen might not be such a workable proposition.

The war has brought home the point to European governments that relying on Russia for energy supplies is a risk. Furthermore, the surge in gas prices has worked to undermine the argument of those supporting the production of blue and grey hydrogen, which are produced with expensive natural gas. For these products the use of carbon capture and storage (CCS), a technology that many consider unreliable for eliminating carbon emissions, is necessary.

Producing blue and grey hydrogen would continue to make some manufacturers dependent on gas imports and subject to the price that such dependence would demand. This has caused a big shift in the way that countries and investors view hydrogen production. The realisation that green

hydrogen produced with electricity generated by wind and solar is now on a similar cost scale with that of blue and grey, has given new impetus to the status of renewables for ensuring energy security.

A recent report by Bloomberg, citing data from BloombergNEF, said the nearly 450 per cent hike in European gas prices over the last year has made green hydrogen cost-competitive about a decade ahead of schedule.

The report said a number of investment funds are joining with governments and utilities with plans to make hydrogen a viable substitute for fossil fuels in manufacturing, transportation and heating. The report quoted fund managers who spoke of large amounts of money available for investment in renewables for the sake of green hydrogen production.

The war is credited with re-framing the debate between blue/grey and green hydrogen. A recent report by Rystad Energy said that the surging cost of blue and grey hydrogen in line

with fossil fuel hikes increased the growing feasibility of green hydrogen as an affordable and secure source of renewable energy in Europe. For Europe, this puts the emphasis on wind energy, although solar could be big in the continent's southern regions.

According to the Rystad report, the cost of hydrogen produced with fossil fuels could be between \$8/kg and \$14/kg very soon, but production cost for green hydrogen could see a lower production cost of \$4/kg, a situation that would move the economics in green hydrogen's favour.

The consultancy said that for green hydrogen to fulfil the role currently played by oil, gas and coal, green hydrogen would need to see output boosted to 10 million tons by 2030 and costs reduced to \$1.5/kg.

Meanwhile, in the case of Ukraine itself, the country is planning to sign an agreement with the European Union in mid-May whereby the two parties will pursue cooperation in hydrogen and renewable gases once the

war with Russia is done. The agreement was supposed to be signed in February, but was sidelined by the Russian invasion.

Ukraine had been deemed a priority partner by the EU in its 2020 hydrogen strategy report. While Ukraine currently produces only 1.5 GW of wind power, a study completed prior to the war estimated a potential of 688 GW.

Transport between the EU and Ukraine would be conducted through some 20 road connections and via the Danube Project, which envisages hydrogen being shipped up the Danube River on barges.

Ukraine's Gas TSO, Slovakia's Eustream, Net4gas of the Czech Republic and OGE of Germany are reported to be working on a plan to transfer hydrogen production plants in those countries to Germany. Furthermore, the natural gas pipeline network operating in that corner of Europe could be repurposed to ship hydrogen, as could all of Europe's gas transport infrastructure.

Gas

EU gas quest throws fresh light on East Mediterranean gas

The European Union is looking to line up new sources of natural gas now that Russian hydrocarbons are taboo. The move has put East Mediterranean gas resources back in the spotlight but any relief the region could offer will not come soon.

Gary Lakes

East Mediterranean gas resources have been on the back burner for a considerable time. Low gas prices in recent years, the lack of a lucrative market, and a global pandemic delayed exploration. But Russia's invasion of Ukraine and the post-pandemic economy has pushed gas prices to new heights. Coupled with Europe's search for natural gas supplies to fill the gap between now and the energy transition, interest in East Mediterranean gas resources as a source of supply for Europe has been revived.

Current development in the East Med focuses on the Israeli fields of Leviathan, Tamar and Karish, which supply, or will supply in the case of Karish, the Israeli market sufficiently for years to come. Some Israeli gas is being exported to Jordan and some is going to Egypt, the region's most developed producer, for industrial customers and

for export in the form of LNG.

Stage two development of the 22 tcf Leviathan field is in its early stages, but operator Chevron has yet to say just which market this gas will target. There had been considerable hoopla over the EastMed Gas pipeline project, which would have sent 10 bcm/year of gas from Israel and Cyprus to Greece and beyond via a 1800 km subsea pipeline, but the US, which supported the project until last year, has recently declared the pipeline unviable.

From the start, the EastMed, the brainchild of IGI Poseidon, a joint venture between Greece's DEPA and Italy's Edison, was considered a long shot, but for political reasons, the governments of Greece, Cyprus and Israel endorsed the \$7 billion project and signed a number of agreements concerning it. But now with the loss of US backing, the project is off the table.

So how might East Mediterranean gas make its way to the EU to help

those countries reduce their dependence on Russian gas, which amounts to around 150 bcm/year? Turkey's President Recep Tayyip Erdogan has long insisted that sending the gas by pipeline to Turkey and then on to Europe would be the best way to export East Med gas. He reiterated this point to Israeli leaders during recent visits to Turkey that give the appearance of a rapprochement between the countries.

Turkey itself relies on Russia for around 40 bcm/year of gas, so it is logical that Israeli gas could help Turkey ease its dependence on Russian imports. But as Israeli gas exports would likely amount to about 10 bcm/year, it is hard to see how any of this gas would make its way to EU customers, especially as Turkey is expected to stop Russian imports. Only increased LNG deliveries and a boost of natural gas imports from Azerbaijan, or possibly Iran (which is also under sanctions), would enable Turkey to cut

Russian imports.

In March this year, ExxonMobil finished an appraisal well in Block 10 in the Cyprus offshore. Results for the drilling, located at the Glavcos-1 discovery site, are expected in May. Meanwhile, partners Eni of Italy and TotalEnergies of France are due to resume drilling in the Cyprus exclusive economic zone (EEZ) before the end of the year, provided the Turkish navy refrains from interfering.

Cyprus can empathize with Ukraine in certain respects. In 1974, prompted by an attempted pro-Greek junta coup, Turkey invaded Cyprus and occupied a third of the country. That situation remains today despite numerous UN and international efforts to end the Turkish occupation. Turkey now claims practically all of the Cyprus EEZ and has on several occasions prevented foreign operators from drilling in Cypriot waters – hence the fact that the Cyprus EEZ is under-explored.

Meanwhile, Cyprus is loathe to have any gas it eventually produces exported through Turkey and favours, if not the EastMed Gas pipeline, then piping the gas to Egypt for re-export as LNG.

Despite the promise of large offshore hydrocarbon deposits, Lebanon has had only one well drilled, and it is unlikely that more drilling will take place anytime soon. The country is totally incapacitated due to its undeclared bankruptcy brought on by years of government corruption and incompetence. While Lebanese gas would go far to provide power to the broken nation, its gas resources might also be used to aid others in the region or travel overland by pipeline to Turkey, where it could serve another useful purpose.

For now, any East Med gas that finds its way to Europe will do so via Egypt, which has capacity at its LNG facilities to accommodate more volumes of Israeli and probably Cypriot gas, when it becomes available.

Utilities take centre stage as Europe pivots away from Russian gas

In the midst of an ambitious decarbonisation drive, Europe is now making energy security its first priority. This shift has clear implications for utilities, explains S&P Global Ratings' Claire Mauduit-Le Clercq.

The ongoing conflict in Ukraine has prompted the European Commission to make a major shift in its energy policy. The REPowerEU plan – unveiled in March 2022 – aims to diversify Europe's gas supplies, replace gas in heating and power generation, and overall reduce the EU's demand for Russian gas by two-thirds by 2023.

The EU currently imports 90 per cent of the gas it consumes and, on average, 40 per cent comes from Russia. Given the lack of adequate supply on offer from alternative sources, replacing the 140 billion cubic metres (bcm) per year currently imported from Russia will be challenging. Indeed, gas storage levels are running well lower than the targeted 80 per cent, and Europe's own gas production has long been in structural decline. Furthermore, most of the world's liquefied natural gas (LNG) production is currently locked into long-term contracts with pre-agreed destination clauses and large supply increments are unlikely before 2026.

Under the most optimistic scenario, Europe could source up to 50 bcm of gas from alternative sources before winter 2022. According to S&P Global Platts Analytics, this would most likely come from international imports of LNG (25 bcm), Italy's strategic reserve (4.6 bcm), a potential increase in Norwegian production (10 bcm), additional flows to Italy from Algeria and Libya (10 bcm and 4 bcm, respectively), and increased production in the Netherlands (2 bcm).

This leaves a considerable shortfall, leading to some demand destruction. This tension on gas supply is likely to prompt a surge in gas prices – and with gas remaining the primary price-setter for European

power prices, a hike in spot and forward power prices will mechanically follow.

The price hike has wider implications. S&P Global Ratings had already anticipated an increase in power prices precipitated by the ongoing energy transition, owing to the closure of coal and lignite plants and the decommissioning of nuclear power plants. The ongoing drive towards decarbonisation therefore places an even greater importance on gas – further accentuating its role in determining European power prices.

Indeed, the TTF, Europe's main gas index, is currently trading 10x higher than its 2020 average and above its previous peak in December 2021 – something that, at the time, led to heavy margin calls by main market players.

Rising prices will inevitably have wider economic fallout, and some energy-intensive industrial sectors like fertilisers, steel, and paper could face temporary plant closures – with repercussions for the Eurozone's GDP growth. Indeed, in light of the ongoing Russia-Ukraine conflict, S&P forecasts a GDP decline of about 1.2 per cent in Europe for 2022. The potential escalation of the military conflict in Ukraine, its expansion across a wider geographic area, or the broadening of sanctions on Russia's energy exports would also bring further macroeconomic risks.

Looking ahead to 2023 and 2024, S&P anticipates that the rate of economic growth will be largely unchanged, while inflation will jump 2 per cent. And while the high volatility makes predictions difficult, forward gas prices could be up to three times higher in 2023 and 2024 than previously assumed.

Such high power prices place an

unsustainable burden on the European economy, which the EU plans to mitigate by introducing measures to protect households and businesses. Possible options being explored by the European Commission include imposing temporary price limits, offering energy subsidies and vouchers and tax reductions.

Considering the current exceptional circumstances, individual member states can set regulated prices for vulnerable consumers, households, and micro-enterprises to help protect consumers and the economy. They can also impose temporary tax measures on utility companies' windfall profits. As such, with most of their operations hedged for 2022, utilities do not stand to benefit significantly from elevated prices. Furthermore, government measures mean that higher prices might not be forthcoming next year either.

Utilities companies therefore face a variety of considerations as they adapt to the new environment. Large European utilities generally manage supply and trading risk by securing prices on both the procurement and sale of commodities. This hedging policy allows them to make a margin without being significantly exposed to volume or price risk. However, in the event of disruption to gas delivery, hedging contracts will leave companies exposed to market risks.

As the energy transition progresses and the geopolitical situation continues to present risks, market volatility will likely persist. Of course, some key commodity market players have adapted rapidly in 2022, supporting their credit quality by renegotiating contracts, limiting margin calls with key counterparties, using letters of credit (LCs) to manage related cash risk with key core banks, and securing additional credit lines to manage liquidity. Nevertheless, large working capital swings are likely to continue.

Despite the turmoil, decarbonisation remains a key priority. Beyond the diversification of gas sources, the goal of reducing dependence on Russian gas necessitates the accelerated expansion of Europe's renewable energy capacity. The Commission's plans for renewables are positive for utilities' growth prospects, even though they may require companies to increase capital expenditure beyond what is planned.

Europe's targets – which require adding between 45 and 55 GW of renewable capacity a year this decade – are ambitious. Indeed, S&P Global Ratings maintains that the national targets envisaged by the EU's 'Fit for 55' package will be difficult to achieve by 2030. Europe's renewables roll-out faces a number of obstacles, including bureaucratic processes to obtain permits and supply chain disruptions,

with a large proportion of necessary components coming from China.

Of more immediate concern, however, is that, in light of the Russia-Ukraine conflict, Europe will likely prioritise the security of its energy supply over decarbonisation. This implies greater use of carbon-intensive energy sources to make up for the shortfall in gas supply – with Germany already considering reopening some coal fired power plants. This move will likely support earnings for the generation companies involved, even if the possibility of earnings claw-backs remains due to the current environment.

Furthermore, in light of these supply concerns, Europe seems to be changing its attitude towards nuclear energy. Few new nuclear plants have been constructed in recent decades, and questions have been raised as to whether Europe has sufficient access to skilled technical personnel. But with power prices surging across the continent, nuclear generation offers a viable, low-carbon supply of energy that supports Europe's drive towards energy independence.

Furthermore, extending the lifespan of existing nuclear plants could buy valuable time for the expansion of renewables.

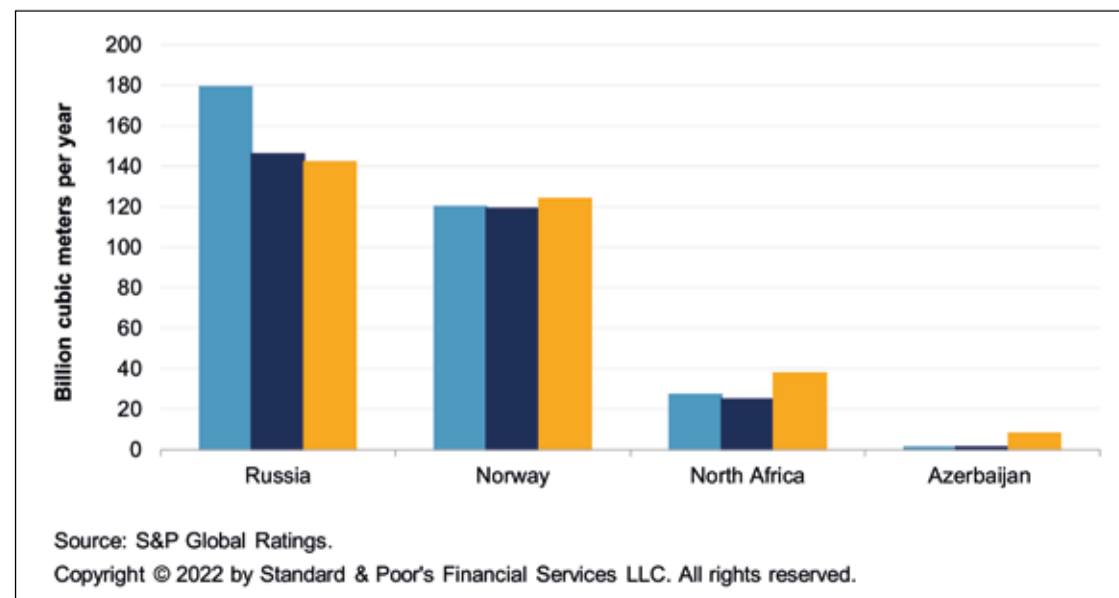
The EU's Green Taxonomy, which seeks to encourage sustainable investment, has recently been updated to encompass nuclear energy under certain conditions. At the same time, concerns about the safety of nuclear plants remain prevalent – particularly in view of the potential risks posed to the nuclear facilities in Ukraine including Zaporizhzhia – Europe's largest plant – and Chernobyl, which is now non-operational.

In light of current events, the power market has to adapt to a new reality. The pivot away from Russian gas could have long-term implications for utilities and for the structure of the power market. In accordance with the energy transition's accelerated trajectory, gas and power utilities will be expected to advance their shift towards renewables. The EU is also planning to invest in increasing its capacity for decarbonised gas, such as biomethane and hydrogen, which will encourage investments in new infrastructure faster than currently anticipated.

Additionally, the European Commission is considering options such as alternative pricing mechanisms to optimise the electricity market's design to promote renewable energy generation and fostering green investments. This could well amount to a move away from the merit order mechanism, and reshape the European energy market.

Claire Mauduit-Le Clercq is Director, EMEA Utilities at S&P Global Ratings

Europe pipeline gas imports by source. Source: S&P Global Power Ratings



Real-time trading creates new, sustainable opportunities

The global drive to net zero and the consequent increase in renewables, introduces challenges for grid operators and new responsibilities for utilities. Hitachi Energy's **Uday Baral** explores the need for utilities and other energy market participants to engage in sophisticated energy contracting and trading transactions to serve their load efficiently and profitably, while meeting sustainability goals within this new, dynamic context, and looks at the technology needed to make that happen.

The past year has been marked by some of the most extreme energy supply and demand shocks ever seen. Events such as global lockdowns caused by the Covid-19 pandemic, weather extremes and more recently, the conflict in Ukraine have posed challenges for energy firms around the world. For energy market participants, these challenges come against the already complex backdrop of new market designs created to facilitate the integration of renewables and the global move toward carbon neutrality.

Last year, for the first time, renewables generated more electricity than fossil fuels in the European Union – a trend noted around the world. While increased renewables pose significant challenges to grid operators, they also leave energy traders facing a new landscape as well. Renewable generation is less predictable, which introduces volatility, price fluctuations and rapidly changing market positions. It requires power companies to make decisions based on more information sources than ever before.

This dynamic environment brings a shift towards more frequent trading, and market participants need to be able to track positions and risk exposures in real-time.

Ten years ago, the energy market

was based around the conventional, centralised generation of oil and coal plants. It was predictable and formulaic. Participants were able to successfully navigate this relatively simple market environment with a basic strategy and manual processes to track market transactions.

The fossil fuel staples of yesterday's energy market are no longer the future of energy generation, however, and outputs from wind and solar, are less predictable than thermal generators. This not only brings about changes in how electricity is produced and consumed, but also in the way energy is traded. These renewable sources can lead to either an abundance of generated power at low prices (even negative when the grid can't absorb the excess) or exactly the opposite, when there is less wind or sunshine than forecasted. Then thermal generators are challenged to fill the gap.

Add to this the impact of localised generation on transmission networks and it's clear how market positions become more uncertain as renewable energy supply increases. The volatile and intermittent nature of renewable resources introduces rapidly changing market positions, which requires a market based on more short-term, intraday trading.

In addition, decarbonisation efforts have created a growing market in green certificates – receiving a boost by the European Union's 'Fit for 55' programme as well as the recent report from the Intergovernmental Panel on Climate Change (IPCC) – driving demand for tradable certificates to offset CO₂ emissions to prove electricity was generated by a renewable source. Managing this increased volume requires new solutions to manage risk, financial and compliance reporting.

Moreover, new consumer and business demands, are calling for support of business scenarios to serve their needs for trade-to-trade matching and peer-to-peer matching of electricity deals (B2B and B2C) with a desired set of certificates. As a result, wholesale market participants are facing increased complexity – necessitating automation and market integration.

This new landscape also requires that market participants develop a sound and multi-faceted energy portfolio management strategy informed by digital technology in order for planners, portfolio managers, traders and investors to make better economic and strategic decisions that support effective, successful operations. Many companies however, continue to rely on manual processes and spreadsheets to track their market access activities. Yet manual and un-integrated system processes can no longer handle the complex and varied nature of all of the components. Un-integrated systems lack the visibility and risk controls necessary for effective portfolio management and optimisation.

This results in market participants losing out on revenue because they cannot respond to the new market. However, by bringing technology into the mix, we are beginning to see energy market participants get ahead of this trend and increase their revenue.

Volatility, and shorter-term and intraday trading will certainly provide traders increased opportunities but will, at the same time, give rise to greater risk exposure. Market participants need to be able to track positions and risk exposures in real-time – not only to monitor risk but also to trade opportunistically. The market participants engaging in sophisticated energy contracting and trading transactions to serve their load efficiently, profitably, and in a balanced fashion on a real-time basis are using a robust digital commodity/energy trading and risk management (C/ETRM) solution.

A real-time integrated C/ETRM system automates bid-to-bill business processes that support the forecasting and optimisation of trade cycles from deal capture and contract management to market integration. Market participants can use these digital solutions to tackle everything from pricing and complex fees to trade confirmations to portfolio management and valuations to environmental product optimisation and more.

The advancement of renewable energy has also brought about the need to capture, track and redeem tradable certificates related to emission allowances and energy attributes. While the recording of a purchase or sale of these certificates is straight forward, the inventory management, expiration and cancellation are more complex.

Nevertheless, there is a new revenue opportunity with renewable energy. As noted, energy attribute certificates (EACs) – known as Guarantees of Origin (GOO) in Europe, Renewable Energy Certificates (REC) in North America, and International RECs (I-REC) in other geographies – are growing in importance and volume as renewable energy becomes a dominant source of the energy mix.

Markets for EACs exist to encourage the supply of, and demand for, certified renewable energy. These markets for certified renewable energy are not only about providing income to producers that can be invested into new generation capacity or create another revenue stream; they are also about giving information that allows consumers to decide what kind of electricity (or green gas) they want to use.

An EAC, such as a GOO, is one that guarantees that 1 MWh of electricity has been produced from renewable energy sources. EACs are tradable products with an expiration period of one year from the date of certification. Additionally, when the energy is delivered, the EAC is cancelled. If you

own the EACs associated with your renewable energy project's electricity output, you can sell these EACs to another party. In doing so, you forfeit the ability to make any claims about "using" renewable energy, but generate a new revenue stream.

The revenue is a function of the system's kWh output and the market price of EACs. Voluntary demand continues to grow, partly because of the growing realisation that EACs are the evidence behind renewable energy Power Purchase Agreements. In addition, regulatory changes, such as the growing adoption of full disclosure is driving the voluntary market. In the next 10 years, the EAC volume is projected to continue its current growth rate (accumulated volume between 2020 and 2030 12 000TWh), while prices are forecasted to more than double.

Businesses that focus on this expanding market will have more opportunities down the line.

Businesses around the globe are making urgent and significant commitments to save the planet, and in fact, environmental stewardship is now necessary for future competitiveness. In recent years, potential employees and other corporate stakeholders have become more focused on a company's purpose and core values as well as its sustainability record. They even use it as a primary factor in their decision to join or invest. They have increasing expectations about the origin of the power consumed. They expect companies to document, report and track electricity consumed from renewable sources.

Market-based instruments such as GOOs are an effective way to increase the market momentum for renewable energy. Buying GOOs sends a signal to the market that the company prefers to consume renewable energy and it shows the organisation's commitment to changing energy behaviour. This presents a growing opportunity to sell to more companies seeking to do good for the planet.

The carbon-neutral world is electric. Analysis comparing and contrasting multiple recent studies of the evolution of the total world energy system shows that global electricity consumption will more than double from 20 per cent today to over 40 per cent of total energy demand by 2050. For this to happen, increasingly larger volumes of renewables will need to be connected to the world's grids and incorporated into energy markets. With the right technology and digital tools, market participants will be ready and able to assess the opportunities and risks that come along with this new landscape. Moreover, they will be positioned to play a dominant role in a truly sustainable energy system for today's generations and those to come.

Uday Baral is Head of Energy Planning & Trading, Hitachi Energy.

Baral: Volatility, and shorter-term and intraday trading will certainly provide traders increased opportunities



Developing a virtual energy system

National Grid ESO has launched an industry-wide programme to develop a Virtual Energy System – a digital twin of Great Britain’s entire energy system. This centralised tool offers the potential to create a collective view of the UK’s energy system: supporting forecasting, decision-making and innovation while informing improvements to the physical system. **Jonathan Barcroft and Simon Evans** explain.

Evans: This is a digital-first system, both to aid the UK’s decarbonisation transition and to adapt with the times



With the countdown to the UK’s target for a decarbonised power system by 2035 in motion, the entire energy industry must combine efforts to reach a sustainable future.

Already, the energy industry has made impressive strides along the path to decarbonisation while undergoing the transition to digitisation. These two important transitions working in parallel have been instrumental in helping to plan for the changing demands on the energy sector as other industries also undergo changes as part of their own efforts to reach net zero.

The next shared step is to capitalise on the potential of a more dynamic, joined-up and intelligent view of the entire energy system. One that will create something incalculably more powerful, and one which offers the potential to advance our progress on net zero while driving benefits to consumers and suppliers alike.

That’s why last year National Grid ESO launched an industry-wide programme to develop the ‘Virtual Energy System’ – a digital twin of Great Britain’s entire energy system.

This centralised tool offers the potential to create a collective view of the energy system: supporting forecasting, decision-making and innovation while informing improvements to the physical system.

The Virtual Energy System begins with an open framework, with agreed access, operations and security protocols. Over time, this is populated by existing and new digital twins – replicas of physical components of our energy system. Each digital twin will contribute to and access real-time data on the status and operation of other elements of the system. This layered data then generates insight, and a virtual environment with the potential to transform the system and support the transition to net zero.

Digital twins are already at the forefront of delivering benefits across an array of sectors. From helping F1 teams model driving patterns, to developing strategies to

build smarter cities, digital twins are revolutionising the way we perform simulations and improve operations. To leverage the opportunity that an integrated network provides, however, we must consistently feed digital twins with relevant and accurate contextualised data. As such, fostering collaboration is vital to meeting net zero goals.

Consumers are also in line to benefit when the industry embraces modelling scenarios that aid decarbonisation. With more accurate projections of how the network functions, it will be easier to share data with customers to help them to reduce emissions and usage costs.

With planning and development well under way, the next steps in bringing the Virtual Energy System to life involve exploring use cases to illustrate the efficacy of the system and to highlight specific process-oriented benefits for businesses. As with all transformative tech projects, there are commercial considerations and technical risks to consider to ensure the system is safe, secure, and fit for purpose.

The project is ambitious in its aims, and success will depend on participation at every level of the industry. And the challenges extend beyond the practical implementation of the digital replica. The socio-technical concerns of the project are far-reaching. The need to establish how this cross-industry collaboration will look in areas such as regulatory and legal issues, cyber security, and data usage is therefore crucial.

It is vital that different elements of the digital twin are compatible and adhere to a Common Framework. Earlier this year, National Grid ESO announced it had appointed professional services firm, Arup, supported by Energy Systems Catapult and Icebreaker One, to articulate the principles and framework needed for parties to develop digital twins which are interoperable and can interact with the Virtual Energy System, using open data.

Development of the framework provides an opportunity to benchmark how to connect digital twins against international best practice and standards. When it is understood how the Virtual Energy System measures up on a global level, it is then possible to harness the potential for wider industry participation in making the grid greener and more sustainable.

The Benchmarking Report detailing key considerations for the creation of the Virtual Energy System has recently been published.

The Virtual Energy System is an important next step in helping the energy industry achieve its goal of reaching net zero. For those putting it together, however, the first challenge to overcome is that the push for decarbonisation across the UK’s energy system has already generated so many strands and areas of work. Across the energy industry and central government there is debate about which technologies should be used, how we adapt to the changing requirements of consumers and, ultimately, about what the right choices are to help us both decarbonise and improve our energy offer.

Connecting these strands, and more generally ensuring the sector is pulling in the same direction, is the only way forward, and the development of the Virtual Energy System can play a key role in helping to deliver this connectivity. Arup, was tasked



Barcroft: With planning and development well under way, the next step is bringing the Virtual Energy System to life

with building the common framework for the system, and necessarily put connectivity and collaboration at its heart.

This need for collaboration with the sector has been a common thread across its work at every stage. Arup worked closely with industry stakeholders from the outset in the development of this common framework. The key is to “collaborate on the rules, compete on the game” – defining the rules for all to use to feed into the Virtual Energy System, whilst acknowledging that these stakeholders will undoubtedly end up competing for business during and after the creation of a decarbonised energy system.

Stakeholder engagement also has to continue throughout the development of the common framework. Stakeholders must be engaged in order to raise awareness of the Virtual Energy System, to encourage their involvement, and to ensure they know how it will work with existing programmes in the digital energy sphere.

Creating this common framework began by developing an understanding of current examples, carrying out a benchmarking assessment of case studies which existed across different industries. These proved to be few and far between – while the concept of “digital twins” has been around for years, creating connected ecosystems of digital twins is a relatively new space. The other sectors in the UK and international energy industries that have attempted it have faced challenges. However, it is important to note that the benchmarking assessment will prove to be an iterative activity, as more case studies will appear in this developing market over the coming months and years which we can then apply learnings from.

While the problems faced by others creating similar systems highlighted a range of technical challenges, they also showed the clear emphasis on the social challenges, and the socio-technical nature of the common

framework – linked also to data, people, and process. These ranged from legal challenges over data sharing, to difficulties with interoperability brought about by a lack of metadata standards, and to a general clear need to focus our attention on education, skills, and change management.

Identifying these socio-technical factors became the top priority once the benchmarking was completed, with 14 identified across the areas of people, process, data, and technology. As well as tackling each of the socio-technical areas that needed to be addressed, each of them had to be aligned with the recommendations and findings of the Energy Digitalisation Taskforce, which was published in January. They also drew from the practical experience gained through the National Digital Twin programme and its CReDo demonstrator, and other industry-wide projects such as Open Banking and Open Energy.

The development of this framework has been no mean feat. The team, including non-profit organisation Icebreaker One and leading energy system innovation centre Energy Systems Catapult, has a huge amount of experience working in the energy sector – providing knowledge and expertise which has been crucial.

This is a digital-first system both to aid the UK’s decarbonisation transition and to adapt with the times. It is National Grid ESO’s aim to create harmonisation, using this common framework to bring alignment and collaboration and thereby create a more efficient, streamlined system. For decarbonisation, for the growth of technologies, and for data and knowledge sharing – the Virtual Energy System’s purpose is to help the UK build an energy network for the future.

Jonathan Barcroft is Common Framework Workstream Lead at National Grid ESO. Simon Evans is Global Digital Energy Leader at Arup.



Junior Isles

A not so magical Easter

Easter may have come and gone but some of those Easter eggs and bunnies will remain unwrapped for some time yet. If anyone was expecting Germany's "Easter Package" for energy to sweeten the bitter effects of Russia's war on Ukraine, they will no doubt be feeling no more encouraged than prior to its announcement. But in truth, it is hard to fathom what more could have been done.

Like the UK's Energy Security Strategy, which was unveiled at around the same time last month, the centrepiece of the Easter Package is legislation aimed at doubling-down

on renewables in reaction to the energy crisis.

By amending the Renewable Energy Sources Act (EEG), the German Federal Government now plans to generate almost all power from renewable energy sources by 2035. Under the 500-page package announced by Germany's Economy and Energy Minister Robert Habeck, the share of renewable energy sources in gross electricity consumption is to increase to at least 80 per cent by 2030, up from the previous target of more than 42 per cent. It is one of the most comprehensive amendments to the EEG since its inception in 2000.

In addition, the government is to provide relief for electricity consumers. As of July 1, 2022, electricity consumers will no longer have to pay the Renewable Energy Sources Act levy ("green power surcharge") as part of their electricity bill. Power suppliers will pass on the resulting price relief to end-consumers in full.

Overall it is an ambitious plan – one that came as the EU prepared to ban imports of Russian coal – but Russia soon responded in what has now become an energy war between Putin and EU countries.

In late April Germany said it was hoping to stop importing Russian oil "within days". And in what could be seen as a warning shot to Germany and others, Russia halted gas supplies to Bulgaria and Poland for rejecting its demand for payment in roubles. The firm said services will not be restored until payments are made in the Russian currency.

Gazprom, the Russian gas export monopoly, said in a statement it had "completely suspended gas supplies to Bulgargaz and PGNiG due to absence of payments in roubles", referring to the Polish and Bulgarian gas companies.

Vyacheslav Volodin, the speaker of Russia's lower house of parliament, the Duma, said Gazprom had made the right decision in suspending gas supplies to Bulgaria and Poland and said Moscow should do the same with other "unfriendly" countries.

It is the toughest retaliation so far against international sanctions over the war on Ukraine; and although hardly unexpected, has no doubt struck fear and outrage in equal measures across EU member states.

While Europe may be able to eliminate oil and coal imports from Russia fairly quickly, weaning itself off cheap and abundant Russian natural gas, which heats its houses, fuels its factories and drives its electric power plants, is a much harder task.

With the decision on Poland and Bulgaria, Russia seems to be first taking aim at its former Soviet-era satellites – essentially, those easier to bully. But the real question is how long will it be before its tactics extend to one of the big EU powerhouses like Germany? It may not happen, as Putin has much to lose. But so does the EU, which is deeply concerned.

European Commission President Ursula von der Leyen branded Gazprom's move as "blackmail" saying it is "unjustified and unacceptable". With economic sanctions beginning to bite, Gazprom and Putin would probably beg to differ.

In preparation for what might be on the cards, in March the European Commission proposed its outline of a plan to make Europe independent from Russian fossil fuels well before 2030, starting with gas. Its REPowerEU strategy will seek to diversify gas supplies, speed up the roll-out of renewable gases and replace gas in heating and power generation. This, it believes, can reduce EU demand for Russian gas by two thirds before the end of the year.

Germany's Easter Package aligns with this strategy. The government has put wind front and centre of its new renewable goals. It is changing offshore wind legislation to reach the new targets of 30 GW of operational offshore wind by 2030, 40 GW by 2035, and at least 70 GW by 2045.

Offshore wind will be prioritised in

maritime spatial planning, permitting procedures shortened and additional staff hired in the permitting authorities.

On top of that the package plans to auction sites that are not pre-developed. In the future, the expansion of offshore wind in Germany would be based on two equally important pillars: auctions of sites that have already been pre-surveyed by state authorities on the one hand and auctions of sites that have not yet been pre-developed on the other hand. Centrally pre-developed areas would be auctioned based on price, awarding 20-year Contracts for Difference (CfDs) to successful bidders. Not centrally pre-developed areas would be auctioned according to a catalogue of criteria, which would also include qualitative criteria.

The German government is also looking into options of auctioning wind energy in combination with renewable hydrogen production.

Central to the Easter Package is the definition of renewable energies as an "overriding matter of public interest and public security". This will speed up the permitting of new renewables projects and reduce delays caused by legal appeals. Importantly, grid planning will be aligned with the accelerated expansion of renewables – 36 new grid expansion and optimisation projects have been added.

It is a laudable package but will not be easy to achieve. Commenting on the challenges during a recent press visit to update journalists on progress at its DolWin kappa offshore converter platform, which is part of the DolWin6 grid connection, Tim Meyerjürgens, Chief Operating Officer at Tennet, the Dutch-German transmission system Operator (TSO) said: "We see very ambitious targets, especially when looking to 2030. As these projects take 6-7 years they have to be existing projects or we will not be able to complete them. But it is positive that the government is so ambitious because it now gives us the opportunity to speed up and build-out capacities to be able to deliver, especially after 2030."

"But we have to speed up licensing procedures, and not just offshore. It's also the connections with the onshore grid and transporting the energy from the north to the load centres in the south. And if you look at the offshore grid, you still see licensing procedures lasting on average, 10 years... the Easter package offers some good first steps but they are just first steps. Licensing [times] should be in the range of what we need for [project] realisation, For AC lines, that time is about two years. For the large DC corridors, we have a construction time of about four years, so four years of licensing should be feasible and sufficient. Currently we see a lot of announcements from politicians but not real decisions to accelerate it."

Having ruled out the possibility of reversing its decision to close its nuclear plant, Germany is truly staring down the barrel. It is difficult to see what options it has if Russia decides to take aim. But with such a move, Russia would also be committing slow suicide. The trick is to see who blinks first.

Germany's proposal of an Easter bunny to be enjoyed in just over a decade from now is welcome. Unfortunately, it is not enough. Nothing short of pulling a rabbit out of a hat will avert the impending emergency.

