THE ENERGY INDUSTRY TIMES

July 2021 • Volume 14 • No 5 • Published monthly • ISSN 1757-7365 www.teitimes.com

Special Supplement

Following its spin-off, Siemens Energy is transferring its cyber security processes to the new organisation. *TEI Times* discusses the process and the growing cyber threat to the energy sector. *Page 10*

Land of the rising sun

In the second of our 'Climate Countdown' series focused on Asia, Joseph Jacobelli explores the challenges facing Japan's decarbonisation effort. *Page 14*

Final Word

Junior Isles follows The Pilgrim's Progress towards the G7 Summit. *Page 16*

News In Brief

Energy investments set to recover but still far from net zero pathway
Global investment in energy is set to rebound by nearly 10 per cent in 2021 but spending on clean energy needs to accelerate to meet climate goals. *Page 2*

First federal offshore wind project sparks boom in potential projects
Following approval of the first large offshore wind project in federal waters, the US has stepped up plans for offshore wind projects to meet plans to install 30 GW by 2030

Page 4

Indonesia raises new and renewables target
Indonesia's energy and mineral resources ministry has raised the country's target to generate electricity from new and renewable energy from 30 per cent to 48 per cent, which includes co-firing coal with biomass. *Page 5*

UK set to see fusion demonstration plant by 2025
General Fusion, a Canadian firm backed by Amazon founder Jeff Bezos, will build a demonstration nuclear fusion power plant at Culham in the UK, it has been announced. *Page 6*

OEMs move to boost electrolyser credentials
Interest in supplying electrolysers is gaining interest, with original equipment manufacturers (OEMs) moving to improve their position in the hydrogen market. *Page 8*

Fuel Watch: Hydrogen
An EBH study reports a large potential for European green hydrogen production. *Page 12*

Technology Focus: Driving the green electron revolution
Grid enhancing technologies are key to the success of the energy transition. Smart Wires has developed a Modular Power Flow Control technology that allows power to flow where there is spare capacity, thus maximising the use of the grid. *Page 15*

Advertise
advertising@teitimes.com

Subscribe
subscriptions@teitimes.com
or call +44 208 523 2573

Finance tops climate agenda but G7 falling short

With climate finance potentially being a major stumbling block at the upcoming COP26 climate meeting, the G7's failure to agree more ambitious concrete commitments to help developing countries tackle the worst effects of climate change is seen as a missed opportunity. **Junior Isles**

The recent agreement reached by the G7 to "raise" contributions to help developing countries address the climate crisis has been met with fierce criticism.

At a summit held in Cornwall, UK, last month by the Group of Seven wealthy countries, leaders from the United States, Britain, Canada, France, Germany, Italy and Japan reaffirmed their commitment to "jointly mobilise $100 billion per year from public and private sources, through to 2025".

The communiqué said the seven nations would "commit to each increase" and improve "overall international public climate finance contributions for this period". It also said the G7 would "call on other developed countries to join and enhance their contributions to this effort".

Green campaigners, however, were unimpressed noting that the communiqué issued at the end of the summit lacked detail and the developed nations should be more ambitious in their financial commitments.

Catherine Pettengell, Director at Climate Action Network, said the G7 had failed to rise to the challenge of agreeing on concrete commitments on climate finance. "We had hoped that the leaders of the world's richest nations would come away from this week having put their money where their mouth is," she said.

The G7 agreement essentially just reiterates an existing pledge. Developed countries agreed at the United Nations in 2009 to achieve a combined contribution of $100 billion each year by 2020 in climate finance to poorer countries, many of which are faced with rising seas, storms and droughts made worse by climate change. That pledge was re-affirmed in Paris in 2015, where rich nations promised to extend the $100 billion a year financing by five years through to 2025.

The target, however, has not been met, partly due to the coronavirus pandemic. According to OECD figures climate finance provided and mobilised by developed countries for climate action in developing countries reached $78.9 billion in 2018 (the most recent year covered by the data).

After the summit concluded, Canada said it would double its climate finance pledge to C$5.3 billion ($4.4 billion) over the next five years, while Germany will increase its pledge by €2 billion, to €6 billion ($7.26 billion) a year by 2025 at the latest.

Professor Kevin Haines, Director of Sustainable Capital PLC, a UK-based issuer which offers green and sustainable bonds, said: "If we are to succeed

Continued on Page 2

Time to invest in emerging economies, says IEA

The world's energy and climate future increasingly hinges on whether emerging and developing economies are able to transition to cleaner energy systems, calling for a step-change in global efforts to mobilise and channel the huge surge in investment that is required, says a new report by the International Energy Agency (IEA).

Annual clean energy investment in emerging and developing economies needs to increase by more than seven times – from less than $150 billion last year to over $1 trillion by 2030 to put the world on track to reach net-zero emissions by 2050, according to the report, 'Financing Clean Energy Transitions in Emerging and Developing Economies'. Unless much stronger action is taken, energy-related carbon dioxide emissions from these economies – which are mostly in Asia, Africa and Latin America – are set to grow by 5 billion tonnes over the next two decades.

"In many emerging and developing economies, emissions are heading upwards while clean energy investments are faltering, creating a dangerous fault line in global efforts to reach climate and sustainable energy goals," said Dr Fatih Birol, the IEA Executive Director. "Countries are not starting on this journey from the same place – many do not have access to the funds they need to rapidly transition to a healthier and more prosperous energy future.

"There is no shortage of money worldwide, but it is not finding its way to the countries, sectors and projects where it is most needed. Governments need to give international public finance institutions a strong strategic mandate to finance clean energy transitions in the developing world."

Recent trends in clean energy spending point to a widening gap between advanced economies and the developing world even though emissions reductions are far more cost-effective in the latter. Emerging and developing economies currently account for two-thirds of the world's population, but only one-fifth of global investment in clean energy, and one-tenth of global financial wealth. Annual investments across all parts of the energy sector in emerging and developing markets have fallen by around 20 per cent since 2016, and they face debt and equity costs that are up to seven times higher than in the United States or Europe.

Avoiding one tonne of CO_2 emissions in emerging and developing economies costs about half as much on average as in advanced economies, according to the report. That is partly because developing economies can often jump straight to cleaner and more efficient technologies without having to phase-out or refit polluting energy projects that are already underway.

"A major catalyst is needed to make the 2020s the decade of transformative clean energy investment," said Dr Birol. "The international system lacks a clear and unified focus on financing emissions reductions and clean energy – particularly in emerging and developing economies. Today's strategies, capabilities and funding levels are well short of where they need to be."

The special report, which was carried out in collaboration with the World Bank and the World Economic Forum, sets out a series of priority actions to enable emerging and developing countries to overcome the major hurdles they face in attracting the financing that is needed to build the clean, modern and resilient energy systems that can power their growing economies for decades to come.

These priority actions – for governments, financial institutions, investors and companies – cover the period between now and 2030, drawing on detailed analysis of successful projects and initiatives across clean power, efficiency and electrification, as well as transitions for fuels and emissions-intensive sectors. These include almost 50 real-world case studies spanning across different sectors in countries ranging from Brazil to Indonesia, and from Senegal to Bangladesh.

THE ENERGY INDUSTRY TIMES is published by Man in Black Media • www.mibmedia.com • Editor-in-Chief: Junior Isles • For all enquiries email: enquiries@teitimes.com

Continued from Page 1

in keeping temperatures below the agreed target of 1.5°C above pre-industrial levels, we must massively accelerate investment in clean and renewable energy projects, particularly in developing countries."

Leaders from developing countries also voiced concern over the outcome of the G7 summit. Malik Amin Aslam, Climate Minister of Pakistan, said: "The G7 announcement on climate finance is really peanuts in the face of an existential catastrophe. It really comes as a huge disappointment for impacted and vulnerable countries like Pakistan – already compelled to ramp up their climate expenditures to cope with forced adaptation needs."

He also warned of the impact on the COP26 talks scheduled for November. "At the least, countries responsible for this inescapable crisis need to live up to their stated commitments, otherwise the upcoming climate negotiations could well become an exercise in futility," he said.

While some said it was encouraging that leaders were recognising the importance of climate change, they argued it was not enough. Pettengell said that their "words had to be backed up by specific action" on cutting subsidies for fossil fuel development and ending investment in projects such as new oil and gas fields, as well as on climate finance.

Aslam called the G7 climate finance "peanuts"

At the summit, European Commission President Ursula von der Leyen said the G7 leaders had agreed to phase-out coal. The G7 said it will end the funding of new coal generation in developing countries and offer up to £2 billion ($2.8 billion) to stop using the fuel. But despite committing to an end to financing coal overseas, and phasing out fossil fuel subsidies by 2025, the group stopped short of calling a halt to the exploitation of new fossil fuel resources.

"We have committed to rapidly scale-up technologies and policies that further accelerate the transition away from unabated coal capacity, consistent with our 2030 NDCs [Nationally Determined Contributions] and net zero commitment," stated the communiqué.

Laurie van der Burg, senior campaigner at the pressure group Oil Change International, said: "The G7 has failed to commit to what leading economists, energy analysts, and global civil society have shown is required: an end to public finance for all fossil fuels. Our climate cannot afford further delay, and the failure of the G7 to heed these demands means more people impacted by the ravages of our climate chaos."

Energy investments set to recover but still far from net zero pathway

- Energy investment to hit $1.9 trillion
- Power sector spending set to grow 5 per cent

Junior Isles

Global investment in energy is set to rebound by nearly 10 per cent in 2021 to $1.9 trillion, reversing most of last year's drop caused by the Covid-19 pandemic, but spending on clean energy transitions needs to accelerate much more rapidly to meet climate goals, according to a recent report from the International Energy Agency (IEA).

With energy investment returning to pre-crisis levels, its composition is continuing to shift towards electricity: 2021 is on course to be the sixth year in a row that investment in the power sector exceeds that in traditional oil and gas supply, according to the 'World Energy Investment 2021' report.

Global power sector investment is set to increase by around 5 per cent in 2021 to more than $820 billion, its highest ever level, after staying flat in 2020. Renewables are dominating investment in new power generation capacity and are expected to account for 70 per cent of the total this year. And that money now goes further than ever in financing clean electricity, with a dollar spent on solar PV deployment today resulting in four times more electricity than ten years ago, thanks to greatly improved technology and falling costs.

"The rebound in energy investment is a welcome sign, and I'm encouraged to see more of it flowing towards renewables," said Fatih Birol, the IEA's Executive Director. "But much greater resources have to be mobilised and directed to clean energy technologies to put the world on track to reach net-zero emissions by 2050. Based on our new Net Zero Roadmap, clean energy investment will need to triple by 2030."

While renewables dominate new power investment, and approvals for coal fired plants are some 80 per cent below where they were five years ago, coal is not out of the picture. There was even a slight increase in go-aheads for coal fired plants in 2020, driven by China and some other Asian economies.

There are signs in the latest data that spending by some global oil and gas companies is starting to diversify. IEA analysis last year highlighted that only around 1 per cent of capital spending by the industry was going to clean energy investments. But project tracking to date in 2021 suggests that this could rise to 4 per cent this year for the industry as a whole, and well above 10 per cent for some of the leading European companies.

The anticipated $750 billion to be spent on clean energy technologies and efficiency in 2021 is encouraging but remains far below what the IEA says is required to put the energy system on a sustainable path. Clean energy investment would need to triple in the 2020s to put the world on track to reach net zero emissions by 2050, thereby keeping the door open for a 1.5 °C stabilisation of the rise in global temperatures, said the Paris-based agency.

Just ahead of the G7 Summit last month, 57 investors managing more than $41 trillion in assets released a joint statement to all world governments urging a global race-to-the-top on climate policy and warning that laggards will miss out on trillions of dollars in investment if they aim too low and move too slow.

This represents the largest collective assets under management to sign a global investor statement to governments on climate change since the first statement in 2009.

Floating wind and hydrogen could decarbonise North Sea oil and gas

Green infrastructure developer Cerulean Winds has revealed an ambitious plan to accelerate decarbonisation of oil and gas assets through an integrated floating wind turbine and hydrogen development that would shift the dial on emissions targets and create significant jobs.

The £10 billion proposed green infrastructure plan would have the capacity to abate 20 million tonnes of CO_2 through simultaneous North Sea projects West of Shetland and in the Central North Sea.

The venture is now calling on UK and Scottish governments to make an "exceptional" case to deliver an "extraordinary" outcome for the economy and the environment. A formal request for seabed leases has been submitted to Marine Scotland.

The proposed development involves over 200 of the largest floating turbines at sites West of Shetland and in the Central North Sea with 3 GW, feeding power to the offshore facilities and an excess of up to 1.5 GW to onshore green hydrogen plants.

Cerulean says the project will need no subsidies or contract for difference (CfD) and will provide green power to offshore platforms at a price below current gas turbine generation.

The company says it has carried out the necessary infrastructure planning for the required level of project readiness and aims to achieve financial close in the first quarter of 2022. Construction would start shortly afterwards and operation could begin in 2024.

Such projects could be crucial to the oil and gas sector. Speaking ahead of a debate in Holyrood, Scotland, in June OGUK, the leading representative body for the UK's offshore oil and gas industry, said that there is a clear plan for the future of oil and gas.

Commenting on the the North Sea Transition Deal, announced in March, OGUK said it recognises the climate crisis as a priority and "provides a clear plan for the industry" as it works to transform the UK's energy system. It said the deal sets out key milestones for the oil and gas industry to cut its emissions by 10 per cent by 2025, 25 per cent by 2027 before 50 per cent by 2030 while producing the "healthy, domestic oil and gas the UK will need with ever reducing emissions".

OGUK External Relations Director Jenny Stanning said: "The North Sea Transition Deal was recognised by many parties during the election campaign and provides a clear plan for the transformation of our energy, resources, people and skills."

Study suggests tax on fossil carbon more effective than CO_2 tax

A tax on fossil carbon is more effective for a carbon border adjustment mechanism (CBAM) than a tax on CO_2 emissions, say experts from Germany's nova-Institute GmbH.

According to a recent paper from the institute, a tax on fossil carbon is "an effective and elegant tool" to achieve the goals of the CBAM, noting that it is in line with the ambitious climate goals of the EU and supports both the decarbonisation of the energy sector as well as the transformation of the chemicals and derived materials sector from fossil to renewable carbon.

With the introduction of the European Green Deal in 2019, the European Union committed to achieving climate neutrality by 2050. As a step towards this goal, the first European Climate Law – agreed in April 2021 – strengthened the emission reduction targets. In 2030, emissions are to be at least 55 per cent lower than in 1990.

There has been growing support for a CBAM to create a level playing field for competitors producing goods in countries that have set their sights lower than the European Union and importing into the internal European market. In other words, goods produced outside the EU would have to bear the same costs for carbon emissions as those produced in Europe.

The most frequently suggested option is to tax imported goods according to the greenhouse gases emitted during their production, most often referred to as a CO_2 tax.

In the new nova-Paper #15, experts argue that a tax on fossil carbon at the feedstock level (called a "fossil carbon tax") provides several advantages over a CO_2 tax as an end-of-pipe measure. Carbon enters the economic cycle through the use of coal, oil and natural gas and is usually emitted as CO_2 (after incineration) but can also be released into the atmosphere in other forms, e.g. CH_4 (methane).

"With levying a price on fossil carbon, the cause of global warming could be priced elegantly, fairly, and universally," said the paper.

The idea follows discussions on the topic at the G7 Summit hosted in June by British Prime Minister Boris Johnson. At the meeting the G7 pledged to work together to tackle so-called carbon leakage – the risk that tough climate policies could cause companies to relocate to regions where they can continue to pollute cheaply.

In May, Johnson came under pressure from senior members of his Conservative party to introduce a UK carbon border tax to protect British industry from cheap competition from polluting countries.

Chancellor Rishi Sunak has ordered work to be done on the tax, which Treasury insiders said would address "real issues". They told the *FT* that Sunak was interested in the proposal, but admitted that there were serious technical hurdles to be overcome.

CIRED ONLINE
20-23 SEPTEMBER 2021

The 26th International Conference and Exhibition on

Electricity Distribution

Enjoy our Early Bird rate and save up to €40 by registering before 19 July 2021

Join the electricity distribution community for three days of technical presentations and discussions covering the very latest challenges facing the industry today and in the future.

20–23 September 2021 | Online

cired2021.org

REGISTER YOUR PLACE TODAY!

IET = The Institution of Engineering and Technology. IET Services Limited is registered in England. Registered Office: The Institution of Engineering and Technology, Savoy Place, London WC2R 0BL, United Kingdom. Registration Number 909719. IET Services Limited is trading as a subsidiary of The Institution of Engineering and Technology, which is registered as a Charity in England and Wales (No. 211014) and Scotland (No. SC03869).

THE ENERGY INDUSTRY TIMES
www.teitimes.com

subscribe today

To guarantee receiving your monthly copy of the award winning newspaper, you need to subscribe today

The Energy Industry Times is the only publication that covers global news related to the power and energy sector in a newspaper style and format whose uniqueness is recognised by our readers.

As a paid subsciber you will gain full access to our online news desk.

You will also no longer have to wait for the printed edition; receive it by PDF "hot off the press" or download it online.

To subscribe, email subscriptions@teitimes.com or visit

www.teitimes.com

TANZANIA RENEWABLE ENERGY

3 AUGUST 2021 // DAR ES SALAAM // ONLINE OPTION

Bringing together the various role players and stakeholders in the Renewable Energy industry in Tanzania to discuss and brainstorm the latest developments, strategies, legislation, challenges and opportunities facing this expanding industry.

AGENDA AT A GLANCE:

- Industry overview
- Unbundling the electricity act
- Access to funding and project finance
- Government grants and subsidies
- Licence distribution, tariffs and distributor registration
- Mitigating and managing operational and technical risks
- Technology advances in the industry
- Project showcase session

AFRICAN INFLUENCE exchange

enquiry@africaninfex.com | +27 (0) 81 777 0028

www.africaninfex.com

First federal offshore wind project sparks boom in potential projects around US shores

- Expressions of interest sought in Gulf of Mexico
- Initial development areas identified off California coast

Janet Wood

Following approval of the first large offshore wind project in federal waters, the US has stepped up plans for offshore wind projects to meet the Biden-Harris administration plan to install 30 GW of offshore wind energy by 2030.

The Department of the Interior recently announced the first competitive offshore wind lease sale for the administration, which will offer areas in the New York Bight – an area of shallow waters between Long Island and the New Jersey coast. The proposal, currently open for a 60-day public comment period, covers eight lease areas that have the potential to house more than 7 GW of capacity.

Secretary of the Interior Deb Haaland said of the plan: "Today's announcement of new proposed lease stipulations puts a priority on creating and sustaining good-paying union jobs as we build a clean energy economy."

The administration has also begun a review process for two new projects: Revolution Wind offshore of Rhode Island and Ocean Wind off the shore of New Jersey.

To date, the Bureau of Ocean Energy Management (BOEM) has held eight competitive lease sales and issued 17 active commercial offshore wind leases on the Atlantic from Massachusetts to North Carolina.

"The New York Bight is a prime example of how regional cooperation, partnerships, and stakeholder feedback can come together to identify areas suitable for offshore wind development," said BOEM Director Amanda Lefton.

North Carolina currently has one 2.5 GW offshore wind project, Avangrid Renewables' Kitty Hawk scheme. Now a new executive order issued by governor Roy Cooper calls for a further 2.8 GW by 2030 and 8 GW by 2040.

"From building out the supply chain, to installing equipment, to operating the wind facilities, North Carolina's manufacturers and workforce are well positioned to play an integral role in the entire East Coast market, not just for projects directly off the state's coast," said North Carolina Commerce Secretary Machelle Baker Sanders.

The Biden-Harris administration is now seeking to gauge the interest in offshore wind in shallow waters in the Gulf of Mexico and has recently published a 'request for interest' for areas off Louisiana, Texas, Mississippi and Alabama. Interior Secretary Deb Haaland said the request, "is an important first step to see what role the Gulf may play in this exciting frontier".

Erik Milito, President of the National Ocean Industries Association, said: "The Gulf of Mexico is extremely well positioned to play an integral role in the exploration of new offshore technologies and energy opportunities."

On the California coast the Interior and Defense Departments have identified a 400 square-mile area off California's central coast that can support up to 3 GW of wind generating capacity, the White House said. The administration is also looking to spur development in a region in Northern California called the Humboldt Call Area.

"These initial areas for offshore wind development in the Pacific Ocean could bring up to 4.6 GW of clean energy to the grid, enough to power 1.6 million American homes," the White House said.

Chile's first liquid air storage planned for 2023

Chile is set to host its first 'liquid air' long duration energy storage project. The 50 MW/500 MWh so-called 'Cryobattery' will be supplied and built by technology supplier Highview Enlasa in a 50/50 joint venture with Energía Latina S.A.-Enlasa, the Chilean backup power generation provider. So far in its 12-year history Energía Latina S.A. - Enlasa has been focused on providing backup power to the system using fast response power units.

The new $150 million project will be sited in Diego de Almagro in the Atacama. The partners say that it can be paired with solar power generated in the region, which has one of the highest solar irradiations in the world.

The project is currently in the prefeasibility engineering phase and construction is expected to start in the second half of 2023.

"This is a big step forward to enabling decarbonisation goals for the country of Chile," said Javier Cavada, Chief Executive and President of Highview Power. He added: "Our liquid air energy storage technology is the optimal solution for the large scale, long duration energy storage that is needed to balance the grid, without the geographic constraints associated with other energy storage technologies."

The cryogenic energy storage plants offer voltage control, grid balancing and synchronous inertia and have a lifespan of over 30 years.

Brazil's wind power appetite still growing despite record-breaking installation

Enel group has now started commercial operations at Brazil's 716 MW Lagoa dos Ventos wind farm, the largest in operation in South America and Enel Green Power's largest project worldwide.

Salvatore Bernabei, Chief Executive of Enel Green Power described it as "an unprecedented wind project" and "an important milestone" for the company.

New figures from national wind energy association Abeeolica have revealed that Brazil's installed wind power capacity has reached 19.1 GW. The country now has 726 operational wind farms with 8585 wind turbines and is Brazil's second largest power source, accounting for 10.8 per cent of the whole electricity mix. According to the association, the country will have about 30.2 GW of installed wind power capacity by 2024.

Brazil has begun looking for new sites, and recently the Ministry of Science, Technology and Innovation (MCTI) announced plans to assess the wind power potential of the coast between the states of Amapa and Rio Grande do Norte. The initiative, a result of a parliamentary amendment, will look into the feasibility of deploying wind in the region, with the aim of providing technical data for private sector developers to take forward projects.

Texas processes new legislation following cold weather blackouts

- Gas infrastructure upgrades could hit small facilities
- Lawmakers debate where costs should fall

Janet Wood

Texas lawmakers acting in response to state-wide blackouts during an extreme cold weather event in February have called for infrastructure upgrades to prepare for extreme weather, better oversight of the state's electricity supply industry and a state-wide emergency alert system in the event of future power outages.

The state's lower assembly has approved a wide-ranging bill which will now be reconsidered by the state's Senate. Among its provisions, the bill would require so-called 'weatherisation' at specific gas supply chain facilities identified as critical natural gas infrastructure necessary to maintain the electricity service.

Gas fired plants provided 46 per cent of the state's power in 2020, but during the February event gas fired power represented two-thirds of the generation deficit. That included 8 GW of gas plants that shut down on 15 February, as the state approached its coldest day, either because of gas shortages or because they had frozen equipment.

Texas is a large natural gas producer and half of its production is used to fuel gas fired power plants within the state, but during the crisis, 40 per cent of Texan gas production capacity was out of action. Electrical compressors in the gas network failed in the low temperatures, and wells or 'gathering lines' had frozen. The more modern production facilities were more highly electrified and therefore more at risk during blackouts.

Some gas producers had interruptible power contracts and had not registered as being critical infrastructure. With those production facilities shut off, gas pipeline pressures were driven down, putting more power plants at risk.

Regarding the new legislation some advocates said that it does not go far enough, particularly in requiring weatherisation of the natural gas supply chain to ensure gas fired electricity plants will be reliably supplied. But others argue that it goes too far and the cost of upgrades could make thousands of small gas production facilities uneconomic.

The bill tasks the Texas Railroad Commission, the state oil and gas regulatory agency, with deciding on upgrades and setting daily fines if plant fails to comply. But it does not say whether costs would be paid by taxpayers, energy companies or some combination of the two.

US sees renewables rise as nuclear and fossil use falls

Renewable energy was the only source of energy that increased year-on-year between 2019 and 2020 in the USA, according to new figures from the US Energy Information Administration (EIA).

The federal organisation included different types of energy in its comparison by converting all the totals to heat equivalents (in Btu). It found that in 2020, consumption of renewable energy in the nation grew for the fifth year in a row, reaching some 12 per cent of total US energy consumption. Fossil fuel and nuclear consumption declined.

Of the total renewable energy sources, wind energy accounted for about 26 per cent of consumption in 2020, up 14 per cent from 2019. It had already (in 2019) passed hydroelectricity to become the biggest source of renewable energy on an annual basis. Hydroelectricity accounted for about 22 per cent of US renewable energy consumption in 2020, while wood and waste energy, accounted for around 22 per cent.

Solar energy accounted for about 11 per cent of US renewable energy consumption in 2020, and overall, US solar consumption increased 22 per cent between 2019 and 2020.

Indonesia raises 'new and renewables' target

- Share of new and renewable sources to hit 48 per cent by 2030
- Coal's share in energy mix to fall but overall consumption grows

Syed Ali

Indonesia's Ministry of Energy and Mineral Reources has raised the country's target to generate electricity from new and renewable energy (EBT) from 30 per cent to 48 per cent, which includes co-firing coal with biomass.

In June state-owned utility PLN's draft electricity generation plan for 2021-30 outlined the increase of EBT generation to 48 per cent or 19 899 MW compared with a previous target for 2019-28 of 30 per cent.

It also stated that the country plans to add 41 GW of power generation capacity over the next 10 years. Meeting this target will take Indonesia's total capacity to 104 GW in 2031.

Various options to achieve this target are being discussed, Director-General of Electricity Rida Mulyana said. This includes the conversion of diesel fired power plants to EBT plants, co-firing coal with biomass at power plants, retirement of ageing power plants and relocation of others.

Some Indonesia-based suppliers saw higher domestic demand for palm kernel shell (PKS) biomass rise as some coal-fired power plants finished testing co-firing with biomass last year. They also pointed out the price to sell PKS domestically could be higher because of the country's current record-high export tax and levy.

The country will also stop approving new coal fired power plants. Indonesia's energy ministry (ESDM) said it would allow the completion of plants that are under construction and those that have achieved financial closure. PLN will start retiring sub-critical coal plants over the next two decades with a goal of carbon neutrality by 2060.

Indonesia's finance ministry proposed the possibility of creating a carbon tax regulation with broader plans to modernise the country's tax system. This has the potential to directly affect domestic coal consumption, as the tax will target coal-consuming industries from pulp and paper manufacturers to cement producers and power generation. Coal fired power plants alone account for 70 per cent of greenhouse gas emissions from Indonesia's power sector.

Under the government's current draft plan, coal consumption for power generation is expected to reach 205.3 million t and account for 30 per cent of the country's total fuel mix by 2025, the ESDM said. This share is projected to fall to 25.3 per cent in 2050, although the actual volume of coal consumed for power generation is expected to increase to 438.8 million t by 2050. This is due to an expected increase in future demand from higher electrification and economic growth.

The share of coal fired power in the energy mix increased to 38 per cent in 2020 from 37.1 per cent a year earlier, despite the country aiming for a steep reduction by 2025. The share of gas fired power generation in the mix is forecast at 22 per cent in 2025, up from about 19 per cent in 2020.

Return of wind boosts India's renewables targets

A new report, 'India Wind Energy Market Outlook 2025', jointly released today by the Global Wind Energy Council (GWEC) and MEC Intelligence (MEC+) finds that India, the world's fourth-largest wind power market, is expected to add nearly 20.2 GW of new wind power capacity between 2021-2025. This would increase the country's 39.2 GW wind market by nearly 50 per cent and is a clear signal that the market is beginning to bounce back after a slow-down in recent years.

Although 2020 was originally forecasted to be a break-out year for wind power in India with a large pipeline and multiple policy interventions to ease bottlenecks, the impact of the Covid-19 pandemic was much more severe than anticipated. Forecasts expected the country to install 3.3 GW of wind power in 2020, but ultimately only 1.1 GW was installed, with the remaining capacity either being pushed into 2021 or dropped by developers.

However, the report finds that the pace of new installations is likely to double over the next two to three years compared to the average annual installations since 2017 when the market began to slow down.

This is encouraging news for the government, which set a renewables target of 175 GW by 2022 and 450 GW by 2030. With 2022 fast approaching, and still 80 GW short, it is looking increasingly unlikely that the government will reach its 175 GW target.

Vinay Rustagi, who is the Managing Director of Bridge to India (BTI), a renewable power consultancy, said: "According to our estimates, before Covid-19, India was expected to achieve a total installed capacity of about 122 GW by the end of 2022 including biomass and small hydro. But the picture has changed after Covid-19 and we estimate India to achieve only about 110 GW by the end of the next year."

He told *Mongabay-India*: "We simply don't have the execution capacity required to scale up annual capacity addition to 25-30 GW. There are a lot of factors involved – land, transmission, grid robustness etc. Moreover, where is the demand for such an amount of power?"

The government of India is, however, confident of achieving its target or at least reaching close to the target by the end of 2022.

While wind is an important part of new renewable capacity additions, solar has been earmarked to play the biggest role – 100 GW out of the 175 GW, with 60 GW to come from wind.

Solar installations have been continuing at pace, with Mercom India Research reporting that solar installations were up 88 per cent in Q1 2021. India added 2056 MW of solar in the first quarter (Q1) of 2021, a 37 per cent increase quarter-over-quarter (QoQ), compared to 1505 MW installed in the fourth quarter of 2020.

Japan's looks to cut reliance on nuclear

Following objections from two Cabinet ministers, Japan's future reliance on nuclear power has been lessened in a draft of its economic strategy set to be finalised in July, according to *Xinhua News Agency*.

Citing local media sources, it said that following protests from Japanese Environment Minister Shinjiro Koizumi and Administrative Reform Minister Taro Kono, both of whom are advocates of renewable energy being used for Japan to achieve carbon neutrality, some pertinent phrases from the draft have been cut.

Government sources reportedly told local media, the phrase the Japanese government "will continue to seek to make the most of nuclear power" has been removed from the draft, which now reads: "While reducing reliance on nuclear power as much as possible, the government will seek to steadily proceed with the restarting of reactors in the country while placing utmost priority on safety."

The country's use of nuclear power has also been changed in the draft from the Ministry of Economy, Trade and Industry-supported description of it being "an established decarbonisation technology" to "an option in practical use for decarbonisation".

The industry ministry's original phrase was referenced in the government's "green growth strategy" compiled last December following Japanese Prime Minister Yoshihide Suga's pledge last October to cut carbon emissions to net zero by 2050.

■ Japan's Ministry of Economy, Trade and Industry (METI) and the Ministry of Land, Infrastructure, Transport and Tourism (MLIT) selected a consortium of six companies led by Toda Corporation to build the country's first commercial floating offshore wind farm. The consortium was the only bidder in the auction. The 16.8 MW project will be built offshore Goto City, Nagasaki Prefecture.

Pakistan needs more than 57 GW by 2030

Pakistan will have to increase its generating capacity 57.2 GW by 2030 according to the Indicative Generation Capacity Expansion Plan (IGCEP) 2020, prepared by the National Transmission and Dispatch Company. This signifies a 35-40 per cent increase from the current demand of approximately 34.5 GW, or an annualised compound growth rate (ACGR) of 3.3-4.6 per cent.

According to IGCEP, this will require the country to invest about $32 billion by 2030 to develop new power projects.

Power project finance received a boost last month with the approval of SAR901 million ($240 million) loan from Saudi Arabia for construction of the Mohmand Hydropower Project.

In a meeting with Federal Minister for Economic Affairs Omar Ayub Khan in Islamabad, Nawaf bin Saeed Al-Malkiy, the Ambassador of Saudi Arabia in Pakistan, said the loan will be given at a very concessional rate of 2 per cent for a period of 25 years.

"This dam will be constructed on Swat River in District Mohmand of Khyber-Pakhtunkhwa province and generate 800 MW of electricity," an official statement issued after the meeting said.

In a separate development, the Asian Development Bank (ADB) and the Pakistani government recently signed a $300 million loan for the 300 MW Balakot Hydropower Development Project.

The $755 million project will be built on the Kunhar River in District Mansehra in Khyber Pakhtunkhwa province. The project, which will also receive $280 million from the Asian Infrastructure Investment Bank, is likely to be commissioned by 2027.

Offshore wind and electrification are the keys to affordable net zero

- Wind organisations expect turbine costs to fall further
- Poland, Finland, Sweden, Netherlands look offshore for more wind

Janet Wood

Two European wind organisations, ETIPWind (the European Technology and Innovation Platform on Wind) and WindEurope, say in a new report that in future a net-zero energy system can be managed for just 10.6 per cent of GDP – similar to the share of GPD that pays for energy system costs today.

The groups say electrification is the most cost-effective way to decarbonise Europe's economy, and that will be led by wind energy, which is expected to provide half of its electricity by 2050.

Adrian Timbus, ETIPWind chair, said: "Wind energy can help electrify 75 per cent of Europe's energy demand and thereby deliver climate neutrality by 2050. But we must prioritise the development of the necessary technologies: next generation onshore and offshore turbines, electrification solutions for transport and for industry, and electrolysers for renewable hydrogen."

The wind organisations' claims came as offshore wind developers announced significant progress in several countries.

In Poland the Energy Regulatory Office has awarded a contract for difference (CfD) to the 1.2 GW Baltic Power offshore wind project, owned and developed by Poland's PKN Orlen and Northland Power of Canada. The 25-year contract is part of the Polish government's commitment, through the Polish Offshore Wind Act, to support an initial phase of 5.9 GW of offshore wind. "We are extremely proud to be developing a significant offshore wind project in Poland, alongside our partner, PKN Orlen to support the country in its decarbonisation objectives," said Mike Crawley, President and Chief Executive Officer of Northland, which completed the acquisition of a 49 per cent stake in Baltic Power in March. Commercial operation is planned for 2026.

Norway, meanwhile, is planning a two-year assessment with the aim of opening new offshore wind lease areas. Last year it opened two areas for offshore wind – Utsira Nord and Sørlige Nordsjø II – with a combined capacity of 4.5 GW. But Tina Bru, Minister of Petroleum and Energy, said: "Offshore wind is an industrial opportunity for Norway. We need to diversify our industrial base and we need to create new jobs."

In Sweden, approval rates for onshore wind farms, a majority of which are in the north of the country, have been falling. Anders Kaijser, Chief Executive of Swedish power company Kundkraft said that a shift towards more investment in offshore wind power is required to maintain the current expansion pace.

The Netherlands is studying eight new offshore areas for construction of 64.9 GW of new offshore wind projects, with development to start 2030.

Germany's SuedOstLink joins Europe's HVDC connections

- Norway links with Germany and GB to share power
- TenneT hedges bets with distributed flexibility pilot

Janet Wood

German transmission system operators (TSOs) 50Hertz and TenneT are planning to build a 500 km link to transport power energy from the renewables-rich north and deliver it to the south via underground cables rated at 525 kV. The SuedOstLink HVDC link will be able to carry 2 GW in either direction.

Siemens Energy will deliver the necessary AC to DC technology in converters at Wolmirstedt in Saxony-Anhalt and near Landshut in Bavaria.

"An essential component of the energy transition is an efficient grid," said Tim Holt, Member of the Executive Board of Siemens Energy. "If we want to exploit the full potential of renewable energies and thus also of the energy transition, the transmission networks must be expanded accordingly. We are pleased to be able to make an important contribution to the European energy transition with SuedOstLink."

The link is one of a growing number of ambitious links within and between countries that will help manage the increasing proportion of renewable energy on Europe's grids.

The most recent to go into operation was NordLink, the 623 km HVDC 1.4 GW link between Germany and Norway, which was officially inaugurated at a digital event in late May by German Chancellor Angela Merkel and Norway's Prime Minister Erna Solberg. It allows for the exchange of German wind energy with Norwegian hydropower. The project is owned by Norwegian TSO Statnett and DC Nordseekabel GmbH & Co KG, a joint venture of TenneT and German development bank KfW.

The €1.7 billion project took five years to build. Solberg said NordLink "will contribute to a more efficient use of power resources and lay the foundations for further investments in renewable production". It will also help lower emissions, Solberg said.

NordLink will soon take second place to an even longer HVDC link, the 720 km North Sea Link between Norway and the UK, which has recently been undergoing tests and is due to go into commercial operation later this year. The capacity of that link – also intended to allow Norwegian hydro to balance other renewables – is slightly less than NordLink at 1.3 GW. It is owned by Statnett and National Grid Ventures.

But TenneT has not put all its investment into bulk power transfer. It has also joined with GreenCom Networks to test how decentralised energy producers and consumers can be aggregated to manage congestion and variability. It will consider a large variety of flexibility options from battery storage and electric vehicle charging to heat pumps, night storage heaters and various PV systems.

Copenhagen utility joins Ørsted to combine green projects

A co-operation between Ørsted and HOFOR, the utility for Greater Copenhagen, is set to extend to carbon capture as well as offshore wind and hydrogen.

The two companies have already agreed that Ørsted will host the onshore substation for HOFOR's 250 MW Aflandshage offshore wind farm project at Ørsted's Avedøre power station and take the power from the wind farm to produce 'green' hydrogen at the site.

The 100 MW combined heat and power plant at the power station consists of two wood pellet-fired units and a straw-fired unit that supply power to the Danish power grid and district heating to the Greater Copenhagen area. Now it is seen as a source of sustainable carbon dioxide for the next phases of the 1.3 GW Green Fuels for Denmark Power-to-X facility intended to produce e-methanol and e-kerosene. Ørsted will now start investigating the best way forward to deploy carbon capture technology at the unit.

"If we're to succeed with the green transformation of our combined energy supply, it's important that major Danish players work together on shared solutions; not least when it makes a lot of sense for both parties. That's why we also see great potential in this long-term agreement," said Jan Kauffmann, Chief Finance Officer of HOFOR.

UK set to see fusion demonstration plant by 2025

General Fusion, a Canadian firm backed by Amazon founder Jeff Bezos, will build a demonstration nuclear fusion power plant at Culham in the UK, it has been announced. It will demonstrate General Fusion's proprietary Magnetised Target Fusion (MTF) technology, paving the way for a subsequent commercial pilot plant.

Construction could begin in 2022, with operations beginning around three years later.

Commenting on the development, Science Minister Amanda Solloway said: "This new plant by General Fusion is a huge boost for our plans to develop a fusion industry in the UK, and I'm thrilled that Culham will be home to such a cutting-edge and potentially transformative project."

The new announcement comes as the UK is preparing to see most of its existing fission power plants shut down. Dungeness B in Kent will begin decommissioning this summer, seven years ahead of schedule and all the country's AGR plants are expected to close by 2030. That will leave the UK with just one nuclear fission power plant in operation, at Sizewell B. At the moment, only two new plants – Hinkley Point C and Sizewell C – are in development.

Greece takes a step forward on batteries, back on wind

The Greek government has brought forward plans to issue a tender for 700 MW of battery storage capacity according to recent reports. The energy storage tender, which was initially said to be scheduled for the first quarter of 2022, will now take place this autumn.

Energy Minister Kostas Skrekas said the upcoming procurement round will award around €200 million ($242.3 million) in subsidies. Local media previously reported that funds for supporting the battery storage tender's budget would be sourced from Greece's Covid-19 recovery plan.

Greece is also interested in hydrogen production and it expects to publish a roadmap on the technology in July.

Greece has set a goal of reaching a 35 per cent share of renewables in final energy consumption by 2030 and shut down most of its coal fired plants by 2023. But the government recently turned down an application for a 486 MW wind farm on 14 uninhabited Greek islets in the Aegean Sea. It said it was not clear that the Aigaio project would harm the environment, with fears over the effect of the turbines on migratory birds.

GCC could become hotbed for green hydrogen production

Plentiful solar and wind resources coupled with abundant funding and strong export infrastructure can power a hydrogen revolution. **Nadia Weekes**

Producing and exporting green hydrogen could create one million jobs and generate up to $200 billion in revenue by 2050 in the six Middle Eastern countries that make up the Gulf Cooperation Council (GCC), according to a new report.

As the cheapest region in the world for solar energy, the GCC is at a distinct advantage to produce low-cost green hydrogen, claims 'The Potential for Green Hydrogen in the GCC Region' report by Dii Desert Energy and Roland Berger.

The GCC region, which includes Saudi Arabia, Kuwait, the United Arab Emirates, Qatar, Bahrain and Oman, benefits from abundant solar and wind resources.

The report also identifies significant funding availability, advanced export infrastructure and local capabilities as advantages that the GCC can harness to emerge as a global leader in the production and export of clean hydrogen.

GCC countries have unveiled plans for a number of green hydrogen projects over the past 12 months. One of the largest is Saudi Arabia's $500 billion Neom development on the Red Sea Coast, with Thyssenkrupp as the hydrogen technology partner.

Powered by more than 4 GW of renewable energy, the project is due to begin operation in 2025, and will produce up to 1.2 million tonnes per year of ammonia. Off-taker Air Products will invest $2 billion in distribution.

In May 2021, a consortium of Oman's state-owned energy company OQ, Hong Kong-based green fuels developer Intercontinental Energy and Kuwait's EnerTech revealed plans for a green hydrogen plant in Oman to be powered by 25 GW of renewable energy.

Also in May, Germany's Siemens Energy, in collaboration with state utility Dubai Electricity & Water Authority and Expo 2020, commissioned a solar-powered green hydrogen plant at the Mohammed bin Rashid solar park in Dubai. The facility contains electrolysis, storage and re-electrification capabilities.

Meanwhile, Abu Dhabi-based company Helios Industry is planning to develop a $1 billion green-hydrogen powered ammonia plant at the emirate's Khalifa Industrial Zone. The project will be powered by 800 MW of solar power and produce 200 000 tonnes of green ammonia from 40 000 tonnes of green hydrogen.

Funding boost for renewable energy in Sub-Saharan Africa

- AREF II funding to kickstart renewables investment
- Growing demand will require $100 billion a year from 2040

Nadia Weekes

The Africa Renewable Energy Fund II (AREF II) has achieved its first close at €130 million, following a joint investment of €17.5 million from The Sustainable Energy Fund for Africa (SEFA) and the Climate Technology Fund (CTF) through the African Development Bank (ADB).

Berkeley Energy-managed AREF II is a 10-year renewable energy Private Equity Fund with a $300 million target capitalisation. It invests in early-stage renewable energy projects, to de-risk the most uncertain phase of development and help green Africa's generation mix.

The funding aims to mobilise private-sector investment into Africa's renewable energy sector. Other investors include the UK's CDC Group, Italy's CDP, the Netherlands Development Finance Company, and SwedFund.

"We are proud to be associated with Berkeley Energy and other like-minded investors, and look forward to AREF's continued success and leadership in promoting sustainable power development on the continent," said Dr. Kevin Kariuki, the ADB's Vice President for Power, Energy, Climate and Green Growth.

The first phase of the AREF scheme invested in hydro, geothermal and solar projects. AREF II has a sharper focus on "green baseload" projects that will deliver firm and dispatchable power to African power systems through hydro, solar, wind and battery storage technologies.

With strong population growth rates and rising GDP, sub-Saharan Africa's electricity demand is set to more than double by 2040, requiring approximately $100 billion investment in power sector infrastructure per year. AREF II is backing mid-sized grid-connected projects, with typical capacity of between 10 MW and 100 MW.

Luka Buljan, Berkeley Energy's Managing Director, said: "We are very excited to have reached this milestone with strong support from our backers… We now look forward to concluding the fundraising and delivering projects that will provide clean, reliable and affordable energy across African markets."

In a separate development, the World Bank's private sector arm, the International Finance Corporation (IFC), and the Rockefeller Foundation (RF) have announced a new partnership to deploy $150 million of RF's catalytic capital in blended finance to mobilise up to $2 billion of private sector investment in distributed renewable energy solutions.

The partnership will prioritise countries in sub-Saharan Africa and select other regions during implementation.

An initial "rapid deployment" phase will distribute $30 million in blended concessional finance and grant capital to leverage an active pipeline of distributed renewable energy projects developed by IFC.

The funding will go toward IFC's prototype scaling mini-grid programme in addition to distributed renewable energy generation, battery energy storage, and other innovative clean energy technologies to facilitate access.

"Investing in renewable energy infrastructure in communities that have not had access to reliable power will ensure that the recovery from the Covid-19 crisis is both green and equitable," said RF's President, Dr. Rajiv J. Shah.

The Covid-19 pandemic has disrupted progress on broadening access, with the number of people lacking electricity in Africa rising to more than 590 million in 2020, a 2 per cent increase from last year, according to analysis in the World Energy Outlook 2020.

IFC Managing Director Makhtar Diop said: "The climate challenge at its core is an energy challenge. The twin goals of improving energy access and addressing climate change both require our urgent attention but can't be achieved with public resources alone. The private sector can and must be part of the solution if the scale of our results is to meet the scale of our ambitions."

Tanzania clinches solar project finance

A 150 MW solar power project in Tanzania's Kishapu District, Shinyanga region, has secured €130 million from the French Development Agency (AFD).

Permanent Secretary in the Ministry of Finance and Planning, Emmanuel Tutuba, said the project is expected to be implemented in two phases. The first 50 MW phase should kick-off next March and be completed within one year, Tutuba said.

The AFD funding will be used for grid modernisation, to enable the integration of non-dispatchable renewable energy and reduce losses. An additional €700 000 has been committed in technical assistance for the project.

The project will support the supply of electricity to the Shinyanga region's gold mines and reduce dependence on hydropower during daylight hours, allowing it to be stored for use during peak demand periods and the extensive dry season.

AFD Country Director, Stephanie Mouen, said the project would provide the foundation for a sustainable low-carbon economy by improving grid performance and deploying much needed solar power production capacity.

Russia's Rosatom to tap into low-carbon transition

Russia's Rosatom is hoping to tap a new wave of demand for its products as countries around the world prepare to shift to low-carbon fuels. The state-run nuclear monopoly, responsible for 76 per cent of global nuclear technology exports, is looking to become a leader in the global energy transition, First Deputy Director Kirill Komarov told the *Financial Times*.

The company, which operates 36 reactors in 12 countries, is stepping up development of small-scale nuclear plants, wind energy, energy storage and green hydrogen projects.

"People are no longer indifferent," Komarov said. "People don't want to use energy sources that are ecologically uncomfortable. They have demands and vote with money, not only with public support. I don't think it's fashionable, I think it is serious."

Speaking at the St. Petersburg International Economic Forum on June 3, Deputy Prime Minister Alexander Novak said that Russia plans to take leading global positions in the field of small-scale nuclear power generation.

"We're the leaders in development of large-scale generation, large units of 1000-1200 MW, but now we're setting the goal of becoming the world leaders in production of nuclear energy with small units of 5 MW to 100 MW, Novak said. "And these are completely new possibilities for the use of nuclear energy in the world in general. These are fundamentally new prospects."

While some leading global economies have turned their backs on nuclear energy, others are looking to use it as carbon-free baseload at times when weather conditions disrupt renewable sources such as wind and solar.

Nuclear accounts for a fifth of all energy supply in Russia, according to Rosatom, the country's largest energy group. The company is diversifying from nuclear, however. It opened Russia's two biggest wind farms last year and is also planning at least two large green hydrogen projects in the country.

It is also looking to expand geographically by entering developing nations. The group expects its revenue to triple to Rbs4 trillion ($56 billion) by 2030, and for 40 per cent of it to come from new lines of business.

Rosatom launched the world's only active floating nuclear power plant in 2019 and plans to replicate the technology for use in remote areas and smaller nations. "African countries want these plants, some island nations are considering it," Komorov said.

OEMs move to boost electrolyser credentials

- MAN Energy Solutions acquires 99 per cent of H-TEC Systems
- Haldor Topsoe establishes green hydrogen organisation

Junior Isles

Interest in supplying electrolysers is gaining traction, with original equipment manufacturers (OEMs) recently making moves to improve their position in the hydrogen market.

Last month MAN Energy Solutions announced that it is increasing its share in H-TEC Systems to almost 99 per cent. The acquisition of the shares, which will remain held in free float, has been agreed.

MAN Energy Solutions already gained a 40 per cent stake in the company in 2019. The now completed acquisition of the shares from the previous majority shareholder, GP JOULE, was already agreed in the past year. The parties have agreed not to disclose the price of the acquisition. The now complete transaction was, until now, subject to approval by the competition authorities.

GP JOULE, the Schleswig-Holstein-based group, which operates in the renewable energies sector, acquired H-TEC Systems in 2010.

With the acquisition, MAN Energy Solutions is completing its range across the hydrogen value chain and will now drive the industrialisation of electrolysis forwards with H-TEC.

"Today, H-TEC Systems offers electrolysers in the megawatt range," said Dr. Uwe Lauber, Chief Executive Officer at MAN Energy Solutions. "The objective now is to prepare the company for serial production because green hydrogen is going to become a mass market."

H-TEC Systems was founded in 1997 and has over 20 years of experience in hydrogen development and research. The specialists in locations such as Bavaria and Schleswig-Holstein produce stacks and megawatt electrolysers based on the polymer-electrolyte membrane process (PEM) to cover the hydrogen demand for industry as well as for energy refiners.

MAN Energy Solutions is also a forerunner in Power-to-X technology, which enables green hydrogen to be converted into climate-neutral fuels.

The announcement follows news that Haldor Topsoe, a Danish supplier of catalysts and proprietary technologies, has established a focused green hydrogen organisation to accelerate its electrolysis business.

Haldor Topsoe has appointed cleantech entrepreneur Chokri Mousaoui as head of the new organisation.

The new green hydrogen organisation aims to accelerate all aspects of Haldor Topsoe's business within electrolysis, including development of high-performance electrolysis technology, sales, and partnerships.

Haldor Topsoe announced in March 2021 that it will build a large-scale SOEC (solid oxide electrolysis cells) electrolyser manufacturing facility to meet customer needs for green hydrogen production. The manufacturing facility is scheduled to be operational in 2023, and will produce electrolysis stacks with a capacity of 500 MW per year, expandable to 5 GW.

Siemens and Mitsubishi are latest to cooperate on eliminating SF_6

Siemens Energy and Mitsubishi Electric have become the latest companies to cooperate on eliminating the use of sulphur hexafluoride (SF_6) in gas insulated switchgear.

In June the two industrial giants signed a Memorandum of Understanding (MoU) to conduct a feasibility study on the joint development of high-voltage switching solutions with zero global warming potential (GWP).

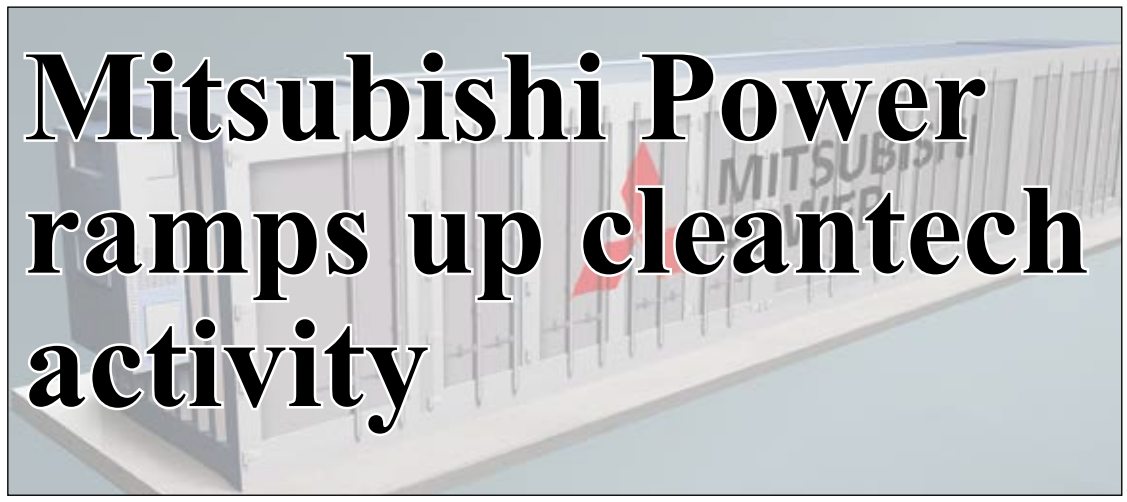
Both companies will research methods for scaling up the application of clean gas insulation technology to higher voltages. They will start with a 245 kV dead-tank circuit breaker that will speed up the availability of climate-neutral high-voltage switching solutions for customers around the globe. Both partners will continue to manufacture, sell, and service switchgear solutions independently.

In most of the world's gas insulated substations, SF_6 – a greenhouse gas with a potential for global-warming roughly 23 500 times greater than CO_2, – is still the insulating gas of choice. Even with very low leakages, the impact on global warming is notable. In light of the drive toward global decarbonisation, the demand for alternatives is growing as operators seek future-proof technologies that significantly reduce the carbon footprint of their systems. At the same time, regulations to reduce or prohibit the use of fluorinated gases in the electricity industry are being reviewed and implemented in various parts of the world.

The agreement between Siemens Energy and Mitsubishi Electric follows a similar agreement between GE Renewable Energy's Grid Solutions business and Hitachi ABB Power Grids in April. The non-exclusive, cross-licensing agreement is related to the use of a fluoronitrile-based gas mixture as an alternative to SF_6.

The two companies will keep the product development, manufacturing, sales, marketing and service activities of their gas solutions fully independent. Each company will continue to independently grant and set terms of licenses to its respective intellectual property, hence preserving supplier base diversity for the industry and fair competition.

Commenting on the reasoning behind the collaboration Dr Markus Heimbach, Executive Vice President, Managing Director, High Voltage Products, Hitachi ABB Power Grids, said: "As part of our commitment towards a carbon-neutral future and accelerating the energy transition, we have chosen to work towards a standard solution to address the needs of our customers through this cross-licensing agreement."



Mitsubishi Power ramps up cleantech activity

Mitsubishi Power is gearing up for an electricity sector that will have an increasing dependence on renewables.

The company has agreed to collaborate with Spanish energy company Iberdrola to drive the development of green hydrogen projects, battery storage systems and heat electrification solutions in different regions around the world.

Commenting on the tie-up, Mitsubishi Power President and CEO Ken Kawai said: "Iberdrola and Mitsubishi Power have been collaborating in supporting decarbonisation in the power generation sector by providing high efficiency GTCC [gas turbine combined cycle] projects. Using this collaborating experience in GTCC projects, we will jointly develop and deploy the necessary hydrogen infrastructure, battery energy storage systems, and electrified heat production systems to decarbonise the power and industrial sectors.

"This joint development with Iberdrola fulfills our mission to create a future that works for people and the planet by developing innovative power and storage solutions to realise a carbon neutral future."

The announcement came as the company confirmed the expansion of its operational footprint in Europe with the establishment of the GTCC EMEA Business Unit, effective April 1, 2021.

The new business unit will focus on the sale of its J-Series air-cooled gas turbines – which boast world-class reliability of 99.6 per cent and efficiency of greater than 64 per cent.

Capable of operating on a mixture of up to 30 per cent hydrogen and 70 per cent natural gas, the turbines will be able to run on 100 per cent hydrogen in the future. This highly efficient energy generation technology can play a crucial role in helping countries across Europe meet ambitious net zero carbon emissions targets.

As a demonstration of the company's continued commitment to EMEA's power industry, the business unit will be located in Dubai. The new business unit will be supported by Mitsubishi Power's dynamic services centres across the region.

Taking up the position of Vice President GTCC Sales EMEA, Jose Aguas – based in Valencia, Spain – will report to Business Unit Head, Khalid Salem, who takes on a new role as GTCC Business Unit Leader EMEA in addition to his role as President, Mitsubishi Power Middle East and North Africa.

Acciona renewables flotation could fetch $10 billion

Spanish group Acciona SA expects its renewables subsidiary, Corporacion Acciona Energias Renovables SA (Acciona Energia), to be valued between €8.8 billion ($10.5 billion) and €9.8 billion in its upcoming initial public offering (IPO).

The group has decided to float 15-25 per cent of the share capital of Acciona Energia on Spain's stock exchanges, corresponding to roughly 49.4 million and up to 82.3 million shares to be offered to qualified investors.

The Spanish Securities and Exchange Commission approved the registration document for the IPO last month and it is expected that management bodies will approve the IPO subject to market conditions and investor interest.

"The announcement of Acciona Energia's IPO is an important milestone in our mission to build a world-leading renewable energy company and to play a central role in the global energy transition," said Acciona Energia Chief Executive Rafael Mateo.

Acciona's renewables business operates in 16 countries and boasts about 11 GW of installed capacity across a diverse range of clean energy technologies, as of March 31, 2021. It plans to reach a total installed capacity of 20 GW by the end of 2025 and has identified 28 GW in opportunities beyond 2025 with the goal of reaching an installed capacity of 30 GW by 2030.

In 2020, Acciona Energia was the largest supplier of 100 per cent renewable energy in Spain. The company was also one of the top four developers in the world by volume of private power purchase agreements (PPAs) signed.

Tenders, Bids & Contracts

Americas

Vestas wins 384 MW Brazil order

Vestas has received an order for an onshore wind power generation project that includes the supply of 81 units of V150-4.2 MW turbines delivered in 4.3 MW Power Optimised Mode, as well as a five-year Active Output Management 5000 (AOM 5000) service agreement.

Delivery and commissioning of the turbines are scheduled for 2023. Customer and project names have not been disclosed.

With this order Vestas has surpassed 5.3 GW in firm order intake of V150-4.2 MW wind turbines in Brazil.

MTU Power secures 10-year service agreement

Amazonas Geração e Transmissão de Energia (Amazonas GT) of Brazil has awarded a 10-year service agreement to MTU Power for the maintenance, repair, and overhaul of the company's five LM6000 gas turbines.

Amazonas GT is based in Manaus, in north Brazil, and is a subsidiary of Eletrobras. Antonio Inaldo, Plant Manager of UTE Aparecida, Amazonas GT, said: "We are delighted to have signed our fourth contract with MTU. We rely on their excellent technical support and creative thinking to get the best out of our turbines at minimal cost."

Asia-Pacific

India awards GE wind turbine order

GE Renewable Energy has been awarded a contract to supply Continuum Green Energy India with wind turbines for a 148.5 MW project in the Indian state of Gujarat. GE Renewable Energy will supply 55 units of its 2.7-132 onshore wind turbine for the Morjar, Bhuj project. The contract also includes a long-term full-service agreement.

Arvind Bansal, CEO of Continuum Green Energy, said that the output from the plant will be delivered to Solar Energy Corporation of India (SECI) under a 25-year PPA.

Continuum Green Energy secured the project during the tranche-VI auction of wind power projects held by SECI.

EPC contract signed for Quang Trach 1

Vietnam Electricity (EVN) has awarded a $1.29 billion EPC contract for the Quang Trach 1 thermal power plant in the central province of Quang Binh to a consortium of contractors comprising Japan's Mitsubishi Corp, Hyundai Engineering and Construction (HEC) of South Korea, and Construction Corporation No.1 of Vietnam.

Construction is scheduled to begin in Q3 of this year, with completion in 2025. The plant will have two units and a combined capacity of 1200 MW. The plant will use the ultra-supercritical coal combustion technology (USC), and be equipped with synchronous treatment systems of wastewater and exhaust gas, and dust filtration systems, in line with Vietnam's environmental standards.

Siemens Gamesa to supply typhoon-proof turbines

Siemens Gamesa will supply 79 of its Typhoon-class onshore wind turbines for Japan's largest wind farm cluster. The 339.7 MW Dohoku wind farm cluster consists of four projects to be developed by Eurus Energy.

Siemens Gamesa will also provide technical field assistance for construction and commissioning of the four wind projects, with full commissioning in the second half of 2023. The turbines have been designed to accommodate the local wind site conditions, which can include very high wind speeds.

Russell Cato, Managing Director of Siemens Gamesa in Japan, said: "We're the first company in the industry that has developed the 4.3 MW typhoon type certified onshore turbines. We are very pleased to supply this milestone giant project to capture the abundant high winds in Japan and extend our partnership with Eurus Energy."

Kepco awards offshore wind turbine order

Kepco has awarded Doosan Heavy Industries & Construction a turbine supply contract for the 100 MW Jeju Hallim offshore wind farm. Doosan Heavy will deliver 18 units of its 5.56 MW wind turbines for what will be the largest offshore wind farm in South Korea when completed in 2024. The contract is worth about €140 million.

The Doosan Heavy 5.56 MW wind turbines feature 68 m blades and are designed to withstand typhoons with winds up to 70 m/s.

The Jeju Hallim wind farm is located near Hallim Port in the northwestern part of Jeju City.

Doosan Heavy and Kepco will also sign a separate long-term maintenance contract.

The project is owned and developed by Jeju Hallim Offshore Wind Power Co., a special purpose company established by Kepco, Korea Midland Power, Hyundai E&C, and Korea Electric Power Technology. The EPC is jointly performed by Hyundai E&C, Korea Electric Power Technology, and Korea Energy Technology, while Doosan Heavy will provide wind turbine manufacturing, delivery, and maintenance services.

Australian 1 GW complex places turbine order

Nordex is in negotiations with Acciona Energía to supply and install wind turbines for the 1.0 GW MacIntyre Wind Farm Precinct in Australia. The contract is valued at $1.5 billion.

The new wind power complex will be located near Warwick in Queensland; it will comprise the 923 MW MacIntyre wind farm and the 103 MW Karara wind farm.

Under the terms of the deal, Nordex will provide up to 180 units of its Delta4000 series N163/5.X wind turbines.

Construction on the wind farm is scheduled to start later in 2021, and it is due to be fully operational in 2024

Europe

Environmentally friendly substations for Norway

Siemens Energy and Norwegian distribution system operator Lyse Elnett have signed a framework agreement to strengthen the Norwegian power grid. Under the terms of the agreement, Siemens Energy will provide services and transmission products for substations in the Sør-Rogaland region in Southern Norway.

The agreement also stipulates that Lyse Elnett can eliminate fluorinated gases in their substations. Evy Thorbjørnsen, Project Director at Lyse Elnett, said: "Limiting the environmental impact of our operations without compromising on safety and reliability of power transmission, is a top priority for us. When it comes to reducing the usage of F-gases, we know that the alternatives from Siemens Energy have zero global warming potential."

If the total scope of supply is called up, the agreement has an estimated value of €200 million. The agreement covers design and construction of new substations as well as modifications and upgrades of existing substations, including the supply of transmission products and services. The largest and most important assignments will be the delivery of 145 kV GIS with associated protection and control systems.

Contracts for Spanish green hydrogen projects

Iberdrola of Spain has announced that it is working with engineering companies Elecnor and Construcciones Electromecanicas Consonni to develop a 20 MW green hydrogen production plant in Puertollano, Spain.

Iberdrola is investing €150 million to develop the project for fertiliser producer Fertiberia, which operates an ammonia plant in Puertollano. The plant will consist of a 20 MW electrolyser, a 100 MW solar PV farm, and a 20 MWh lithium-ion battery storage system.

Elecnor will be responsible for the electrical assembly of the hydrogen plant and will supply equipment such as electrical panels and cabinets, support, conduits and luminaries. Consonni will

Vestas receives 108 MW orders in Poland

Vestas has secured orders from DIF Capial Partners for four projects in Poland with a combined capacity of 108 MW. The four projects are: Pruszcz (70 MW), Markowice (26 MW), Piaski (8MW), and Wyszki (4 MW). The Pruszcz and Markowice projects are located in Kujawsko-Pomorskie Voivodeship, while the Piaski and Wyszki projects are situated in Wielkopolskie Voivodeship.

Vestas will supply and install 52 V100-2.0 MW turbines and two V90-2.0 MW turbines across the four projects. Vestas also won a 20-year Active Output Management 4000 (AOM4000) service agreements for the projects.

Turbine deliveries are scheduled to start in 2021, with commissioning of all four projects due for completion by the end of 2022.

Nexans secures Viking cable contract

SSE Renewables has awarded Nexans a contract to supply 800 km of underground cables for connections for the 443 MW Viking Wind Farm. The wind farm on Shetland is scheduled to go online on 2024.

The Viking Wind Farm will comprise 103 wind turbines. The 33 kV underground cables supplied by Nexans will link the wind turbine arrays together and then export to the main substation for feeding into the interconnector that will transfer power to the UK grid.

The cables for the Viking Wind Farm will be manufactured at the Nexans Hellas plant in Lamia, Greece and will be supplied via Nexans UK. First deliveries are scheduled for September 2021.

ABB power converters for Dogger Bank

ABB will deliver 95 medium-voltage power converters to GE Renewable Energy to be installed at the UK's Dogger Bank Wind Farm, which will be the largest offshore wind farm in the world.

ABB will supply 95 PCS6000 medium-voltage converters to be installed in GE's Haliade-X 13 MW wind turbines. The first phase of the Dogger Bank Wind Farm will generate 1.2 GW.

ABB in Turgi, Switzerland is leading project engineering while the PCS6000 converters will be manufactured by ABB in Łódź, Poland. First delivery is scheduled for summer 2021 with completion in late 2022.

ABB's collaboration with GE began in 2017 and the companies have worked closely to optimise the PCS6000 converter for the Haliade-X platform. This included successful test operations on a turbine installed at the Port of Rotterdam, Netherlands.

manufacture medium-voltage equipment.

The hydrogen plant is due to start operation in 2021.

DTEK orders Vestas wind turbines for Ukraine

Vestas Wind Systems has received an order for the 372 MW second phase of the 500 MW DTEK Tiligul wind project in Ukraine. The renewables subsidiary of Ukrainian energy company DTEK has ordered 62 units of the V162-6.0MW turbines for installation at a hub height of 125 m.

Vestas will provide services for both phases under a 20-year Active Output Management 5000 (AOM 5000) deal. The entire wind power complex is expected to be commissioned at the end of the third quarter of 2022.

International

Sungrow wins 2.1 GW contract in UAE

China Machinery Engineering Corporation, the EPC contractor for the 2.1 GW Al Dhafra PV power plant in UAE, has signed agreements with Sungrow for inverter supply for the project. The PV site is located 35 km from Abu Dhabi city.

The project is being developed by a consortium consisting of Abu Dhabi National Energy Company, Masdar, EDF, and JinkoPower. Financial close for the project was reached in December 2020.

FMG picked for massive Grand Inga expansion

The Government of the Democratic Republic of the Congo (DRC) has selected Fortescue Metals Group (FMG) to develop the Grand Inga hydroelectric power expansion project. The government plans to expand the facility, which currently has a capacity of 1.8 GW, to 40 GW with the addition of six more dams.

The expansion will cost around $80 billion.

First pumped storage hydro project in Gulf

Hitachi ABB Power Grids will supply Andritz Hydro with technology for grid connection and stabilisation for a pumped storage hydropower plant under construction in the Hajar Mountains, 140 km southeast of Dubai. The 250 MW Hatta power station is the first of its kind in the Arabian Gulf region. It is being developed by Dubai Electricity & Water Authority (DEWA), and is due to be commissioned in early 2024.

Hitachi ABB Power Grids will supply two AC excitation systems to ensure variable speed operations of the reversible rotating units. Hitachi ABB Power Grids will also supply an integrated solution to connect the plant to DEWA's 132 kV network.

Energising cyber security

Following its spin-off almost a year ago, Siemens Energy is transferring its cyber security processes to the new organisation. **Junior Isles** hears what this has meant for the company and its customers, and discusses the growing cyber threat to the energy sector.

As digitalisation spreads through the electricity sector and a growing number of companies move data into the cloud, cyber-attacks are on the rise. For critical infrastructure like electricity, water and gas, the consequences of a successful cyber-attack can be disastrous. The attack on the Colonial Pipeline in May was a very public reminder.

Fortunately, regulators are becoming increasingly active in tackling the problem. Following the Colonial Pipeline incident, US lawmakers joined forces in a bipartisan bill that would direct the Cyber security and Infrastructure Security Agency (CISA) to create a special cyber programme to test the nation's critical infrastructure defences.

It is a step in the right direction but the scale of the problem cannot be underestimated.

Dr. Judith Wunschik, Global Cyber Security Chief at Siemens Energy, outlined how Siemens Energy is preparing itself for the challenges ahead. Having grown her cyber security expertise in the banking sector, she was able to offer an interesting perspective on the threat facing the energy sector.

"I have a physics background but switched over to cyber security in 2013 for ING Bank. Joining what was then Siemens Gas and Power in 2019 was a challenge and opportunity to see cyber security from a different viewpoint. Banks have been doing this for a long time, and a lot of the cyber principles from the banking sector can be transferred [to the power industry]. At the end of the day, an IT system is an IT system, and if someone tries to attack a weak point on a chip, it makes little difference if the computer is in the data centre of a bank or in the data centre of a utility operator, or on the site of the utility itself."

She noted that when considering the IT/OT (operational technology) convergence in the energy sector, whether at in-house manufacturing sites or utility installations, processes have to be modified but core principles remain the same. "Processes [in the energy sector] have to be adapted to more locally managed, non-redundant systems and there are a lot more layers to the operation. But it's still asset management. Also, crisis management and communication is a core process for any cyber security officer regardless of the business itself."

She also said the adversaries in the two sectors are comparable: they could be hackers looking to extort money; 'hacktivists', looking to cause reputational damage; or nation-state actors that are politically motivated to compromise systems.

Essentially, years of experience have taught Dr. Wunschik that regardless of the sector, every connected product or solution can be attacked. Coming into the energy sector, her first task was to secure the solutions and processes of Siemens Energy.

"When you look at the digital environment from a Siemens Energy point of view, there are the internal assets – all the IT for our daily business, laptops, mobiles, applications, servers, etc. – the data and information assets of the company and its customers, all the product specifics and the intellectual property as well as the digital components of the products itself; and last but not least the solutions and services we supply as a full-service offering to the customer. As a cyber security officer in energy, your universe is much broader compared to a digital product realm."

During her first year as global cyber security officer, Dr. Wunschik's main task was to ensure the security of the newly spun-off Siemens Energy – keeping the licences to operate existing processes within Siemens and transferring them to the independent company. Now it is a case of ramping up the cyber security capabilities across the new organisation.

"With more than 90 000 employees around the globe, we always joke that we are the largest global start-up ever. This year we are now looking at the processes to see what can be done leaner with a higher degree on automation," said Dr. Wunschik. "The product departments within Siemens Energy are quite mature already and there are a lot of principles in place. We are currently looking at more standardised working from an oversight perspective to bring the same standards to all departments. That also helps our customers from an industry perspective.

"But the biggest focus is to build our energy business of tomorrow with products and solutions that evolve with changing threat landscapes to continuously meet the highest cyber security standards."

As an example, she cites the company's recent receipt of 'Cyber Essentials Plus' certification across Great Britain and Ireland (see box). This certification is essential for bidding for critical national infrastructure projects but will also support Siemens Energy's R&D, lifecycle and supply chain processes.

These processes address more than data transfer and data privacy; they also look at specific products.

"When we produce a piece of hardware that includes electronics and software, and the hardware has to be transported to a customer site, you have to test the equipment in the factory and again on-site after deployment. It's important to secure the entire supply chain before installation on the site in such a way that the system itself cannot be manipulated," said Dr. Wunschik. "Almost all systems in the energy industry have a physical attack surface, which can affect IT security, and vice versa where IT vulnerability can take a physical dimension at a customer site."

Dr. Wunschik explained: "Take a simple switch to be used at a data centre, for example. You order the switch from anywhere in the world, install it and expect it to work correctly. But during maintenance, the engineer might notice additional chips on the switch. Were they put on the motherboard after the initial production process? I have seen this happen whereby a manufacturer added components to block some functionality on the switch in order to sell it at a lower price. But do you really know what these chips are doing without having tested?"

It is therefore imperative that the entire chain is secure – that includes vendors like Siemens Energy, its suppliers, as well as the customer site. As Dr. Wunschik put it: "Cyber security is a team sport. You cannot do it only from your own point of view; you need partners with the same security level or at least the same awareness of the topic."

Siemens Energy has a dedicated "ProductCERT" team in place that manages all security-related issues in Siemens Energy products, solutions, and services. ProductCERT coordinates and maintains communication with all involved internal and external parties to quickly and effectively respond to security issues. Security Advisories are issued to inform customers about measures that must be taken to securely operate Siemens Energy products and solutions.

Dr. Wunschik: "It is imperative that the entire chain is secure – that includes vendors like Siemens Energy, its suppliers, as well as the customer site"

The company has offered power plant operators in the UK penetration testing – not as a typical IT vendor but as an energy company for IT and OT issues at the site. Here, Siemens Energy experts act as external hackers to test systems and products for vulnerabilities.

While a number of energy companies are quite mature in terms of cyber security strategy, Dr. Wunschik believes some need to leverage the community effort to deploy technologies and processes and apply similar approaches from the IT side to the energy grid. She says this is where Siemens Energy can help but noted that the level of what is needed varies from place to place.

"There are specific regions in the world where the government is very active in monitoring the energy grid and they are looking at how transmission and distribution operators are working together to look for anomalies in the system to assess

where first attacks might come from. But there is a huge difference in maturity around the globe.

"As a global vendor, you have to be able to tackle the needs of the region. If you look at mobile IT devices, for example, there are regions in which you can use the device itself as a trusted factor; but there are others where you can't. When you are looking to remotely monitor plants or grids you have to consider whether you send out a field engineer with their own device. The industry needs to mature much more from the perspective of trusted identities and processes."

Certainly, the energy industry has challenges ahead in the world of cyber, with perhaps the main one being the increasing number of threats and attacks on old vulnerabilities.

"There are growing attacks on IT infrastructure. If you look at the attack on the Colonial Pipeline in the US, it was not an attack on the OT [infrastructure] of the pipeline, i.e. the operational technology. It was an attack on the financial systems of the enterprise, which caused Colonial to take the decision to shut down the pipeline. So the reputational and financial damage was caused by attacking a classical IT system," said Dr. Wunschik. "This is why you have to look at the entire digital landscape and ask where an attacker can come in – he will always step in at the weakest link in the chain."

Similar vulnerabilities can arise from field service engineers using old systems or unchecked devices such as USB sticks.

"The pandemic has increased the distribution of your end-points, from an office point of view, across the internet," said Dr. Wunschik. "Companies that were not ready, having previously worked only in closed office networks without a transparent asset and identity management concept, failed immediately," said Dr. Wunschik. "From an energy company/utility view, although direct attacks on the generation and transmission business did not change, adversaries found there was a growing environment to hack connections via the internet. At Siemens Energy, we have seen the level of attacks grow significantly. But we were prepared, supported by mature technologies and processes that we could scale up to securely meet the increased demands. All office employees were equipped with laptops, and IT infrastructure performance was available on broad scale."

Unfortunately, small and medium-sized enterprises are often not so prepared and social engineering, i.e. changing social behaviour around cyber security, remains a key issue as more employees work from home.

Looking past the pandemic, in the immediate future Siemens Energy will continue to support utilities in securing the entire ecosystem – not just specific parts, such as financial systems or scada systems but to secure and create protection concepts from a threat perspective. This requires more than equipment and software; it also requires people.

One of the main challenges that Dr. Wunschik sees for the next 5-10 years is talent. "We need to find the people that are ready to step into these cyber security positions. A lot of enterprises are relying on software vendor promises. Energy utilities have to adapt the secure solutions they are offering, so you still need knowledge. So the question for the next five or ten years from a cyber management perspective should be how to share resources across the industry."

Summing up, she said: "I'm always asked who will pay for all of this? But cyber has to become a USP for the vendors as well as the [energy] companies. It is fundamental to securing our society overall."

Cyber security: the experience of a UK CSO

According to a recent report by global data protection company Veritas Technologies, just over half of UK utilities have fallen victim to a cyber-attack in the last year. But despite the sector's vulnerability to cyber-attacks, it is pressing ahead with its move to the cloud. The research found that, on average, utility companies have 48 per cent of their business data stored in the cloud. In the next five years, this is set to grow to 60 per cent.

It is a trend that will keep John Cornelius busy for the foreseeable future. As Siemens Energy's Senior Cyber Security Officer (CSO) UK&I and "the face" of cyber for the company in the UK and Ireland, Cornelius is the first point of contact in supporting Siemens Energy business units and their customers in their efforts to keep their organisations and the nation's energy infrastructure safe and secure.

"Attacks on energy infrastructure and industrial facilities unfortunately happen every day. The differences are not specific to regions but depend on the nature of the different threat actors and their individual motivation – which might be publicity, monetary interests, political revenge or blackmailing," he said. "The industry is shifting away from on-premise solutions to cloud-hosting solutions. The risks that go with that are an increased potential for attacks aimed at manipulating or stealing data. A big part of my role is to understand the potential impact of someone getting hold of Siemens Energy data, and protecting it in line with corporate requirements to the best of everyone's ability."

According to Cornelius, activities to provide this protection include:

- Critical Asset identification – what is the most important data for Siemens Energy and how to protect it
- 'Exception management' – mitigating risks if a business is unable to comply with policy and making sure everything is transparent
- Vulnerability management – taking care of internal IT vulnerability management aspects and supporting the company's "Product and Solution Security team" in detecting vulnerabilities in the lifecycle management
- Training and awareness, e.g. as part of the Siemens Energy-wide Cyber security Ambassador community that helps local management to apply cyber-secure work practices and improve the company's overall resilience.

This last point is of particular importance in an environment where more staff are working from home. But the training and awareness programme has paid off.

"When everyone started working from home at around the end of February last year, I was very concerned the amount of cyber security issues would go through the roof," said Cornelius. "I thought there would be compromised credentials, people clicking on links in emails, etc., but every single employee stepped up their game. We've had less cyber security incidents in the last year than we've had in previous years."

During his first 12 months, Cornelius' main task has been to secure Siemens Energy internally and demonstrate this to customers. The first real proof-point to customers of that undertaking was achieved in May when the company received Cyber Essentials Plus (CE+) certification for Great Britain and Ireland.

The government-backed certification, which is a pre-requisite for national critical infrastructure projects, shows Siemens Energy provides reliable products, solutions and services, and also demonstrates the resilience of its policies and procedures.

CE+ requires independent verification by an external auditor who conducts a series of technical assessments to ensure the company is protected against various attack scenarios. The evaluation, completed remotely in view of the Covid-19 restrictions, assessed:

- Boundary firewalls
- Secure asset configuration
- Patch management
- User access controls
- Malware protection
- Mobile assets

The certification was awarded by ECSC, an independent certifying body for the Cyber Essentials programme, and must be re-certified every 12 months. In total, around 5500 digital assets were in the scope of the evaluation.

Steve Scrimshaw, Vice President, Siemens Energy UK&I, commented: "Cyber-attacks have become more sophisticated and common in today's digital world. It is therefore crucial for us as Siemens Energy to have robust procedures and protections in place to reduce cyber threats. Our customers want to see that we provide reliable products, solutions and services and also take the security of their information seriously. Cyber security is therefore mandatory for every reliable business partner as well as being a prerequisite for critical national infrastructure projects."

Cornelius added: "We [the cyber team] haven't delivered CE+, Siemens Energy employees have delivered it for themselves by doing what's been asked – following the guidance and training, and doing what matters at the right time. We are very proud of them."

Receiving CE+ certification is, however, only seen as the starting point and Siemens Energy says it will continue to evolve and improve its processes and procedures. Looking forward, Siemens Energy has already identified some areas for further work. In addition to re-certifying CE+ annually, it is continuing to roll-out ISO 27001 compliance across its locations and businesses.

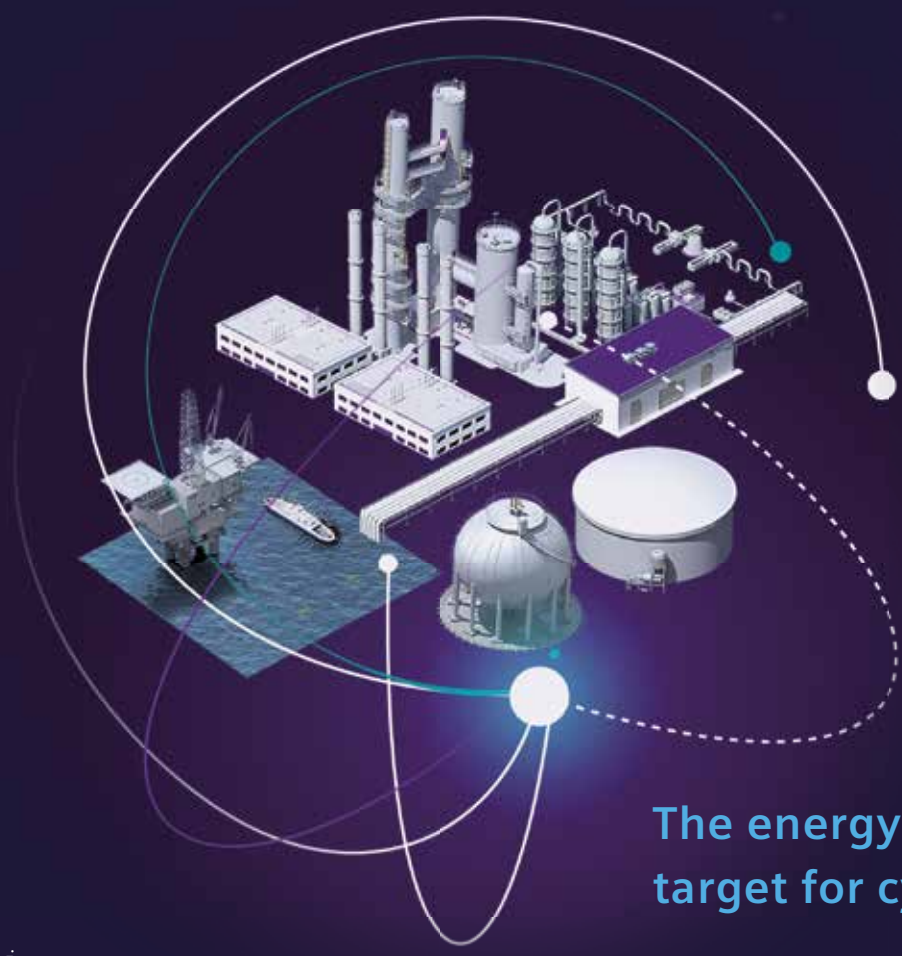
Over the next 12 months Cornelius says the company will continue to identify, assess and protect what he calls "critical assets". This is key data within the Siemens Energy business, its suppliers, or that of customers. "This is a continual cycle, we never just set and forget – it's discover, understand, protect and review all the time."

Cornelius says Siemens Energy will continue to evolve and improve its processes

SIEMENS energy

Perpetual vigilance

for what's mission critical



The energy sector has become a primary target for cyber attacks.

Siemens Energy helps its customers confront the growing cyber threat with our protection, detection, and monitoring solutions.

LET'S MAKE TOMORROW DIFFERENT TODAY.

siemens-energy.com

Siemens Energy is a registered trademark licensed by Siemens AG.

Hydrogen

EBH study reports large potential for European green hydrogen production

The European Union and the United Kingdom have the potential to meet a projected European hydrogen demand equivalent to 20-25 per cent of EU and UK final energy consumption by 2050, says a new report.

Gary Lakes

Across the globe, news media carry stories daily about the steady development of hydrogen and other renewable energy technology.

Last month, the European Hydrogen Backbone (EHB) Initiative released a report stating the European Union and the United Kingdom have the potential to meet a projected European hydrogen demand for 2300 TWh by 2050, the equivalent of 20-25 per cent of EU and UK final energy consumption by 2050.

The EHB is a group of Transmission System Operators (TSOs) that have proposed the establishment of a dedicated hydrogen pipeline infrastructure across Europe, comprised mostly of repurposed natural gas pipelines that would connect hydrogen demand clusters and regions with high renewable energy potential in a cost-efficient manner.

Initially, EHB consisted of 11 TSOs, but has since expanded to 23 European TSOs whose gas networks cover 19 European member states, the UK and Switzerland. Earlier this year it produced a map proposing a dedicated hydrogen pipeline network covering 21 European countries. According to the study, repurposing existing gas infrastructure will play a crucial role in connecting hydrogen supply and demand locations. Furthermore, it claims, hydrogen pipeline infrastructure is the most cost-efficient means for long-distance, high-volume transport at a price of €0.11-0.21/kg per 1000 km, cheaper than transport by ship for all reasonable distances within Europe and neighbouring regions, the report says.

Pipelines are also preferred to power transmission lines. To transport volumes of energy corresponding to a single 48-inch hydrogen pipeline (the equivalent of up to 16.9 GW) would require seven overhead power transmission cables.

Besides hydrogen supply being transported via pipelines in the EU and the UK, transport economics also favour pipeline imports from North Africa, Norway and Ukraine.

Domestic European green and blue hydrogen supply potential is vast, the report says, adding that it exceeds what would be needed to meet projected European hydrogen demand for all sectors. The EHB said green hydrogen (hydrogen made with renewable energy) potential from dedicated renewables is estimated to be 450 TWh in 2030, 2100 TWh in 2040, and 4000 TWh in 2050.

"This potential already takes into account the growing need for renewable electricity or direct consumption, land availability, environmental considerations and installation fees," the report said. "Realising this potential will likely require a rapid, vast expansion of wind and solar capacity, beyond what is needed for direct electricity demand and corresponding to cumulative installed capacities of 1900 GW in 2030, 3200 GW in 2040, and 4500 GW in 2050."

The 2030 installed capacity figure represents a more than doubling of current cumulative National Energy and Climate Plan targets, according to the report. Demand for hydrogen will likely reach 2300 TWh by 2050, the report says. About 1200 TWh will go to industry, particularly steel manufacturing and chemicals, such as green ammonia. Of this, some 200 TWh will be used in high temperature industrial heat. Another 650 TWh can be expected to go to dispatchable electricity production. The report points out that the value of hydrogen over most other flexible power options is that it can be supplied and stored in large quantities at relatively cheaper investment costs, making it appealing for longer duration storage.

Demand in the transport sector for hydrogen as fuel is expected to reach around 300 TWh per year. Additional hydrogen will be needed for hydrogen-derived synthetic fuels for aviation, the report said.

Heating buildings will be decarbonised using a range of technologies, according to EHB. Hydrogen demand for this sector will depend on renovation rates, the relative shares of biomethane and hydrogen, and the mix of heating technologies applied.

The study estimates that annual renewable and low carbon gas demand in buildings will be around 600 TWh in 2050. It said all of this could be hydrogen, but considering the use of biomethane, hydrogen demand is likely to be 150 TWh.

Besides green hydrogen, Europe has a large potential to produce blue hydrogen, which is produced by using natural gas. Supply is virtually unlimited as natural gas supply and CO_2 storage potential exceed the total foreseen hydrogen demand, the report says. The cost of producing blue hydrogen will be higher than that for green hydrogen, and may rise further with the cost of carbon. But blue hydrogen can drive emission reductions and accelerate the pace of transition, the study says, especially during the market's ramp-up around 2030.

Gas

ADNOC expands Shah sour gas project with self-sufficiency in mind

The EPC contract has been awarded for the Shah Sour Gas Plant. Boosting output at the plant lends to ADNOC's programme to expand other gas resources and meet the UAE's 2050 energy targets.

Gary Lakes

The Abu Dhabi National Oil Company (ADNOC) awarded an engineering, procurement and construction (EPC) contract to Italy's Saipem worth ($510 million) in mid-June for work that will boost production at the Shah Sour Gas Plant located some 120 km southwest of Abu Dhabi city by 13 per cent to 1.45 billion cubic feet per day (bcf/d).

Boosting output at the Shah plant lends to ADNOC's programme to expand other gas resources and meet its 2050 energy targets whereby gas produced in the UAE will account for 38 per cent of energy supply.

The ADNOC Sour Gas project is a joint venture with US energy firm Occidental. It draws gas from the ultra-sour Shah gas field and first came onstream in 2015. The project currently produces some 1.28 bcf/d, most of which is distributed to companies within the UAE. The plant also produces 5 per cent of the world supply of granulated sulphur, which is exported through the industrial Port of Ruwais. Expansion of the plant is scheduled to be complete by 2023.

The Saipem contract covers the Optimum Shah Gas Expansion (OSGE) project, the scope of which includes associated off-sites and utilities necessary for the integration of the new facilities with existing installations and infrastructure such as gas gathering facilities, the main gas plant, pipelines and the sulphur granulation plant. Current plant operations will not be impacted during the expansion project.

"The Shah Gas Expansion Project is an excellent example of how ADNOC is growing its gas production at existing fields to deliver a more sustainable gas supply and support the UAE's gas self-sufficiency objective," Yaser Saeed Almazrouei, upstream Executive Director for ADNOC, said in a statement. "Importantly, the in-country value generated from the EPC contract award will help to stimulate the growth of the private sector and local economy as we navigate the post-Covid recovery and continue to meet the future energy needs of our nation."

One of the main points of the EPC contract is that 50 per cent of its value will be paid into the UAE economy under ADNOC's In-Country Investment Program.

ADNOC supplies two-thirds of the natural gas to UAE companies and has the potential to produce at least 11 bcf/day of natural gas. Most of the emirates gas resources contain a high degree of sulphurous compounds, hence the designation 'sour gas'. Abu Dhabi is estimated to have conventional gas reserves of 273 trillion cubic feet (tcf) and 160 tcf of unconventional gas resources.

In May, ADNOC signed a 10-year gas supply agreement with two major industries in the UAE: Emirates Steel, the country's largest producer, and Arkan, a construction and building materials company. The two companies are owned by Senaat, Abu Dhabi's General Holding Corporation. Senaat is reported to be considering a merger of the two companies, which would create a business with $3.54 billion in assets.

Last November, ADNOC and France's Total announced the delivery of first gas from the Ruwais Diyab Unconventional Gas Concession. Total holds 40 per cent in the joint venture, which aims to produce 1 bcf/d by 2030. ADNOC has also partnered with Italy's Eni and Germany's Wintershall to develop the Ghasha ultra-sour gas field by 2025 with a planned production target of 1.5 bcf/d. The group are also looking to develop two more sour gas fields: Bab and Bu Hasa.

Also in June, Abu Dhabi's chemical giant TA'ZIZ signed an agreement with Abu Dhabi-based Fertiglobe covering a world-scale blue ammonia production project that will be located at the TA'ZIZ Industrial Chemicals Zone, adjacent to the Ruwais Industrial Complex. A statement released by ADNOC, which owns major stakes in both companies, said the agreement "further strengthens the UAE's hydrogen value proposition, building on the deep experience in carbon capture and storage of ADNOC, and the world leading ammonia capabilities of Fertiglobe, to develop the first-of-its-kind large scale blue ammonia project in the MENA region." The plant will have a capacity to produce 1 million tons annually.

The UAE in 2017 launched 'Energy Strategy 2050', a unified strategy based on supply and demand. The plan aims to raise the contribution of clean energy in the UAE's total energy mix from 25 per cent to 50 per cent by 2050 and reduce carbon emissions from power generation by 70 per cent. The plan also calls for consumption efficiency of individuals and corporations to increase by 40 per cent.

The UAE plans to invest AED 600 billion ($163.34 billion) in the strategy by 2050 and expects to save AED 700 billion.

Japan is not the land of the rising decarbonisation

Asia has a huge role to play in meeting global carbon emissions targets. With the COP26 climate change conference just over four months away, through a series of articles *TEI Times* will look at several countries in the region and their plans for decarbonisation. This month Asian energy expert, **Joseph Jacobelli**, explores Japan.

Japan's faces huge challenges in meeting its net zero emissions goal by 2050. The land of the rising sun may find the decarbonisation climb a desperately steep one. Governmental, institutional, and socio-political impediments are just some of the multi-faceted challenges. Still, many business and investment opportunities for new market entrants and companies from abroad will be created as the country tries to reach its targets.

To gain a better understanding, it is necessary to look at Japan's heavy fossil fuel-consumption, government policies and ambitions as well as institutional and socio-political barriers, and assess potential opportunities.

To better evaluate the massive challenge in achieving net zero, some of Japan's energy market tenets must first be examined.

The country has positive cultural and geopolitical factors to drive its energy transition. Culturally, the population does not need a hard sell or massive education campaign to be convinced of the benefits of clean energy. Nature and the environment are an integral part of life in the country. They are a cornerstone of Japanese culture.

The nation has almost no indigenous energy resources. So, prioritising domestic zero carbon energy makes great sense geopolitically. In fact, about 87 per cent of its primary energy is from polluting fuels, including coal (26 per cent), gas (21 per cent), and oil (40 per cent). Planners had counted on nuclear power to meet at least a quarter of output. However, that aim fell through after the country shut down all of its nuclear power fleet following the Tohoku earthquake and tsunami that caused the Fukushima Daiichi Nuclear Power Plant meltdown on 11 March 2011.

Of note, the average output for nuclear energy was about 290 TWh per year out of an average of 1130 TWh in total, in the ten years through December 2010. Nuclear now contributes about 4 per cent of the electricity mix and the overall contribution from zero carbon generation is a low 17 per cent. Standard coal and gas plants occupy a massive 75 per cent of the mix. In terms of electricity sector decarbonisation, this poses a challenge even greater than the one China faces, albeit China's power consumption is 7.5 times the size of Japan (see *TEI Times, June 2021, page 14*).

There are at least another two major hurdles to the nation's net zero ambitions. One is that while its population is ageing and declining, electricity consumption is not expected to fall but should instead continue to rise due to drivers such as rising electric mobility. Another is that the land resource for solar and wind farms is very limited given the country's land mass is small, very mountainous, and it is a densely populated country.

In terms of government policies and ambitions, the various Japanese governments in the past few decades have a poor energy policy record. Much of the running of the sector was left to the major corporates involved, i.e., the large, traditionally vertically integrated electric power companies, such as Tokyo Electric Power and Kansai Electric Power.

An example of poor policy is the energy mix targeted by March 2031 in a plan released in the late 2010s. It specified that between March 2019 and March 2031 power generation from fossil fuels would be cut to 56 per cent from 77 per cent, nuclear power's contribution raised to 20-22 per cent from 6 per cent, and renewable energy output to 22-24 per cent from 17 per cent.

Research at the time showed that these targets were clearly unrealistic. Few of the nuclear reactors shut down post-Fukushima have restarted. The operators have struggled to bring them back online in part because they must meet significantly higher safety standards and also because of a significant lack of support from the population.

Another example lies with the recently announced Green Growth Strategy. It admirably calls for more rapid adoption of innovative technologies and spells out the focus areas. Unfortunately, the strategy is very lightweight, lacks detail, and does not offer clear incentives to the private sector to accelerate their energy transformation. In fact, Japanese corporations in general are far behind those of other developed markets in terms of the energy transition or disclosing (and probably understanding), for example, climate risk factors.

There are, however, a few optimistic voices such as the Japanese independent think-tank, the Renewable Energy Institute (REI). In REI's Transition Promotion Scenario (i.e., its more bullish scenario), it estimates that solar and wind capacity could almost double to about 174 GW by March 2031 from 60 GW in March 2020. While these are realistic forecasts, to reach these levels quite a few hurdles must be surmounted.

In terms of business and investment opportunities, they could come from at least two sources. A government net zero goal 'crisis' and faster institutional adoption of energy transformation paths.

Given the relatively poor track record of Japan's energy policy makers, it would not be far-fetched to assume that in the next three to five years the government realises that it is far from attaining its net zero ambitions. This will lead to an accelerated push especially for renewable energy. Under this scenario, the REI forecast could be easily met or even surpassed.

Another likely transformation may be from domestic corporates as they react too slowly to the energy transition. It includes companies in the seven priority areas – cement, chemicals, gas, oil, power, paper pulp, steel – and others. Push factors, besides the government, include shareholders, stakeholders, and, especially, financial institutions. A recent example is Kansai Electric Power, facing a call from its shareholders to stop building new coal fired plants last April. Another is the country's biggest commercial bank, Mitsubishi UFJ Financial Group, formally announcing last May that it is targeting a net zero finance portfolio by 2050. This makes it hard for the bank to lend to polluting power plants for example and allow for more capacity to lend to clean energy projects.

Business and investment opportunities will come about in several ways. The country may not have sufficient domestic production capacity to supply its market and it could open the door for more imports. A lack of experience or expertise in some areas may also mean government promoting and incentivising foreign investments into some of the green growth strategy priority. These areas include, but are not limited to, offshore wind power, electric mobility, digital technologies and solutions revolving around the management of the delivery of the energy.

Often the perception abroad is that it is hard for overseas companies to participate in the Japanese and electric power sector. But this has been far from the truth in recent years. Some examples are Denmark's Ørsted in offshore wind projects, France's Engie in electricity trading, the UK's Centrica in Demand Side Response, Italy's Enel X in advanced energy services, and Australia's Power Ledger in blockchain-based energy trading.

Giuseppe (Joseph) Jacobelli is a business executive, analyst, and author with over 30 years' experience in energy and sustainability in Asia. He is author of 'Asia's Energy Revolution: China's Role and New Opportunities as Markets Transform and Digitalise', De Gruyter, 2021.

Year to 31 March	2020 Actual (GW)	2031 Base Case[1] (GW)	Change vs. 2020	2031 High Case[2] (GW)	Change vs. 2020
Wind Total	**4.4**	**23.3**	***430%***	**29.3**	***566%***
Onshore	4.3	16.6	*286%*	19.2	*347%*
Bottom-mounted	-	6.7	*n/a*	10.0	*n/a*
Floating	-	0.1	*n/a*	0.1	*n/a*
Solar Total	**55.6**	**102.1**	***84%***	**144.6**	***160%***
Residential (roof-top)	11.3	20.3	*80%*	25.8	*128%*
Industrial (roof-top)	n/a	15.7	*n/a*	36.1	*n/a*
Commercial (ground)	44.3	66.1	*49%*	82.8	*n/a*
Solar and Wind	**60.0**	**125.4**	***109%***	**173.9**	***190%***

(1) Current policy scenario; (2) Transition promotion scenario

Japan's solar and wind capacity forecast by the Renewable Energy Institute.
Source: Renewable Energy Institute (2020). Proposal for 2030 Energy Mix in Japan. [online] Renewable Energy Institute, Tokyo, Japan: Renewable Energy Institute, pp. 7–8,11. Available at: https://www.renewable-ei.org/pdfdownload/activities/REI_Summary_2030Proposal_EN.pdf [Accessed 30 September 2020]. Calculations by the author.

Japan power generation 11 months through February 2021
Source: Author's calculations. Data from: Agency for Natural Resources and Energy, "Electric Power Survey Statistics, Agency for Natural Resources and Energy" (www.enecho.meti.go.jp, May 31, 2021) <https://www.enecho.meti.go.jp/statistics/electric_power/ep002/> accessed June 22, 2021.

Gigawatt-hours			
Hydro	66,691	Coal	252,158
Pumped storage	10,360	LNG	326,522
Nuclear	33,234	Oil	12,955
Wind	6,844	LPG	195
Solar	14,506	Gas (Other)	23,821
Geothermal	1,809	Bituminous Mixture	1,110
Other	188	Other Fossil Fuel	24,001
Subtotal	**133,632**	**Subtotal**	**640,762**
Percentage of total			
Hydro	8.6%	Coal	32.6%
Pumped storage	1.3%	LNG	42.2%
Nuclear	4.3%	Oil	1.7%
Wind	0.9%	LPG	0.0%
Solar	1.9%	Gas (Other)	3.1%
Geothermal	0.2%	Bituminous Mixture	0.1%
Other	0.0%	Other Fossil Fuel	3.1%
Subtotal	**17.3%**	**Subtotal**	**82.7%**

Driving the green electron revolution

Grid enhancing technologies are key to the success of the energy transition. Smart Wires has developed a Modular Power Flow Control technology, also known as SmartValve, that allows power to flow where there is spare capacity, thus maximising the use of the grid.

Michael Walsh

In ten short years, the global energy landscape has changed profoundly. Continued international focus on climate change and its impacts has seen the march towards the energy transition intensify. Couple this with positive regulation and policy changes across the world, growth in renewables, and further development of innovative technology, and thankfully we are now on an unstoppable trajectory which will see several major nations reach net zero by 2050. As the energy transition gathers pace, the question has changed from "when" will it be achieved, to "how".

The increased adoption of innovative, grid enhancing technologies (GETs) will be key to meeting the commitments and targets laid out by the Paris Agreement in 2015.

Generating 'green electrons', or renewable energy, is of course a core component of the energy transition, but so is the ability to move clean energy effectively and efficiently from source to demand – meaning the grid, or electricity network, must be an enabler rather than a barrier.

The current grid was designed for large-scale, centralised fossil fuel power generation, not intermittent renewable generation of varying-size and distribution. Energy generation and demand patterns are shifting, and so too must the grid. In order to unlock the energy transition, the grid must operate differently. The good news is that there is actually a fair bit of flexibility and capacity that can be extracted from today's grid.

Grid enhancing technologies, such as power flow control, dynamic line rating, topology optimisation and others, are poised to be absolutely critical in transforming the existing grid, and in doing so, unlocking and maximising its capacity.

A recent Brattle Group report found that grid enhancing technologies can allow more than double the volume of renewable generators to connect to the grid – compared to the status quo approach – over the next five years. These investments could be implemented in less than one year and would pay for themselves in six months.

Modular Power Flow Control (MPFC) is one such technology that is gaining huge global traction. Smart Wires has developed a MPFC technology, known as SmartValve, which is the next logical step in the progression of FACTS (Flexible Alternating Current Transmission System). It enables system operators to control power flows in the network by adjusting transmission line reactance in real-time. Essentially, this intelligent hardware causes power to be pushed off overloaded lines or pulled onto under-utilised lines – causing power to flow where there is spare capacity, and maximising the full use of the grid.

As the flow of renewable energy increases, the MPFC technology can automatically activate to balance power flows, boosting the amount of energy the grid can transfer.

This is essential to enabling significantly larger amounts of renewable energy to enter the system, and importantly reduces the need for new transmission lines – maximising the use of what is already there.

As distinct from legacy forms of power flow control, SmartValve is a modular, digital solution which means it is quick and flexible to install and easy to scale or relocate. This flexibility and adaptability is incredibly valuable when generation, load, and the evolution of the grid itself are highly uncertain.

Greece's Independent Power Transmission Operator (IPTO) deployed MPFC in a containerised mobile unit parked inside a substation, to accelerate renewable integration in a relatively constrained portion of the grid. IPTO installed the mobile MPFC technology on one of two 150 kV parallel single-circuit overhead lines, to increase the lines impedance – reducing loading on this particular line by 17 per cent.

A key benefit of the mobile MPFC is to resolve short-term or near-term issues. In this case, the mobile MPFC provided a short-term solution until a new line came into service. This rapidly deployable and redeployable solution is also often used for managing operational constraints, such as enabling outage windows for critical construction and maintenance works.

Historically, it takes years to get transmission projects completed, even simple ones. The mobile MPFC solution can be delivered in a few months and installed within a matter of days, allowing utilities to respond much faster to the needs of generators, customers and communities. As it is mobile, it is fully re-deployable and can be reused many times at different voltage levels across the grid.

After several months on the Greek system, the unit was moved to the Bulgarian transmission system, where it is also being leveraged to improve renewable integration and cross-border electricity flows. Installation of the technology, which took just 2.5 days, was a joint project between the Bulgarian Transmission System Operator (TSO), Electricity System Operator (ESO), and Smart Wires, as part of FLEXITRANSTORE – a European Union Horizon 2020 consortium. The mobile power flow control solution was installed in northeast Bulgaria, where 750 MW of wind generation is installed.

In the UK, a substation-based deployment of Smart Wires' MPFC freed up 95 MW of additional network capacity by installing the technology on two lines within the UK Power Networks distribution system.

This work resolved a critical pinch point near the Essex/Suffolk border and allowed more electricity generated from renewable sources to feed into the system – without building costly and disruptive new electrical cabling and substations.

In just a year, UK Power Networks saved customers £8 million, and enabled enough renewable power to run 45 000 homes to safely connect to a previously constrained point in the local electricity network.

Further north in the UK, National Grid (NGET) recently deployed the world's first large-scale use of the technology, enabling an extra 1.5 GW extra capacity on its existing network.

NGET is installing SmartValve on five circuits at three of its substations in the North of England, which makes 500 MW of new network capacity available in each region. The sites, at Harker in Carlisle, Penwortham in Preston and Saltholme in Stockton-on-Tees near Middlesbrough, were identified as needing a solution to solve bottlenecks of north-to-south renewable power flows. Installing modular power flow controllers at these sites allows NGET to provide National Grid's Electricity System Operator with the tools to quickly reduce the congestion that limits renewable generation, with minimal impact on communities and the environment.

Following these initial installations at the three sites, National Grid is looking to extend the capability at Harker and Penwortham in the European autumn. This could mean freeing up an additional 500 MW of capacity, enough to power more than 300 000 homes. The scale of this project is unprecedented, as are the benefits to National Grid. The cost and environmental savings involved are immense: 1.5 GW of extra capacity is enough renewable energy to power 1 000 000 homes, clearly supporting the UK's net zero ambitions.

Elsewhere, Slovenian Transmission System Operator ELES and Smart Wires are collaborating on a project that will see ELES' dynamic line rating (DLR) technology combine with Smart Wires' MPFC. The two technologies offer compelling synergies. DLR can identify which lines have available capacity and power flow controllers can then intelligently route power to those lines.

The companies anticipate a series of collaborative ventures on different sites. ELES' part of the collaboration will be managed by its recently launched member company Operato, focused solely on the implementation of SUMO DTR (dynamic thermal rating) technology.

SUMO DTR technology cost-efficiently monitors and predicts weather conditions along the whole line to calculate a transmission line's real-time rating. By using SUMO DTR's real-time ratings, transmission operators can use higher line ratings without endangering safety or reliability.

Since some circuits reach their maximum rating while others are well below their limits, balancing power flows can eliminate constraints and improve network transfers, which is where Smart Wires' MPFC comes in to push power off lines that are overloaded or pull power onto lines with spare capacity.

Combining these rapidly installed and low environmental impact technologies is the next logical step in grid innovation as our industry facilitates the energy transition.

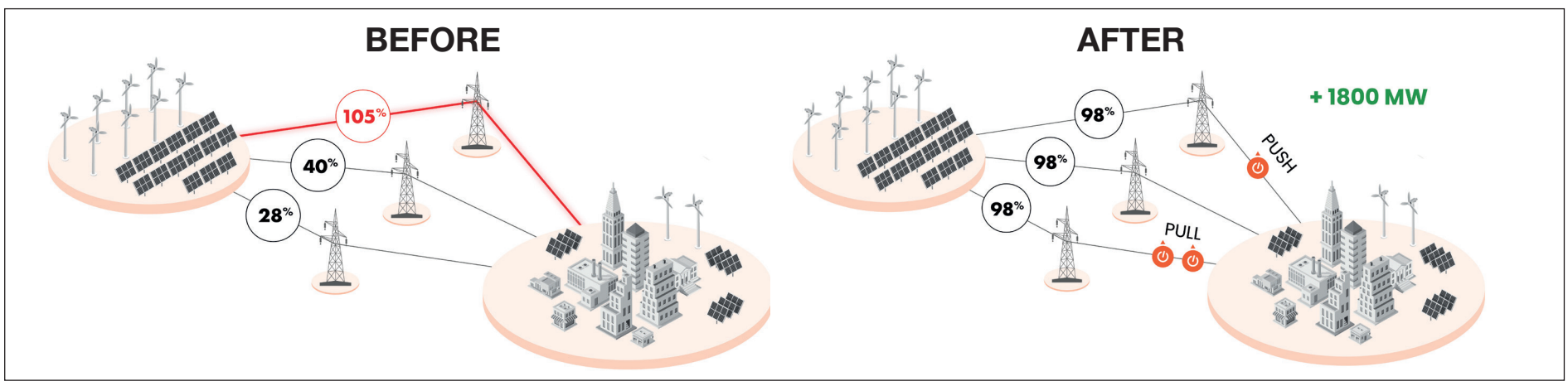
Innovative, grid enhancing technologies are providing the industry with incredibly flexible and high-impact solutions, which are ultimately delivering faster, cheaper and better ways to plan and operate power systems.

It's this type of holistic thinking and a use of multi-pronged approaches that we need to accelerate an affordable energy transition.

The transition is upon us, a critical evolution of technology and behaviour, and as Charles Darwin, the champion of evolution, so eloquently said: It is not the strongest or the most intelligent who will survive but those who can best manage change.

Michael Walsh is Chief Commercial Officer at Smart Wires.

SmartValve is a modular, transformerless static synchronous series compensator, with an integrated fast-acting bypass and flexible installation and control. Intelligent hardware causes power to be pushed off overloaded lines or pulled onto under-utilised lines



Junior Isles

The Pilgrim's Progress

In their march to Cornwall ahead of last month's G7 summit, pilgrims from the protest group Christian Climate Action (CAA) could in some ways be seen to be taking a leaf or two from English writer John Bunyan's 1678 Christian allegory. The aim of the group was to draw attention to "the vital need for more urgent action from the developed nations on climate change to protect creation". But there was probably little need. The world was already well aware that climate change was high on the agenda of leaders from the so-called Group of Seven wealthy nations.

During the run-up to the meeting in Carbis Bay, Cornwall, on the tip of England's southwestern coast, a prominent concern was that rich countries are coming up short on their pledges to help poor countries tackle climate change.

In 2009 at COP15, the most industrialised nations pledged to reach a level of $100 billion in aid each year by 2020 to help the poorest countries reduce their greenhouse gas emissions, for instance through investment in clean energy generation, and to adapt to the impacts of extreme weather such as floods and droughts. In Paris 2015, that goal was reaffirmed and extended for another five years, through 2025. But it is a promise the developed countries have failed to keep.

According to the most recent OECD progress report, climate finance provided and mobilised by developed countries for climate action in developing countries reached $78.9 billion in 2018 (the most recent year covered by the figures), up from $71.2 billion in 2017.

While the headline numbers make worrying reading, further examination in a report published in January this year by the international NGO, CARE International, offers cause for greater concern. Half of the pledged annual $100 billion is to be spent on helping vulnerable people and countries adapt to climate change but according to CARE, current official figures for adaptation finance are severely overstated and far too high.

Official OECD figures showed that in 2018 donors had committed just $16.8 billion of the pledged $50 billion for adaptation. Examining the OECD's figures, CARE calculates the number is significantly lower, at only $9.7 billion.

Together with civil society organisations in Ghana, Uganda, Ethiopia, Nepal, Vietnam and the Philippines, CARE assessed 112 projects, representing 13 per cent of total global adaptation finance between 2013-17. The research found climate adaptation finance to be over-reported by 42 per cent, which if applied to the remaining projects, would result in $20 billion of over-reporting across this time period.

The research shows large amounts of climate finance for projects that bear no relation to adaptation and that donors exaggerate the adaptation component of their projects, thereby over-reporting the amount they actually spend on climate adaptation. For example, its assessments reveal that Japan has over-reported its climate adaptation finance by more than $1.3 billion. This includes $432 million on projects that did not target climate adaptation, such as the 'Nhat-Tan Friendship Bridge' and the 'North-South Expressway Construction Project' in Vietnam.

Meanwhile, the World Bank has over-reported by $832 million in total, including $328 million on an Earthquake Housing Reconstruction Project in Nepal, says CARE. Although the project is primarily a response to a geo-hazard unrelated to climate change, 86 per cent of its budget is reported as finance for climate-change adaptation.

In a follow-up report, 'Hollow Commitments: An analysis of developed countries' climate finance plans', issued in June just ahead of the G7 meeting, CARE said: "One might expect rich countries to act when more than $20 billion still needs to be found annually if they are to realise their commitments. An appropriate response would be to ensure that their recently submitted reports showed precisely how much each country would increase their own climate finance to secure their common goal. Yet only three countries, Luxembourg, New Zealand and the United Kingdom, put forward numbers demonstrating a planned increase in their climate finance across multiple years."

It said the information provided by rich countries suggests that international climate finance will increase by just $1.6 billion in 2021 and 2022, compared to the amount provided in 2019.

The report concluded: "The overall picture is very clear: rich countries are not providing evidence that they will meet the promised $100 billion target from 2020 onwards."

Going into the Cornwall summit, the UK and the US were the only two G7 countries to have set out proposals to increase climate finance in recent months. In April US President Joe Biden, announced a doubling of climate finance from pre-Trump levels, to $5.7 billion by 2024. His predecessor had cancelled most of the nation's climate finance commitments during his term in office.

Several countries were called on to do more on increasing international climate finance. Brandon Wu, Director of Policy and Campaigns for ActionAid USA, said: "Many US groups and members of Congress are calling for an $800 billion commitment through 2030 as a down payment on the US' fair share of climate finance. This is the scale we need to be talking about to have any chance of avoiding the worst impacts of the climate crisis."

But despite the calls, the G7 outcome can only be described as disappointing. Leaders only again pledged to meet the existing annual target. They agreed to raise their current contributions to reach $100 billion a year through 2025, but only two nations offered firm promises of more cash.

Canada said it would double its climate finance pledge to C$5.3 billion ($4.4 billion) over the next five years while Germany will increase its by €2 billion to €6 billion ($7.26 billion) a year by 2025 at the latest.

Britain's Prime Minister Boris Johnson re-announced previously allocated cash, in the form of a £500 million blue planet fund for marine conservation, already set out last year.

The G7 also said it will provide up to $2.8 billion to help developing countries end coal fired power generation, although it is not clear whether this is new money. The G7 communiqué only said: "We welcome the commitments already made by some of the G7 to increase climate finance and look forward to new commitments from others well ahead of COP26."

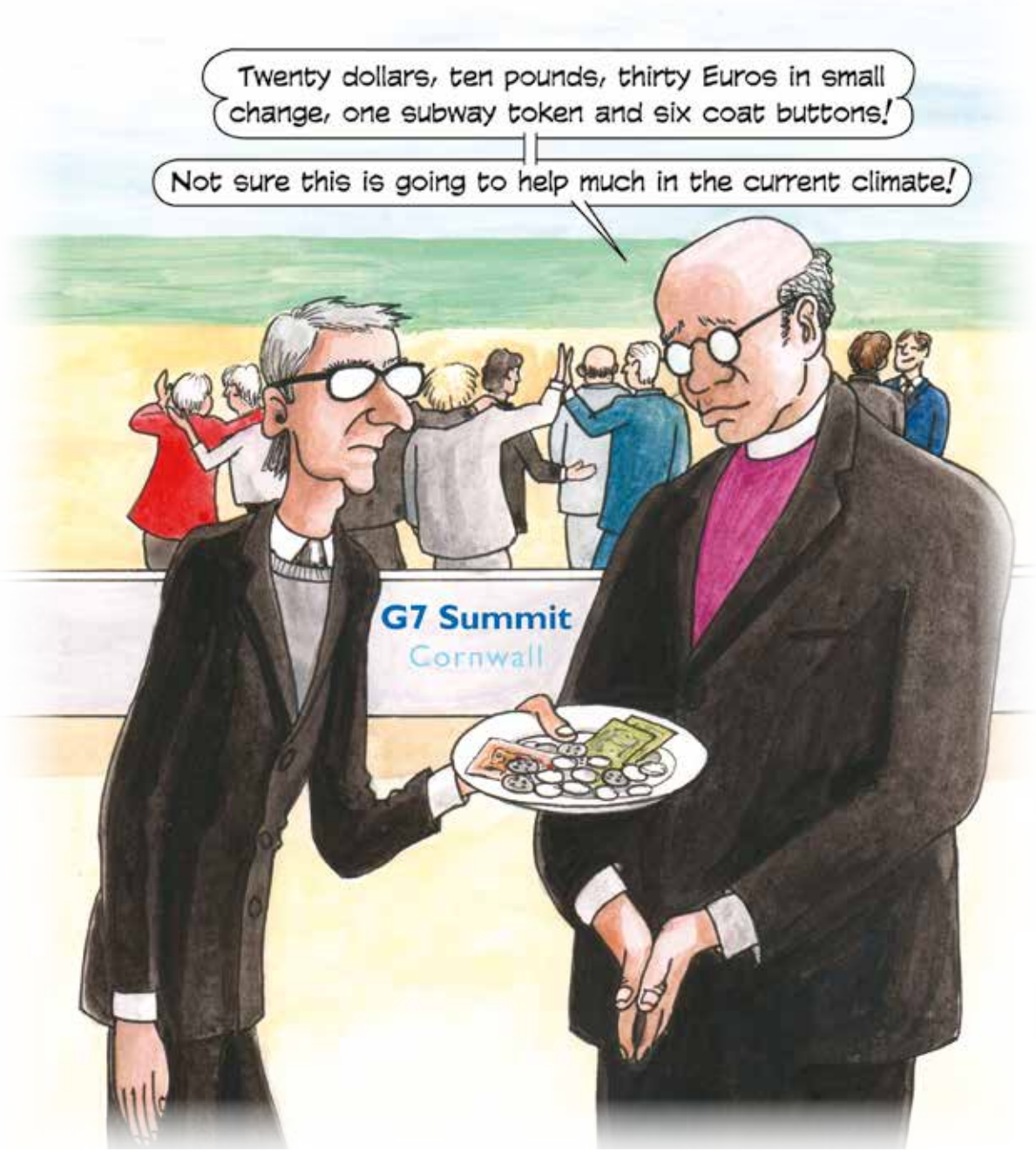
Green campaigners and leaders from developing nations, understandably, saw the failure to secure financing as a flop. Catherine Pettengell, Director at Climate Action Network, an umbrella group for advocacy organisations, said the G7 had failed to rise to the challenge of agreeing on concrete commitments on climate finance.

"We had hoped that the leaders of the world's richest nations would come away from this week having put their money where their mouth is," she said.

Malik Amin Aslam, Climate Minister of Pakistan, noted: "The G7 announcement on climate finance is really peanuts in the face of an existential catastrophe. It really comes as a huge disappointment for impacted and vulnerable countries like Pakistan – already compelled to ramp up their climate expenditures to cope with forced adaptation needs."

While some progress was made, the outcome of the G7 Summit leaves a difficult path ahead of COP26 in November. Securing net zero by 2050 to keep 1.5°C within reach, and adapting to protect communities and natural habitats needs developed countries to make good on their promises to mobilise the agreed climate finance each year.

The CCA's protest may not have been necessary but perhaps served some purpose. John Bunyan used *'The Pilgrim's Progress'* to deliver the main idea that the road to Heaven is not easy, the cost is great, and the true Christian must be willing to pay the cost no matter what. Whether you are religious or not, arguably, the same holds true for the journey to a carbon neutral world. The question is: are world leaders willing to bear the cost?



Cartoon: jemsoar.com