

# THE ENERGY INDUSTRY TIMES

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## Special Supplement

TEI Times hears how data centres can be an important part of the move to a low carbon energy economy.



## Financing Asia's decarbonisation

There is plenty capital available for decarbonising Asia but there will be bumps in the road. Joseph Jacobelli explains. *Page 14*



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Change is never easy but it's often necessary, says Junior Isles. *Page 16*



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# World leaders must bridge the gap at COP26

World leaders at the UN's COP26 climate summit in Glasgow are under pressure to increase ambition on climate change, as several reports reveal a huge emissions gap between national pledges to cut global warming gases and what is needed to limit global temperature rise to targets agreed in Paris. **Junior Isles**

As COP26 kicks off, clean energy progress is still far too slow to put global emissions into sustained decline towards net zero, warn several major reports issued ahead of this year's UN climate summit in Glasgow, UK.

In its latest 'World Energy Outlook (WEO) 2021', published as a handbook for the COP26 Climate Change Conference, the International Energy Agency (IEA) issues stark warnings about the direction in which today's policy settings are taking the world.

Governments will be in the spotlight at the COP26 over the next 10 days to meet a deadline of this year to commit to more ambitious climate pledges, in what could be the last chance to put the world on track to limiting global warming to below 2°C above pre-industrial levels and ideally to 1.5°C as agreed under the Paris Accord.

The IEA's annual flagship publication, shows that even as deployments of solar and wind go from strength to strength, the world's consumption of coal is growing strongly this year, pushing carbon dioxide (CO<sub>2</sub>) emissions towards their second largest annual increase in history with potentially disastrous effects.

In its 'Announced Pledges' scenario, which maps-out a path in which the net zero emissions pledges announced by governments so far are implemented in time and in full, demand for fossil fuels peaks by 2025, and global CO<sub>2</sub> emissions fall by 40 per cent by 2050. All sectors see a decline, with the electricity sector delivering by far the largest. However, the global average temperature rise in 2100 reaches 2.1°C, exceeding the 1.5°C ambition agreed in Paris in 2015.

"Today's climate pledges would

result in only 20 per cent of the emissions reductions by 2030 that are necessary to put the world on a path towards net zero by 2050," said Dr. Fatih Birol, the IEA Executive Director. "Reaching that path requires investment in clean energy projects and infrastructure to more than triple over the next decade. Some 70 per cent of that additional spending needs to happen in emerging and developing economies, where financing is scarce and capital remains up to seven times more expensive than in advanced economies."

Commenting on the IEA Outlook, Dr Simon Cran-McGreehin, Head of Analysis at the Energy and Climate Intelligence Unit (ECIU) said: "By showing that current policies fall well short of getting global warming in check by 2030 and providing a clear checklist of commitments that the UK

– as host of COP26 – will need to secure to keep 1.5°C of warming alive, the IEA are laying down a clear gauntlet for action on climate.

Shortly after the report, the Global Wind Energy Council released a manifesto at the Bloomberg NEF London summit calling on governments to "get serious" about the energy transition and work with the private sector to rapidly scale up wind and renewable energy installations.

The call came as the UN Environment Programme's (UNEP) 12th annual Emissions Gap report confirmed country pledges will fail to keep the global temperature rise under 1.5°C this century. The UNEP analysis suggests the world is on course to warm by around 2.7°C with hugely destructive impacts.

*Continued on Page 2*

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The UN World Meteorological Organization (WMO) also said that greenhouse gas concentrations hit a record last year and the world is “way off track” in capping rising temperatures.

The Emissions Gap report takes into account nationally determined contributions (NDCs) or carbon-cutting pledges submitted by 120 countries for the run-up to 2030, as well as other commitments not yet formally submitted in an NDC. It finds that when added together, the plans cut greenhouse gas emissions in 2030 by around 7.5 per cent compared to the previous pledges made five years ago.

“If there is no meaningful reduction of emissions in the next decade, we will have lost forever the possibility to reach 1.5°C,” said UN Secretary General Antonio Guterres.

In early October, global consulting firm Capgemini also revealed energy consumption and greenhouse gas emissions are on the rise again and called for realistic, affordable, plans to accelerate energy transition.



**Guterres: the possibility of limiting warming to 1.5°C could be “lost forever”**

In the 23rd edition of its annual report, the World Energy Markets Observatory (WEMO), created in partnership with De Pardiue Brocas Maffei, Vaasa ETT and Enerdata, Capgemini makes several recommendations to meet climate change goals whilst ensuring energy security of supply, and affordability for citizens.

These include setting ambitious but realistic energy transition plans; accelerating research in low carbon technologies; measuring the effect of actions taken; and paying special attention to cyber security.

The WEMO report followed a report published at the end of September by the Energy Transitions Commission (ETC), which set out the actions nations and companies could take during the 2020s to deliver the Paris agreement and limit global warming to 1.5°C.

The ETC’s report ‘Keeping 1.5°C Alive: Closing the Gap in the 2020s’, describes technologically feasible actions that could close that gap to a 1.5°C pathway and could be catalyzed by agreements in Glasgow.

It said many of the actions entail minimal cost and would spur further innovation and support green economic development; and all of them could be given impetus at COP26 via commitments from leading countries and companies, without the need for comprehensive international agreement. It stressed, however, that two high priority actions – ending deforestation and reducing emissions from existing coal plants – will need to be supported by climate finance flows from rich developed countries.

# Industrial nations can lead decarbonisation effort

- G7 can serve as first movers
- OECD to end support for unabated coal fired power plants

Junior Isles

The world’s developed countries must show leadership in tackling global climate change, says a new International Energy Agency (IEA) report.

According to the report ‘Achieving Net Zero Electricity Sectors in G7 Members’, G7 members are well placed to fully decarbonise their electricity supply by 2035, which would accelerate the technological advances and infrastructure rollouts needed to lead global energy markets towards net zero emissions by 2050.

The pathway laid out in the report underscores how the G7 can serve as first movers, jump-starting innovation and lowering the cost of technologies for other countries while maintaining electricity security and placing people at the centre of energy transitions.

“G7 leadership in this crucial endeavour would demonstrate that getting to electricity sectors with net zero emissions is both doable and advantageous, and would also drive new innovations that can benefit businesses and consumers,” said Dr. Fatih Birol, the IEA Executive Director. “G7 members have the financial and technological means to bring their electricity sector emissions to net zero in the 2030s, and doing so will create numerous spill-over benefits for other countries’ clean energy transitions and add momentum to global efforts

to reach net zero emissions by 2050. The new report builds on the IEA’s landmark Roadmap to Net Zero by 2050, which identifies key milestones, challenges and opportunities for G7 members. It was requested by the United Kingdom, which holds the G7 Presidency this year.

to reach net zero emissions by 2050.

The G7 accounts for nearly 40 per cent of the global economy, 36 per cent of global power generation capacity, 30 per cent of global energy demand and 25 per cent of global energy-related carbon dioxide (CO<sub>2</sub>) emissions.

According to the IEA’s pathway to net zero by 2050, renewables need to provide 60 per cent of the G7’s electricity supply by 2030, whereas under current policies they are on track to reach 48 per cent.

It says the G7 has an opportunity to demonstrate that electricity systems with 100 per cent renewables during specific periods of the year and in certain locations can be secure and affordable. “At the same time, increased reliance on renewables does require the G7 to lead the way in finding solutions to maintain electricity security, including seasonal storage and more flexible and robust grids,” the report states.

The IEA’s findings came as the Organisation for Economic Cooperation and Development (OECD) agreed to end support for unabated coal fired power plants. Specifically, the ban will

apply to officially supported export credits and tied aid for:

- new coal fired power plants without operational carbon capture, utilisation and storage (CCUS) facilities; and
- existing coal fired power plants, unless the purpose of the equipment supplied is pollution or CO<sub>2</sub> abatement and such equipment does not extend the useful lifetime or capacity of the plant, or unless it is for retrofitting to install CCUS.

Participants to the arrangement are Australia, Canada, the European Union, Japan, Korea, New Zealand, Norway, Switzerland, Turkey, the United Kingdom, and the United States.

At the end of September United Nations (UN) Secretary-General Antonio Guterres called on countries to rapidly shift towards decarbonised energy systems, redirect their fossil fuel subsidies to renewables and place a price on carbon.

“Investing in renewable energy – instead of spending billions on propping up fossil fuels – can create tens of millions of good jobs and empower the most vulnerable,” Guterres said.

“Every country, city, financial institution, company and civil society organisation has a role to play in building a sustainable and equitable energy future,” he said.

Companies continued to demonstrate their commitment to tackling

climate change, as analysis from BNEF revealed that through August, 111 of the 167 Climate Action100+ “focus companies” set a net zero or equivalent target, pledging to fully reduce and/or offset their emissions at a level equivalent to what they emit annually.

BNEF says these companies will reduce greenhouse gas emissions by 3.7 billion metric tons of carbon dioxide equivalent (GtCO<sub>2</sub>e) annually. This increases to 9.8 billion metric tons by 2050 – equivalent to over a quarter of global greenhouse gas house emissions today.

Kyle Harrison, head of sustainability research at BNEF, said: “Companies will be under the microscope for the path they take to achieving net zero emissions. The winners will be the ones that will – and already do – address their entire value chain, focus on tangible emission reductions and turn a net zero strategy into a new business opportunity.”

In late September funds managing nearly \$30 trillion in assets called on 1600 of the world’s most polluting companies to “urgently” set science-based emissions reduction targets.

■ The Court of Justice of the EU (CJEU) has ruled that the international treaty used by energy companies to claim compensation from member states that frustrate their investments is incompatible with EU law.

## Green finance labelling uncertainty still surrounds gas and nuclear

The spiralling cost of electricity has forced Brussels to take more time in considering how to classify nuclear power and natural gas under the EU’s landmark labelling system for green finance.

As EU member states call for slacker rules to help counteract the continent’s energy crisis, EU financial services commissioner Mairead McGuinness told the *Financial Times* that Brussels would delay its decision on how to deal with the energy sources under the so-called “taxonomy on sustainable finance”. The decision had been due this autumn.

Amid the ongoing debate on how to classify low carbon natural gas and

nuclear energy, which produces no CO<sub>2</sub> but creates nuclear waste, McGuinness said: “As we come to the end of the year there will be more pressure to resolve this. We don’t have a ready-made solution because this is, both technically and politically... one of those issues where you have very divided views.”

Environmental groups want the system to abide by scientific criteria to ensure the rules stamp out, rather than encourage, ‘green washing’ in the investment industry. Meanwhile pro-nuclear countries and pro-gas member states are demanding the taxonomy rules do not penalise technologies they say are vital in securing the transition

to net zero emissions.

McGuinness added: “We’re hearing from citizens and businesses about higher energy costs and keeping the lights on. We must make sure we don’t create fears that this transition is a problem because the transition is the solution.”

Speaking at Russian Energy Week last month, HE Yury Senturin, Secretary General of the Gas Exporting Countries Forum (GECF) said the current global energy crunch and the intensifying climate change debate highlight the serious need to embed natural gas as part of a long-term solution to energy market stability and transition.

“One of the most sensible, economically-viable ways to achieve sustained energy market stability, inclusive economic growth and Sustainable Development Goals is to consider natural gas as a destination fuel.”

Russia’s President Vladimir Putin, noted: “According to experts forecasts looking at a 25-year horizon, the share of hydrocarbons in the world energy balance may decrease from the current 80-85 per cent to 60-65 per cent. At the same time, the role of oil and coal will decrease. But the role of natural gas as the most environmentally friendly clean, transitional fuel will grow, including the development of the production of liquefied gas.”

## Hydrogen and CCS are winners under Brussels ruling

The European Parliament has issued updated rules to select which energy projects should be supported in a move to make cross-border energy infrastructure sustainable and in line with the EU Green Deal.

The Industry, Research and Energy Committee approved its position on the criteria and methodology for selecting energy projects of common interest (PCIs), such as high voltage transmission lines, pipelines, energy storage facilities or smart grids, which

would benefit from fast-track administrative procedures and be eligible to receive EU funds.

Members of the European Parliament supported funding the development of hydrogen infrastructure, including the construction of electrolyzers, as well as carbon capture and storage (CCS). They also propose to fund projects that repurpose existing natural gas infrastructure for hydrogen transport or storage.

Projects based on natural gas will no

longer be eligible for EU funding under the updated rules. However, a temporary derogation will allow, under strict conditions, natural gas projects from the fourth or fifth list of PCIs to be eligible for a fast-track authorisation procedure.

Despite making little progress in the power sector, CCS appears to be gaining momentum in hard-to-abate sectors. Last month a new climate report released by the Global CCS Institute said that in 2021, the total capacity of

the CCS project-pipeline increased for the fourth year in a row – by almost one third over the previous year.

CEO of the Global CCS Institute, Jarad Daniels, said: “As we accelerate toward net zero emissions by mid-century and establish clearer interim targets, CCS will be integral to the decarbonisation of energy, industrial sectors such as cement, fertilisers, and chemicals, and will open new opportunities in areas including clean hydrogen and carbon dioxide removal.



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# Offshore wind projects set for massive expansion as new auction areas open

- Federal and state plans each total 30 GW
- US targeted for floating wind investment

Janet Wood

The Biden administration has unveiled plans to open much of the US coastline for development of offshore wind energy. Seven areas on both coasts and the Gulf of Mexico will be auctioned for wind farms in the next few years. The wind farms are part of Biden's plan to generate 30 GW of offshore wind energy by 2030.

The auctions will be organised by the US Bureau of Ocean Energy Management (BOEM) which plans to auction leases by 2025. The likely Wind

Energy Areas are expected to be the Gulf of Maine, New York Bight, Central Atlantic, and Gulf of Mexico, as well as offshore of the Carolinas, California, and Oregon.

"The Interior Department is laying out an ambitious roadmap as we advance the administration's plans to confront climate change, create good-paying jobs, and accelerate the nation's transition to a cleaner energy future," said Interior Secretary Deb Haaland.

BOEM is also refining its process for identifying other areas that may

be suitable for offshore wind. "We are working to facilitate a pipeline of projects that will establish confidence for the offshore wind industry," said BOEM Director Amanda Lefton.

Alongside Federal plans, states could add a further 32 GW to offshore wind totals. Several have ambitious targets for delivery, including New Jersey (7.5 GW), New York (9.3 GW), Massachusetts (5.6 GW), Connecticut (2.1 GW), Rhode Island (1 GW), Maryland (1.6 GW), and Virginia (5.2 GW). California, meanwhile, recently signed into law an Act that requires

the California Energy Commission to evaluate the maximum capacity of offshore wind on or before 1 June 2022 and to establish offshore wind planning goals for 2030 and 2045.

Federal and state plans for the industry could offer a \$109 billion opportunity to businesses in the supply chain over the course of the next decade, according to a report from the Special Initiative on Offshore Wind (SIOW), an independent project at the University of Delaware. SIOW estimates that is the opportunity from the development, construction, and

operational phases.

Meanwhile, TotalEnergies and Irish floating wind specialist Simply Blue Group have launched a joint venture, TotalEnergies SBE US, targeting floating offshore wind projects in the US. "Offshore wind has arrived. To bring its full benefits to market, we need to go big and go deep," said Stephanie McClellan, Chief of Strategy & Policy, TotalEnergies SBE US. "TotalEnergies SBE US will accelerate development of US floating wind, and help states and the federal government meet their clean power goals."

## Iberdrola consortium leads bidding for Chile's first HVDC line



The tender process for the first long-distance high voltage direct current (HVDC) line in Chile has begun. The \$2.5 billion dollar project includes 1500 km of 600kV lines, with a capacity of 3000 MW, between the Kimal substation, in the Antofagasta region, and Lo Aguirre, in the Metropolitan region. Two direct current converter stations are expected to use Siemens technology. The winning consortium will be chosen on 13 December and the line is scheduled to be commissioned in 2028.

Among the entries in the tender is a consortium led by Iberdrola, which is targeting half of its investment in

electricity grids or other regulated assets between 2025 and 2030. The company has launched an investment plan of €150 billion over the next decade – €75 billion by 2025 – with which it will triple its renewable capacity and double its grid assets.

It holds 60 per cent of the bidding consortium in Chile, with partners Celeo and the Dutch pension fund APG. If Iberdrola wins the tender, it will be its first operation in Chile.

Iberdrola currently operates more than 1.2 million km of transmission and distribution lines and more than 4400 substations, supplying power to more than 34 million people.

## Mexico's coal retreat reversed

Mexico's new energy bill is set to reverse its coal phase-out, according to recent analysis. The country was among the first to announce the phase out of coal power by 2030, but a recent retreat from that promise means there will be little reduction in coal power capacity, falling from 6.02 GW in 2020 to 5.67 GW in 2030.

The Mexican Wind Energy Association and the Mexican Solar Energy Association warned that if a current electricity reform initiative is approved, the Mexican government would damage its renewable energy industry. The initiative, by President Andres Manuel Lopez Obrador, would give control of the sector to the Federal Electricity Commission and give

priority to state-owned hydroelectric plants and those that run on coal and oil.

Rohit Ravetkar, Industry Analyst at GlobalData, said: "Steps taken by the Mexican government such as not raising their targets for reducing CO<sub>2</sub> emissions under the Paris Agreement, passing an energy bill that favours electricity generation from fossil fuels and the purchase of two million tons of coal for power generation shows that power generation from fossil fuels is there to stay in the country for a long period of time. The government's lack of support for renewable technologies is expected to reduce the interest and investment of foreign companies in the country's renewable sector."

## Hydrogen initiatives planned across the Americas

- Wind to electrolysis projects on the drawing board
- US development cash for storage and nuclear production

Janet Wood

States in North and South America have joined the race to extract hydrogen using fast-expanding renewable energy facilities, with oil and gas companies often pivoting to produce green hydrogen.

The most ambitious was a new roadmap presented to the Colombian government, which would see it install up to 3 GW of electrolyzers by 2030.

Other plans, while smaller, are closer to development. In Argentina, Integración Energética Argentina (IEASA), the country's state-owned oil and gas company, recently announced an agreement with the German institute Fraunhofer to develop a project to produce green hydrogen in Bahía Blanca from wind generation, with a 200 MW wind farm providing power for the electrolysis.

IEASA's President, Agustín Gerez, said investment and construction is planned for the beginning of 2022. He said: "This sustainable energy project

will be the vector of the energy transition in Argentina and a great contribution to the reduction of carbon emissions globally, through its industrial application and eventual export of green ammonia, positioning our country as a central player in the goal of zero net carbon emissions by 2050."

In neighbouring Brazil, Engie has signed a memorandum of understanding (MoU) with the government of Ceara state to construct a facility at the Pecem industrial and port complex. The initial electrolysis capacity of the facility is expected to be up to 150 MW.

Uruguay's state-owned oil and gas company ANCAP has joined with the country's ministries of industry and environment, to announce a plan for green hydrogen production powered by offshore wind, which could see a tender launched in a couple of years. The new H2U Offshore programme requested potential partners to submit proposals.

Meanwhile, the US Department of Energy (DOE) plans to add to its

hydrogen investments with \$20 million to demonstrate technology that will produce clean hydrogen energy from nuclear power. The project, based in Arizona, will make progress on DOE's H2@Scale vision for clean hydrogen across multiple sectors and help meet the Department's Hydrogen Shot goal of \$1/kg in one decade.

"Developing and deploying clean hydrogen can be a crucial part of the path to achieving a net zero carbon future and combatting climate change," said Deputy Secretary of Energy David M. Turk.

Meanwhile Shell has joined McDermott's CB&I Storage Solutions, NASA's Kennedy Space Center, GenH2 and the University of Houston to demonstrate that a large-scale liquid hydrogen tank, with a capacity up to 100 000 m<sup>3</sup>, is feasible and cost competitive. The initiative has \$6 million of funding from the DOE's Hydrogen and Fuel Cell Technologies Office and \$3 million each from Shell and CB&I Storage Solutions.

## Infrastructure bill could clear US grid blockages

The US infrastructure bill could speed up investment in high voltage long distance transmission lines.

Transmission lines in the US are almost entirely regional, because the Federal Energy Regulatory Commission (FERC) does not have powers to overrule state and local planning commissions on where transmission lines are sited.

Local utilities tend to oppose proposals while states such as Texas are

unwilling to back high voltage lines that would be under federal instead of state jurisdictions.

The infrastructure bill extends FERC's authority so that it can overrule local commissions and expands the list of factors FERC can use to do that.

The bill also allows the Department of Energy to enter contracts for up to half of the power transmitted.

Steve Cicala, an energy economist

at Tufts University, said that even with the new powers, FERC and project developers will still have to jump through more hoops to approve transmission projects than they currently do for new oil and gas pipelines.

But he said: "there's enough private sector interest in building transmission lines, if only they could get approval for it", and that "streamlining this process is a lot more important than throwing money at it".

# China power crunch impacts global energy markets

- Power crunch comes as country stepping up climate change mitigation
- India facing possible power outages

Syed Ali

The impact of China's power crunch is being felt globally, as commodity prices remained elevated in late October, driven by high coal prices.

The country experienced power outages in September and a mandate to energy companies from government to secure power at all costs pushed coal and gas prices even higher. With winter on its way for much of the world and natural gas prices at record levels, economies are competing for a limited supply of coal.

Europe's coal use is expected to increase over the winter amid lower renewable energy production, record natural gas prices and planned nuclear reactor closures.

Meanwhile India is being hard hit and warned of possible power shortages. India is facing possible energy supply problems in the coming months due to coal shortages and a post-pandemic surge in demand, the

power minister said in a report.

"Normally the demand starts coming down in the second half of October... when (the weather) starts cooling," R. K. Singh told the *Indian Express* in an interview.

"But it's going to be touch and go," Singh said, calling demand for electricity "tremendous".

India's coal fired power stations had on average four days' stock at the end of September, the lowest in years. More than half the plants were on alert for outages.

In late October coal prices fell somewhat on news that China's National Development and Reform Commission (NDRC) would "study specific measures to intervene in coal prices" if they kept rising.

The power outages in China were a consequence of a head-on collision between strong electricity demand growth and China's policies to reduce both energy demand and emissions intensity.

China's power crunch has struck at a time when the country is stepping up climate change mitigation targets. Earlier this year it said it is aiming to reach a peak in its CO<sub>2</sub> emissions before 2030 and achieve carbon neutrality before 2060 – a target likely to be questioned at the UN COP26 climate change summit currently ongoing in Glasgow, UK.

In a weekly blog, Gavin Thompson, Wood Mackenzie Asia Pacific Vice Chair, wrote: "... the short-term reality is that China and many others have little choice but to increase coal consumption to meet power demand. Looking further out, China's economic and strategic push towards decarbonisation must support a greater role for gas, accelerate investments in renewables and increase the rate of nuclear build."

In its recently released report, 'An Energy Sector Roadmap to Carbon Neutrality in China', the International Energy Agency said China has made

notable progress in its clean energy transition, but still faces some significant challenges.

Coal accounts for over 60 per cent of electricity generation, and the country continues to build new coal power plants domestically. At the same time, China has added more solar power capacity than any other country year after year. It is the second largest oil consumer in the world, but it is also home to 70 per cent of global manufacturing capacity for electric vehicle batteries.

The China Roadmap sets out a pathway consistent with the enhanced ambitions that China announced last year in which CO<sub>2</sub> emissions reach a peak before 2030 and carbon neutrality is achieved before 2060.

The main drivers of emissions reductions between now and 2030 in this pathway are energy efficiency improvements, expansion of renewables and a reduction in coal use. Electricity generation from renewables, mainly

wind and solar PV, increases seven-fold between 2020 and 2060, accounting for almost 80 per cent of China's power mix by then. Industrial CO<sub>2</sub> emissions decline by nearly 95 per cent by 2060, with the role of emerging innovative technologies, such as hydrogen and carbon capture, growing strongly after 2030.

■ China has started construction on the first 100 GW phase of a solar and wind build-out that is likely to see hundreds of gigawatts deployed in the country's desert regions. The announcement was made by President Xi Jinping via video link at a United Nations Biodiversity Conference last month. While the location and construction timeline of the projects, or the total expected capacity or the number of subsequent phases, were not revealed, the scheme will represent a notable chunk of China's ambition of reaching more than 1200 GW of installed solar and wind capacity by 2030.

## Asian countries can reduce reliance on coal

According to a new report by the Centre for Research on Energy and Clean Air (CREA) and TransitionZero, close to 75 GW of excess fossil fuel capacity can be retired immediately without compromising reliable supply of electricity in four key countries – India, Bangladesh, Pakistan, and Sri Lanka.

The study found that 27 per cent of the total excess fossil fuel capacity (coal, oil and gas) in the modelled countries in 2021, can be considered overcapacity in South Asia. The high amount of overcapacity found in the study is a result of excessive investment in coal development, as construction has far outpaced actual demand growth within countries.

The report, 'Ripe for Closure', highlights how retiring excess fossil fuel capacity can result in immediate cost savings worth billions of dollars while improving system efficiency.

"Our analysis finds that South Asia has over 75 GW of excess fossil fuel capacity. This excess capacity can be phased out resulting in improved utilisation of other power assets as well as annual savings of over \$2.3 billion," CREA analyst Sunil Dahiya said.

Together, India, Bangladesh and Pakistan commissioned over 30 GW of coal, oil, and gas capacity between March 2018 and 2021. The report finds close to 29 per cent of excess installed fossil capacity.

"Our analysis finds that India has the largest overcapacity of fossil fuel in South Asia. Over 67 GW of coal fired capacity in India is found to be in excess. This is costing Indian rate payers over \$2.1 billion (Rs 15,780 crore) annually. Retiring 67 GW of excess coal-fired capacity will not only save billions of dollars but also help India improve its air quality," Dahiya told *IANS*.

In regulated electricity markets like those in South Asia, investments are

made through power purchase agreements (PPAs). Conventional fossil fuel generators are often shielded from market forces and receive fixed capacity charges and payments regardless of whether plants are utilised. Such payment policies make overcapacity a cost borne by consumers and can raise the overall cost of electricity.

An estimated \$2.3 billion in fixed operating and maintenance costs is spent despite no longer being necessary to meet peak demand.

Given the enormous potential savings in maintenance costs and benefits to human and planetary health, phasing out excess fossil fuel capacity and ensuring that future demand is met by renewable energy by halting additional fossil fuel projects is a crucial first step in the energy transition.

In August, the Asian Development Bank said it planned to work with private sector financial firms to buy and close coal fired power plants across Asia in a bid to help countries meet their climate targets. The plan was expected to be ready for the COP26 climate conference.

Last month the ADB approved a new energy policy to support universal access to reliable and affordable energy services, while promoting the low-carbon transition in Asia and the Pacific. ADB President Masatsugu Asakawa said energy is central to inclusive socio-economic development, but the expansion of energy systems has come at the cost of harmful impacts on the climate and environment.

"This new policy locks in our strong commitment that ADB will not fund new coal power production. Together with our elevated ambition to deliver \$100 billion in climate financing to our developing member countries in 2019-2030, it provides a clear path for ADB's contribution to an environmentally sustainable energy future."

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# Indonesia eyes transition away from coal

- Coal operators will be compensated
- PLN to build over 21 GW of new renewable capacity

Syed Ali

The Indonesian government is working on an energy transition plan to replace coal fired power plants with sustainable and green electric power plants, according to Deputy Minister of Finance Suhasil Nazara.

Under the energy transition plan, the government can request coal fired power plant operators to cease power plant operations whilst adhering to contract terms normally inked for a long-term period between the operators and state electricity company PT PLN, he affirmed. PLN earlier pledged to stop building coal plants by 2023

after finishing the 35 GW worth of projects it had in the pipeline.

After fulfilling its obligation to compensate the coal fired power plant operators affected by the scheme, the government will continue with the next stage to construct renewables-based power plants, he noted.

“We need to allocate a budget to compensate for the replacement of existing coal fired power plants and construct new sustainable power plants under the energy transition mechanism scheme,” Nazara said during a webinar in Jakarta last month. The minister said the move was “an indispensable step” to achieve zero carbon emissions by 2060

or sooner, whilst preventing losses to related parties.

Meanwhile, Director General of Electricity at the Energy and Mineral Resources Ministry Rida Mulyana confirmed that the government would no longer accept proposals for new coal fired power plant, as the future national energy policy will focus on renewable energy and a green economy.

“After 2030, no fossil fuel-fired power plant construction will take place, and all power plants will be new and renewable energy-based, Mulyana said.

A new Power Procurement Plan (RUPTL), approved by the Indonesian

government in October for state-owned electricity company Perusahaan Listrik Negara (PLN) for 2021-30, is expected to deliver 51.6 per cent share of renewable generating capacity in PLN’s generating mix.

Under the RUPTL, 40.6 GW of new capacity will be installed in the next 10 years, including 21 GW of renewables generating capacity and 19.6 GW of fossil-based generating capacity. The country will allow more private power companies or independent power producers (IPPs) to be involved in the development of new plants.

The planned additions could bring the share of renewable power in the

national mix to 25 per cent by 2030. At the end of 2020, it stood at 14 per cent and the country is aiming at 23 per cent by the middle of the decade.

“With the cost of building solar power systems becoming increasingly lower and construction time faster, to fulfil the 23 per cent target of renewables mix by 2025, the share of solar power systems is made bigger than in the previous RUPTL,” said Energy Minister Arifin Tasrif.

“In addition, the renewables mix target will be met by co-firing biomass at coal fired power plants with due consideration of the environment when providing feedstock,” he added.

## Japan OKs plan to push clean energy, nuclear to cut carbon

Japan has adopted a new energy policy. The new basic energy plan, adopted by the Cabinet, calls for drastically increasing use of renewable energy to cut fossil fuel consumption over the next decade as Japan pushes to achieve its pledge of reaching carbon neutrality in 2050.

The plan compiled by the Ministry of Economy, Trade and Industry says

Japan should set ambitious targets for hydrogen and ammonia energy, carbon recycling and nuclear energy. It also calls for promoting offshore wind power and use of rechargeable batteries that have potential for growth.

“We will mobilise all options” to achieve the emissions target, the plan states, adding that the “supply of stable and low-cost energy is a prerequisite”.

Since the 2011 Fukushima disaster, Japan has been undecided on the future of nuclear. It now says reactor restarts are key to meeting its emissions targets.

Japan has pledged to reduce its emissions by 46 per cent from 2013 levels, up from an earlier target of 26 per cent, to achieve carbon neutrality by 2050. It says it will try to push the reduction as high as 50 per cent to be in line with

the European Union’s commitment.

The energy plan says renewables should account for 36-38 per cent of the power supply in 2030, up from the current target of 22-24 per cent, and that newly introduced fuels such as hydrogen and ammonia should comprise 1 per cent. The target for fossil fuel use was slashed to 41 per cent in 2030 from 56 per cent. The plan said

Japan will reduce dependence on fossil fuel but did not set a timeline.

■ UK company SSE Renewables is to enter Japan’s offshore wind farm market through a \$208 million joint venture with local renewables company Pacifico Energy. The alliance will see the energy firms develop offshore wind projects in the country as it seeks to become net zero by 2050.

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## Australia to issue carbon credits for CCS projects

Australia is planning to issue carbon credits to ‘carbon capture and storage’ (CCS) projects.

In what it says is a world’s first, the government will award large-scale CCS projects with tradeable carbon credits, known as Australian Carbon Credit Units (ACCUs). Each ACCU will represent one tonne of carbon emissions avoided, and projects will be able to sell ACCUs to the Australian government at bi-annual auctions or on the private voluntary market.

Commenting on the move in its *Out-Law* newsletter Toby Evans of law firm Pinsent Masons, said: “CCS technology has the potential to assist in decarbonising some of Australia’s most carbon-intensive industries and should be supported in that aim. To that end, during our transition from fossil fuels to more carbon-neutral alternatives such as hydrogen and biofuel, we see the potential benefits of awarding carbon credits to appropriate large-scale projects in the interest of promoting the incorporation of CCS in fossil fuel projects which otherwise would have

proceeded without such harm minimising technology.”

The Clean Energy Regulator, an Australian statutory authority responsible for administering legislation to reduce carbon emissions in the country, is also entering a public consultation phase to further expand the range of activities eligible for incentives under the Emissions Reduction Fund, including hydrogen and ‘carbon capture use and storage’ (CCUS).

Australian is already at the forefront of hydrogen developments, with new projects regularly reported.

Last month Queensland’s state-owned CS Energy and its joint venture partner Japanese engineering firm IHI announced they will build a pilot renewable hydrogen plant with capacity of 50 000 kg per year from 2023.

Meanwhile, the Government of New South Wales (NSW) also announced the launch of the NSW Hydrogen Strategy – a plan to support its decarbonisation efforts and drive investments of more than A\$80 billion (\$58.8 billion) in the region.

The NSW government will offer incentives for hydrogen production and establish a network of hydrogen refuelling stations across NSW. NSW has already committed to offering A\$70 million for the development of hydrogen hubs in the Illawarra and Hunter regions.

Meanwhile, the Northern Territory Government also in October released its Renewable Hydrogen Masterplan, which will support the development of a local and export renewable hydrogen industry.

The Territory is looking to make use of its advantages such as high solar resources, vast land areas and an established energy production and export industry to drive the hydrogen industry, which could help both cut emissions and create economic growth.

The local government says the hydrogen sector in the Northern Territory could be similar to the existing export liquefied natural gas (LNG) market.

## Europe News

# UK publishes policies to drive move towards net zero goal

■ More investment in new nuclear, offshore wind ■ CCS clusters to receive funding identified

Janet Wood

The UK government has published a suite of policy proposals for decarbonisation, including a Net Zero Strategy that would see all electricity generated from low carbon sources by 2035. That included at least 40 GW of offshore wind and potentially up to 60GW, with 1 GW of floating offshore wind by 2030, and a promise to facilitate a Final Investment Decision on one new nuclear plant by the end of this parliament (two more years). The UK generated 43 per cent of its electricity from renewable sources in

2020 but gas fired power plants still account for a significant proportion, while ageing nuclear plants provide about 15 per cent.

Two industrial clusters, Hynet in the north west of England, and the East Coast cluster, in the north east of England, were named as lead projects to receive funding for carbon capture and storage (CCS) industrialisation and for hydrogen production, with Scotland's 'Acorn' project expected to be in a second phase.

In another step towards nuclear new-build the government said it will legislate to allow new nuclear power

plants to be funded under a regulated asset base (RAB) format. This would mean that consumers would begin to make payments to the plant owner from the start of construction, so that the long-lead time projects incur less finance cost.

Secretary of State Kwasi Kwarteng MP said: "Nuclear power is crucial to strengthening energy security and reducing our reliance on volatile fossil fuels. I've announced plans for a new finance model to encourage private investment and save consumers £30 billion on every large-scale nuclear project". The new model, which still

requires government legislation, is expected to apply first to Sizewell C.

The host of policy documents came from the UK's Department for Business, Energy and Industrial Strategy (BEIS), which was under pressure to publish policy proposals documents – some previously deferred several times – before the UN COP26 climate meeting in Glasgow.

Overall, the Net Zero package was welcomed. Chris Stark, Chief Executive of the UK's independent adviser on tackling climate change, the Climate Change Committee, said: "Overall, we see this as a big step forward.

It's ambitious and broad in scope, with credible mechanisms to drive delivery and scale up private investment."

Patrick Hall, Senior Research Fellow at Conservative-leaning think tank Bright Blue, said: "The government ought to be applauded for delivering one of the most comprehensive, economy-wide net zero strategies worldwide, and doing so before COP26. However, there is a lot in this strategy which has already been announced in previous publications from the government, and questions still remain as to how the government plans to deliver on some of its lofty ambitions."

## German plans for decarbonisation 'must be stepped up'

■ Ambition requires more than 'tinkering'  
■ Plans to close nuclear plants next year questioned

Germany must hike its wind and solar investment to achieve climate neutrality by 2045, according to the Ariadne project, a new study by various research and economic institutes.

The country has maintained investment in renewables, and a recent tender round was oversubscribed for the first time since 2020, eventually awarding contracts for 1.49 GW of onshore wind projects and 70 MW of biomass-fired plants. But electricity generation from wind and solar would have to be around 50 per cent above current targets for 2030, the study found, and the phase-out of coal as an electricity source would need to take place as early as 2030.

"Climate neutrality cannot be achieved overnight, which is why important decisions need to be made at the beginning of the next legislative period," said Gunnar Luderer, vice head of the Ariadne Project, at the

Potsdam Institute for Climate Impact Research (PIK).

Although renewable electricity and other green options are replacing fossil fuels, the transition has to speed up and infrastructure, vehicles and industry have to be updated, the study found. A new German Energy Agency report, Towards Climate Neutrality, found that 84 'tasks' to achieve the goal were all feasible but it would be "a huge challenge to orchestrate all these tasks in parallel". Chief Executive Andreas Kuhlmann commented: "The energy transition and climate policy must be better organised, the small-scale 'tinkering' we have seen in the past needs to be overhauled."

A third study, published by Germany's development bank KfW, estimated that Germany would need to invest around €5 trillion to reach its goal of achieving climate neutrality by mid-century.

The analyses come as plans to exit from coal as well as nuclear have opened a debate in Germany over the cost of the country's energy transition, with some activists saying it should ease the process by delaying next year's planned closure of its six remaining nuclear plants. Maintaining the nuclear fleet would allow exit from coal by 2028, ten years earlier than Angela Merkel's government has planned, according to a new report from Think Atom.

Meanwhile, Germany's Federal Network Agency has reduced the rate of return on capital for electricity and gas grids, amid more debate. The networks have to attract investors to fund expansion plans to accommodate the shift to renewables. The Agency said investment in the power grid will remain attractive to operators in the long term, but the rate reduction would lessen the burden for bill payers.

## France takes U-turn on nuclear, offers export to Poland

In a U-turn from previous plans to cut nuclear's contribution to France's energy mix from 75 to 50 per cent by 2035, President Emmanuel Macron has announced that France will invest €1 billion in nuclear power by the end of this decade. New nuclear will include large plants but Macron also said, "The number one objective is to have innovative small-scale nuclear reactors in France by 2030".

France also wants nuclear energy to be labelled as 'green' in the evolving EU green finance taxonomy.

Meanwhile Electricite de France (EDF) has put forward new proposals to build 'four to six' EPR reactors across two to three sites in Poland. Together they would have a capacity of 6.6-9.9 GW, which could meet up to 40 per cent of the current demand for electricity in Poland.

EDF said it wants to establish the principles for a Polish-French strategic partnership framework to support Poland's energy transition plan – required to meet the EU's Net Zero goal by 2050.

EDF said: "The programme would benefit from significant synergies with other EPR projects across Europe, in the spirit of a long-term European partnership between the Polish and French nuclear industries."

## Investors rush to invest in green hydrogen

Chemicals giant Ineos has announced that its subsidiary Inovyn is to build a 100 MW electrolyser to produce green hydrogen at Köln in Germany. The project forms part of more than €2 billion investment in green hydrogen announced by Ineos recently.

The investment would be used to produce green ammonia, develop power-to-methanol applications and be used for other processes.

Wouter Bleux, Inovyn Hydrogen Business Manager said: "This project builds on our growing hydrogen portfolio, aiming to accelerate the decarbonisation of energy, and supports our ambition to become a leading Hydrogen company."

Meanwhile, in the UK Protium

recently announced plans for a green hydrogen production facility in Tees-side. The plant could have up to 40 MW of electrolysis capability, along with hydrogen storage, and will be completed by 2026.

Chris Jackson, Chief Executive of Protium, said: "The growing hydrogen hub offers a faster route to market for the deployment of this clean energy source, so we're very excited to be part of the transition to a greener economy and future in the heart of Tees Valley."

The two projects are among a raft of European projects racing to cut the costs of green hydrogen in competition with other projects in South and North America (see page 4).

## Floating wind success prompts follow-on projects

The 50 MW Kincardine floating offshore windfarm in Scotland is now fully commissioned.

Jaime Altolaquirre, KOWL Project Director and representative of major investor Cobra, said: "Kincardine offshore windfarm has shown that the largest and most advanced wind turbines available can be installed on floating platforms in the challenging North Sea environment."

Now a Danish company has proposed building a larger floating wind farm off Scotland's Caithness coast. The Pentland project would comprise up to 10 turbines, totalling 100 MW. Work on the array could start in 2025, according to the company.

Other floating wind farms proposed around the UK include three 100 MW sites, two south of Pembroke and one

off the coast of Devon. The ScotWind offshore leasing round invited bids for developing both fixed and floating projects.

Elsewhere, Falck Renewables and BlueFloat Energy have partnered to develop floating offshore wind farms off the Italian coast, and begun seeking permissions for a project, the 1.2 GW Kailia Energia, in the waters off Brindisi.

Falck Renewables said Puglia was of strategic importance in the national context and in the developers' business plan. Toni Volpe, CEO of Falck Renewables, said: "Today we are bringing the floating offshore wind technology to Italy, demonstrating our commitment to achieving sustainable goals through the implementation of innovative technologies."

# UAE first Gulf state to pledge net zero by 2050

The United Arab Emirates is the first Gulf state to announce plans for net zero carbon emissions. Its commitment relies on the ability to roll out investment plans that marry economic and sustainability goals. **Nadia Weekes** reports.

The UAE has become the first Middle East and North Africa (MENA) country to set a target to reach net-zero carbon emissions by 2050, pledging to spend more than \$160 billion to achieve the goal.

Under the "UAE Net Zero by 2050 Strategic Initiative", which was announced in October at the Expo 2020 event in Dubai, Sheikh Mohammed bin Rashid al-Maktoum, Vice President and Prime Minister of the UAE, said the UAE would invest more than Dh600 billion (\$160 billion) in renewable energy "to seize the opportunity"

to cement its leadership on climate change within the region.

The UAE, which has set a target for 50 per cent of its energy to come from clean energy sources by 2050, has developed several renewable energy projects in recent years. In Dubai, more than 400 MW of renewable generating capacity has been installed since 2016 under the Shams rooftop solar programme.

The Government Accelerator for Climate Ambition and Economic Development programme, which started earlier this year, took a holistic

approach to developing a framework for the UAE's pathway to net zero, leveraging strategies for green economic growth and job creation.

"The UAE Net Zero Strategic Initiative is an open invitation to the world to collaborate with the UAE in developing practical solutions, boosting multilateralism, and creating opportunities for sustainable socio-economic development," said Dr Sultan Al Jaber, UAE Minister of Industry and Advanced Technology and Special Envoy for Climate Change.

"Critically, we will leverage the de-

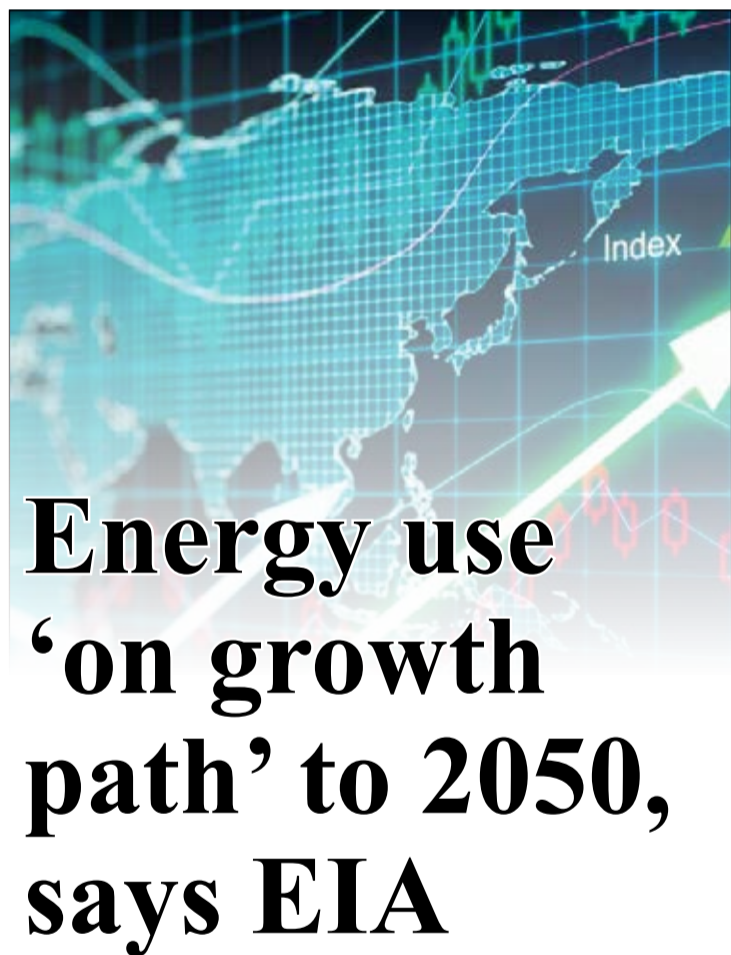
velopment pathway to net zero as a vehicle to create economic value, increase industrial competitiveness and enhance the UAE's standing as an attractive destination for investment," he added.

The UAE Net Zero by 2050 strategic initiative aims to align with the needs and priorities of the key economic sectors in the country, and support their efforts to benefit from green-growth opportunities.

"Our announcement of the Net Zero 2050 strategic initiative is consistent with our drive to diversify and build

a knowledge-based economy, adopt the principles of a green and circular economy, protect the environment, attract foreign direct investment, and develop competencies in future growth areas," said Mariam Almheiri, UAE Minister for Climate Change and Environment.

Federal and local government authorities will be responsible for preparing comprehensive studies and developing plans that introduce the measures necessary to reduce emissions while also ensuring sustainable economic growth.



## Energy use 'on growth path' to 2050, says EIA

Strong economic growth and larger populations will drive increases in global energy-related carbon dioxide emissions and energy consumption through 2050, according to the reference projection in the International Energy Outlook 2021 by the US Energy Information Administration (EIA).

Liquid fuels and renewable energy sources will meet much of the increase in energy consumption under the reference scenario, with liquid fuels remaining the largest energy source but renewable energy growing to nearly the same level.

IEO2021 analyses long-term world energy markets in 16 regions through 2050. It also includes side cases that explore differing assumptions of economic growth and crude oil prices.

It finds that industry and transport will be the main drivers of energy consumption. Internal combustion engine vehicles will peak in 2023 for OECD

member countries and in 2038 globally, as electric vehicle sales grow through 2050.

Energy-related CO<sub>2</sub> emissions are also projected to rise over the period, according to the IEO2021 reference case. Oil and natural gas production will continue to grow, mainly to support increasing energy consumption in developing Asian economies.

Electricity generation will almost double in the developing non-OECD countries between 2020 and 2050. This generation will come largely from renewable resources, which are increasingly being adopted because of falling technology costs and favourable laws and regulations.

Dispatchable generation sources such as natural gas and coal fired generating technologies will remain important according to the EIA Outlook. Together with batteries, they will play a significant role in supporting grid reliability.

## Energy storage capacity to top 740 GWh by 2030

- Global growth to accelerate through decade
- Technology key to capturing stable revenue streams

Global energy storage capacity could increase at a compound annual growth rate (CAGR) of 31 per cent, reaching 741 GWh of cumulative capacity by 2030, according to Wood Mackenzie's latest Global Energy Storage Outlook.

Front-of-the-meter (FTM) storage is forecast to continue to dominate annual deployments, accounting for up to 70 per cent of annual total capacity additions for the rest of the decade.

The effects of the coronavirus pandemic are expected to have a negative impact on growth in the early 2020s, "but growth will likely accelerate in the late 2020s, to enable increased variable renewable penetration and the power market transition," said Wood Mackenzie principal analyst Rory McCarthy.

As energy storage is still a nascent market, stakeholders are interested in continuing to invest in the sector and do not appear to be hindered by economic recession impacts, the report finds.

"Investment decisions are likely to be pushed back in some cases, but the general trajectory of the power market transition and the need for energy storage to enable this has not changed,"

McCarthy said.

"If anything, the transition may be accelerated as governments around the world grapple with how to recover their economies more sustainably than in the past with upside for the energy storage industry."

The US maintains its pole position and will make up over 49 per cent or 365 GWh of global cumulative capacity by 2030. In the past two years, the majority of utilities have dramatically shifted planned resources towards renewables and storage due to cost and state-driven clean-energy goals.

China is also expected to see its cumulative storage capacity grow exponentially. It will account for 21 per cent or 153 GWh of global cumulative capacity by the end of the decade. The ancillary services market will attract hybrid storage installations in China from 2020 to 2025 thanks to government policy requiring solar and wind developers to make up the costs for building stable and grid-friendly renewable generation assets.

Firming renewables capacity to reduce curtailments is the second most important driver in Australia, China, South Korea and Japan. Energy arbitrage makes up additional revenues

for storage as more Asia Pacific power markets may be fully liberalised from 2025 to 2030.

Europe's growth story is expected to be slower than its global counterparts, with frequency response auctions one of the key revenue streams.

"Storage holds the key to strong renewables growth. The question is whether storage can capture stable long-term revenue streams. Low-cost and longer duration storage can increasingly out-compete coal, gas and pumped hydro, enabling higher levels of solar and wind penetration. However, most lithium-ion energy storage systems economically max out at 4 to 6 hours, leaving a gap in the market," said Wood Mackenzie senior analyst Le Xu.

The future of energy storage will require safe, low-cost batteries, with battery manufacturing splitting between stationary and electric vehicle batteries due to differing needs cases. LFP (lithium iron phosphate) is poised to overtake NMC (nickel manganese cobalt) as the dominant stationary storage chemistry within the decade, growing from 10 per cent of the market in 2015 to more than 30 per cent in 2030.

## Contracts awarded for \$1.8 billion Egypt-Saudi Arabia grid project

The Egyptian Electricity Transmission Company (EETC) and Saudi Electricity Company have been awarded contracts worth \$1.8 billion to implement a project to link their countries' power grids and allow the exchange of up to 3 GW of electricity.

Under an agreement with EETC, a consortium of Egypt's Orascom Construction and Hitachi ABB Power Grids will execute all the work in Egypt related to the project. A consortium of Hitachi ABB Power Grids and Saudi Services for Electro Mechanic

Works (SSEM) will execute the related work in Saudi Arabia.

The companies said the project will provide power to over 20 million people in Egypt and 2.3 million households in Saudi Arabia.

Completion of the project's first phase is scheduled for 2024, with a total installed capacity of 1.5 GW, according to the Egyptian construction company.

As both countries increase their reliance on renewable energy, this linkage will constitute a safety net for their

two power grids to tackle variable generation.

The project will have a peak load of 3 GW with a 500 kV high voltage direct current (HVDC) technology, consisting of three high voltage power stations in East Madinah and Tabuk in Saudi Arabia, and one in Badr, East Cairo, Egypt.

The three stations will be connected by overhead transmission lines, stretching nearly 1350 km, and 22 km of undersea cables in the Gulf of Aqaba.



# Transitioning beyond data

The growing number of data centres and their high energy consumption presents a conundrum for a world that has to cut carbon emissions while satisfying the need to handle increasing amounts of data. Siemens Energy argues that data centres can do more than just handle data; they can also be an important part of the move to a low carbon energy economy.

**Junior Isles**

As the world's demand for increasing amounts of data processing grows, so too does the need for data centres. In recent years, the energy consumption and corresponding carbon footprint of these facilities has come to the attention of the public. Yet, the explosive growth in data centres need not be a problem. Instead, data centres can play a positive role in the global energy transition.

The International Energy Agency (IEA) estimates that electricity demand for global data centres in 2019 was around 200 TWh, or about 0.8 per cent of global final electricity demand.

The IEA predicts an electricity demand for hyperscale and colocation data centres (where a company rents space within a data centre) to grow from 70 TWh in 2019 to 93 TWh in 2022 globally. This translates to approximately 3 GW additional demand on a yearly basis.

Today that growth, which is partly due to increasing digitalisation and cloud-based services, is being intensified by the Covid-19 pandemic's acceleration of the transition to working from home, teleconferencing, online shopping, video streaming, and other data-intensive activities.

Other potential geopolitical moves could also have an impact. For example, the EU believes that its data should be stored within the bloc instead of in the US. This will drive growth in Europe. Asia is also thinking along the same lines and the region is expected to see the most growth globally.

According to a report released this year by French think-tank, The Shift Project, the annual electricity usage of just five tech groups – Amazon, Google, Microsoft, Facebook and Apple – is about as much as New Zealand's, at more than 45 TWh. As demand continues, so too does the

potential for generating carbon emissions. According to the report, carbon emissions from tech infrastructure and the data servers that enable cloud computing now exceed those of pre-Covid air travel.

Estimates suggest tech-related emissions are rising by 6 per cent annually, and public pressure is prompting some companies to act. Big tech companies are investing in renewable power like solar panels on their roofs and solar fields nearby or even wind farms mostly connected via virtual Power Purchase Agreements (PPAs).

Hyperscale (bigger than 5000 servers and 10 000 ft<sup>2</sup>) data centre operators in particular are leaders in corporate renewables procurement, particularly through PPAs. The top four corporate off-takers of renewables in 2019 were all ICT companies, led by Google.

Christoph Schuenemann, who leads Siemens Energy's Competence Centre for data centres in the Generation Division, has been working with a growing number of companies on how to decarbonise the power supply of their data centres.

He commented: "This [data centre] sector is very interesting from two aspects. Firstly, almost every day we are seeing new megawatt-scale data centres – typically between 25 MW and 400 MW – either being planned or erected somewhere. The IEA has forecast this will call for an additional 3 GW per year but we think it could be more, based on the drivers.

"In addition to these hyperscale and colocation data centres, there's another trend that will come in the future – edge data centres. These will be smaller, in the kW range, setup so data is close to the users, for example in urban situations and industrial locations.

"Secondly, we are seeing those big tech companies like Google, Apple



**Schuenemann says there is a boom in data centres and power demand, at the same time as a need for decarbonisation**

and Microsoft, sign up for renewable PPAs to help meet their zero carbon targets – most have targets for 2030. So on one hand, there is this boom in data centres and power demand, and on the other there is this need for decarbonisation via low and better zero carbon power supply solutions for existing and future projects.

"This decarbonisation plan is now becoming even more concrete, so to speak. Instead of buying green certificates on an annual basis, companies are really analysing what part of their energy is really green and what is grey by monitoring their consumption hour-by-hour."

Earlier this year more than 100 global companies, including PwC, Microsoft and Google, announced they are taking part in a new worldwide initiative led by the independent non-profit EnergyTag, aimed at verifying clean energy sourcing on an hourly basis.

Typically data centres are built in locations based on internet nodes, where there is a high latency of data, so cities such as Frankfurt, London, Amsterdam, Paris Dublin (FLAPD markets) are the most popular with increasing growth in the Asia Pacific region. The data centre owner also has to look at how it will be powered, so the electricity connection – connection point, generation, voltage level, etc., – has to be assessed before power is purchased from the supplier. At the same time backup power solutions are installed, e.g. small diesel or gas engines along with fuel tanks supported by signed contracts to ensure fuel supply is always available.

If the data centre is in a more remote area, it may be that the owners build their own decarbonised hybrid generating facility. "In the US, for example, a company is planning data centres in areas where there is space to locate solar PV, with batteries for backup," noted Schuenemann. "But this can't

work if the data centre is in a location where there is a high latency of data required, which is usually in metropolitan areas where limited space is available."

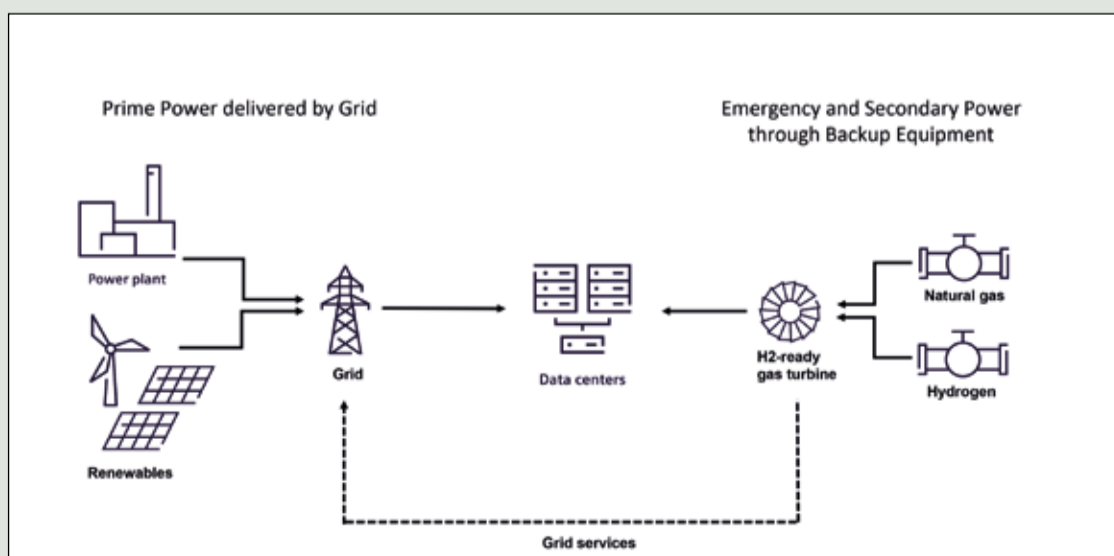
Building and operating a 25-400 MW power plant to serve a data centre is usually not the business of a big tech company. Nevertheless, securing firm power contracts from utilities is often a challenge.

"Ireland's EirGrid has published a data centre connection policy, which says that a data centre connection customer can get a connection and receive power, but only on a flexible basis. So you don't know when or how much power you will get," said Schuenemann. "However, they have said that if you want a firm contract, you need to install reliable and dispatchable gas-based power generation at your data centre."

This, he says, is an "interesting move" by EirGrid in terms of how the power sector is developing in Ireland "because the data centre now becomes part of the solution and not the problem".

Offshore wind will play a significant role in Ireland's decarbonisation. According to its National Energy & Climate Plan, Ireland aims to develop 5 GW of offshore wind by 2030. And with its newly published climate bill, the Irish government aims to reduce total carbon emissions by more than 50 per cent by 2030 compared to 2018. It also commits Ireland to climate neutrality by 2050.

According to Schuenemann, every data centre will help this push for more green power. "Green power fluctuates – the wind is not always blowing and the sun is not always shining. So with this policy that the data centre will have its own generation, it will not only provide power for the data centre to operate but also support stabilisation of the grid. So essentially the data centre can be



**Backup power solutions such as gas turbines can be installed to ensure power is always available**

## Special Technology Supplement

part of the solution in a decentralised electricity grid on the way to decarbonisation.”

According to the Sustainable Digital Infrastructure Alliance, by the beginning of 2030, data centres are estimated to account for up to 13 per cent of global electricity consumption, noting that the inefficient use of equipment is creating unnecessary waste and costs. On a global average, eight out of ten servers are idling while still consuming energy, it says. Yet it sees digital technology as one of the keys to solving the world's most pressing problems, be it the distribution of resources, social mobility or climate change.

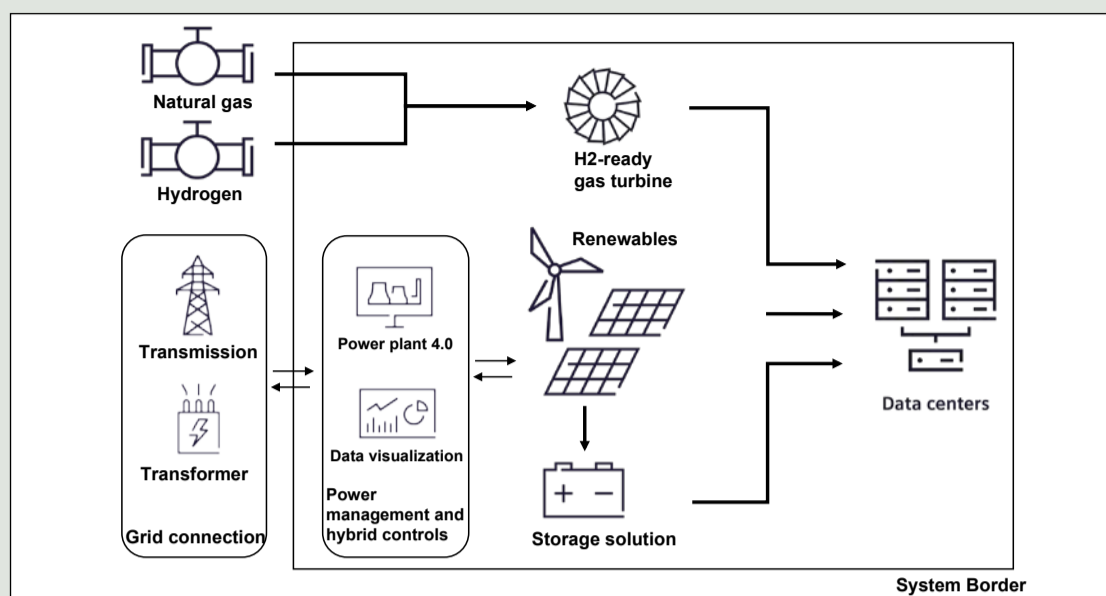
Certainly cooperation between data centre owners, governments, utilities and power plant technology suppliers could help optimise the overall energy system and address climate change. To ensure data centres are an integral part of the sustainable future of Europe, the European Data Centre Association (EDCA), an organisation comprised of data centre operators and trade associations, have agreed to make data centres climate neutral by 2030. Their aim is to leverage technology and digitalisation in support of the European Green Deal's goal of making Europe climate neutral by 2050.

On clean energy, data centres will match their electricity supply through the purchase of clean energy. Data centre electricity demand will be matched by 75 per cent renewable energy or hourly carbon-free energy by December 31, 2025 and 100 per cent by December 31, 2030.

Although data centres are making serious steps to power their operations by green energy, typically they often still have diesel gensets for backup power if the grid fails. However, in many parts of the world these engines are not permitted to run for more than 300 hours per year due to their high emissions. This means diesel gensets are not a suitable technology to firm up fluctuating renewable power.

In terms of reliable, self-generation alternatives, large lithium-ion batteries may become the default in the future but there will still be situations when battery storage is insufficient – Li-ion batteries cannot be refilled with fuel and therefore can only cover power supply for periods of hours to a day. Schuenemann says there are several alternatives in such scenarios.

“We are applying existing technologies such as gas turbines and also looking to work with customers on new technologies in our focus area, for example, storage and hybrid



countries,” Schuenemann added.

The use of hydrogen as an energy vector is gaining momentum as the amount of renewables on the grid rises and sustainable hydrogen and its derivatives (e-ammonia, e-fuels) are being introduced in several other sectors such as industry and mobility. Eventually, hydrogen is also expected

with green hydrogen likely being used in other sectors of the economy first, we expect new gas turbine plants being built today to switch gradually to hydrogen over their life time. This requires provisions for a later retrofit to hydrogen as a fuel, a concept called H2 readiness”, said Schuenemann.

Siemens Energy has been working on adapting its gas turbines to run on hydrogen for a number of years now, and has released a hydrogen blending capability with natural gas in DLE (dry low emissions) mode between 30 and 75 per cent by volume, depending on the gas turbine model. The company has set out a roadmap for achieving a 100 per cent hydrogen capability in DLE mode by 2030 at the latest.

Notably, Siemens Energy has a demonstration project under execution in France known as HYFLEX-POWER that will play a key role in demonstrating full decarbonisation of its gas turbines. The project, which is being hailed as the world's very first industrial-scale power-to-X-to-power demonstrator with an advanced 13 MW SGT-400 hydrogen turbine, will demonstrate the importance of using hydrogen as a long-term energy storage technology for a grid that has a high renewables penetration.

Where provision and storage of sustainable hydrogen is not possible, other decarbonised fuels like synthetic e-fuels or biofuels may – albeit more expensive or less sustainable – also become an option for gas turbines.

The high cost of green fuels can be mitigated by configuring these turbines as high efficiency combined cycle plants. But with such fuels not yet widely commercially on viable,

**Siemens Energy is applying existing technologies such as gas turbines and also looking to work with customers on new technologies in its focus areas, for example, storage and hybrid power plants**



**Aeroderivative SGT-A05: Gas turbines have a higher power density than reciprocating engines**

This self-regulatory initiative focuses on, among other things, energy efficiency and clean energy.

Under its ‘Climate Neutral Data Center’ pact, the EDCA says data centres and server rooms in Europe shall meet a high standard for energy efficiency, which will be demonstrated through aggressive power use effectiveness (PUE) targets. PUE describes the ratio of IT power vs. total power including cooling power.

By January 1, 2025 new data centres operating at full capacity in cool climates will meet an annual PUE target of 1.3, and 1.4 for new data centres operating at full capacity in warm climates. Existing data centres will achieve these same targets by January 1, 2030. These targets apply to all data centres larger than 50 kW of maximum IT power demand.

In recognition of the European Commission's interest in creating a new efficiency metric, trade associations will work with the appropriate agencies or organisations toward the creation of a new data centre efficiency metric. Once defined, trade associations will consider setting a 2030 goal based on this metric.

“There are various ways to increase PUE, including avoiding transmission losses by, for example, direct current to direct current connections from the power source to the servers” Schuenemann mentioned.

power plants, and other forward looking technologies like hydrogen fired gas turbines or fuel cells,” he said.

Schuenemann notes, that the natural gas option is attractive because not only is it lower carbon than diesel, but it also offers the possibility of being easily converted to a carbon-free fuel in the future. Gas turbines have a higher power density than reciprocating engines and are also fuel flexible; they can run on liquid fuels including bio diesel as well as gaseous fuels such as natural gas and hydrogen. This ability to run on hydrogen brings a big opportunity to decarbonise gas.

“Natural gas is a fossil fuel but with lower carbon dioxide emissions than diesel. Also, gas turbines compared to gas engines have lower methane slip and so release less methane into the atmosphere,” he explained. “Gas turbines can start quickly without major pre-warming, are dense in power and have high availability and reliability and also have the versatility to switch fuels online. This makes them attractive.

“Ireland, for example has a vision to have 50 per cent of its gas demand carbon-free by 2050,” noted Schuenemann. Part of the plan for achieving this is by investing in new technologies to facilitate substitution with a sustainable gas (e.g. hydrogen), into the gas network. “This approach by Ireland may also be valid for other

to play a role as a fuel for gas turbines – replacing fossil fuels for the residual load to enable large-scale, long-term seasonal storage of renewable energy and deep decarbonisation of the power sector.

“Even if re-electrification of hydrogen is not cost-economical today,



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## Special Technology Supplement



**Fuel cells are another clean option for data centres. BBC Studios Natural History Unit has used a GeoPura solution in place of diesel gensets for critical and back-up power**

Siemens Energy says natural gas would be today's fuel to allow low emissions per electricity unit generated, with the e-fuel being mixed in as it becomes available. With waste heat utilisation overall energy conversion efficiency can be in the order of 80-90 per cent. Such solutions, however, are complex and may only be suited to very specific requirements of a data centre.

Siemens Energy says fuel cells are another clean option for data centres. Through its partnership with GeoPura, the company can deliver such systems for events and other situations where green onsite power is needed. In

September last year, the partners delivered a hydrogen-powered fuel cell to provide off-grid power and heat to National Grid's UK Viking Link construction site in Lincolnshire. The installation served the site for eight months when the remote site was without a grid connection. Also BBC Studios Natural History Unit have used a GeoPura solution in place of diesel gensets for critical and back-up power whilst filming on location.

"With improving economies of scale, this is becoming an interesting solution, especially when considering its high efficiency, modularity and potential high power density," said

Schuenemann. "Its modularity means you can size the installation to better match the power needs at high efficiency."

The other interesting technology for data centres, is waste heat utilisation. Data centres generate significant amounts of heat and therefore require cooling systems.

Schuenemann explained: "It may be there is air conditioning and cooling of the servers. If you have a 100 MW data centre, depending on the location, you will need to add 40 per cent for the air conditioning and cooling. The waste heat released to the atmosphere from the cooling system outside of the building should be better re-used via heat pumps, which can boost the heat to a higher temperature level so it can be sold to an industrial customer or fed to a district heating network."

He noted that waste heat is cur-

rently not subject to carbon taxes in most countries where it is produced by fossil power plants and is a more sustainable form of producing heat than just burning fossil fuels. This can provide a business opportunity in the future for facilities like data centres, which together with local partners such as municipalities, can sell otherwise wasted heat to further drive decarbonisation.

As the world goes through the energy transition, it is clear data centres have a role to play. Looking at technologies to support the power needed for their burgeoning growth, combined with the business opportunities presented by the implementation of those technologies, data centres no longer need to be seen as part of the climate challenge. On the contrary, they could be integral to helping the world meet those challenging climate targets.



**Waste heat released to the atmosphere from the cooling system outside of the building should be better re-used via heat pumps, says Schuenemann**



**As the world goes through the energy transition, it is clear data centres have a role to play**

## Satisfying the thirst for data

According to an International Energy Agency (IEA) report, global internet traffic surged by almost 40 per cent between February and mid-April 2020, driven by growth in video streaming, video conferencing, online gaming, and social networking. This growth comes on top of rising demand for digital services over the past decade: since 2010, the number of internet users worldwide has doubled while global internet traffic has grown 12-fold or around 30 per cent per year.

Demand for data and digital services is expected to continue its exponential growth over the coming years, driving massive growth in demand for data centre and network services. Global data centre electricity demand in 2019 was around 200 TWh, or around 0.8 per cent of global final electricity demand.

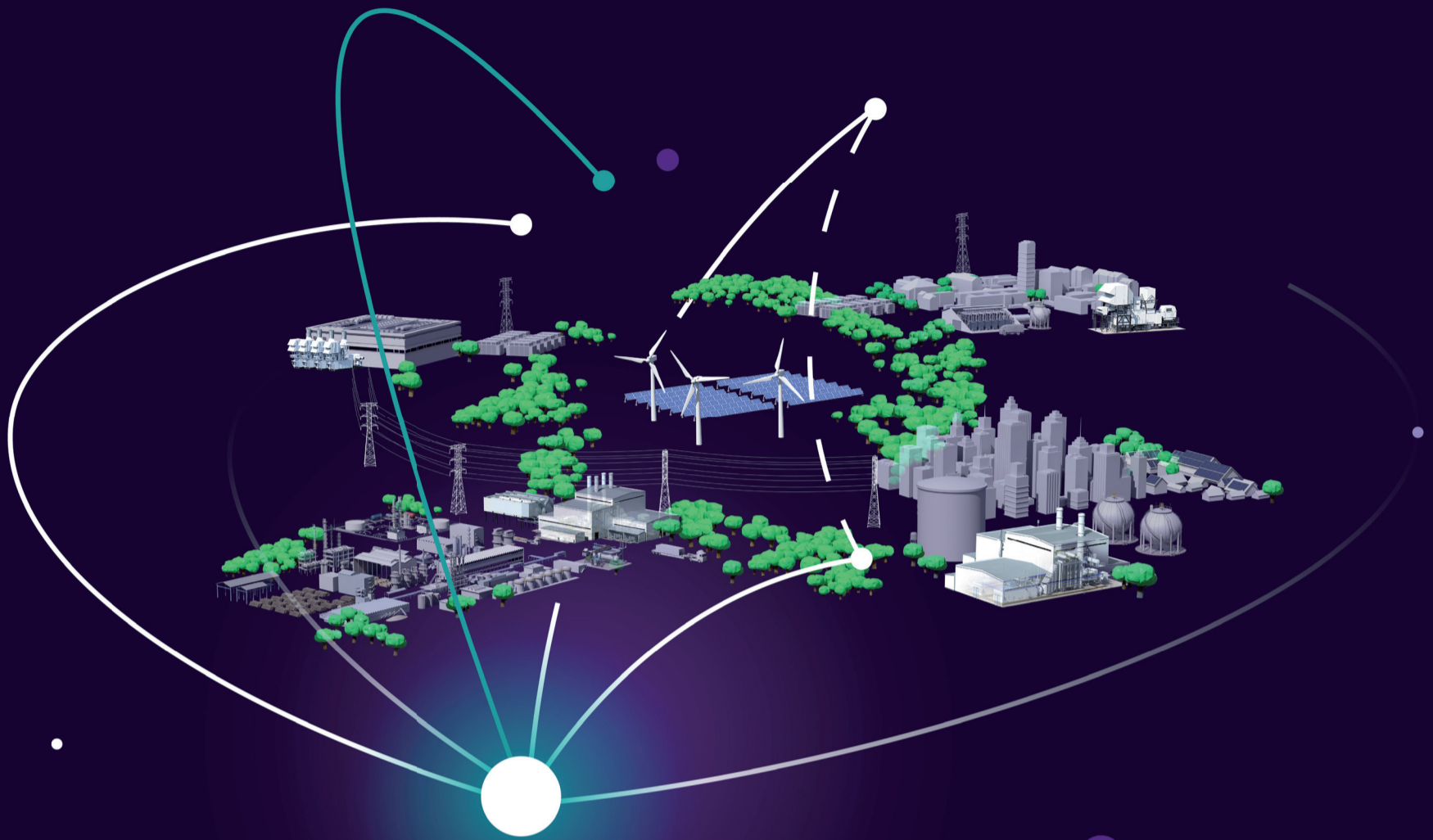
The report, 'IEA (2020), Data Centres and Data Transmission Networks', notes, however, that rapid improvements in energy efficiency have helped to limit energy demand growth from data centres and data transmission networks, which each accounted for around 1 per cent of global electricity use in 2019. Strong government and industry efforts on energy efficiency, renewables

procurement, and RD&D are necessary to limit growth in energy demand and emissions over the next decade, it said.

If current trends in the efficiency of hardware and data centre infrastructure can be maintained, global data centre energy demand can remain nearly flat through 2022, despite a 60 per cent increase in service demand, according to the IEA.

Strong growth in demand for data centre services continues to be offset by ongoing efficiency improvements for servers, storage devices, network switches and data centre infrastructure, as well as a shift to much greater shares of cloud and hyperscale data centres.

Hyperscale data centres are very efficient large-scale cloud data centres that run at high capacity. They enable data centre operators to deliver greater work output with fewer servers. According to Statista hyperscale data centres have doubled their energy demand between 2015 and 2021.



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# Hydrogen tie-ups continue to gather pace

Momentum behind the nascent hydrogen market continues to build, as several deals around the world demonstrate.

## Junior Isles

Several tie-ups in recent weeks show that companies around the globe are betting on hydrogen becoming a key fuel in the future energy landscape.

At the end of September, ABB and Peric Hydrogen Technologies Co., Ltd., a company headquartered in China announced they are joining forces to accelerate the widespread adoption of hydrogen as an energy source.

Both companies signed a Memorandum of Understanding (MoU) to explore how integration of ABB's automation, electrification and digital solutions with Peric's electrolysers can help reduce hydrogen generation costs in the future.

The collaboration between ABB and Peric will cover ongoing consultation relating to the development of joint solutions and/or the integration of complementary technologies that will optimise efficient green hydrogen generation. The aim is for a detailed action plan and specific agreement to be defined within three months following the signature of the MoU.

Demand for hydrogen, which has grown more than three-fold since 1975, continues to rise. According to the International Energy Agency, clean hydrogen is currently enjoying unprecedented momentum, with the number of policies and projects around the world expanding rapidly. Scaling up technologies and bringing down costs of production is vital to enabling widespread use of hydrogen.

Russia is also positioning itself in the market. Last month Gazprom Neft and Rusatom Overseas (part of the Rosatom) signed an agreement on cooperating in hydrogen energy and reducing carbon dioxide emissions.

Vadim Yakovlev, 1st Deputy CEO of Gazprom Neft, said: "Our company is part of the global trend in transitioning to low-carbon energy and decarbonising production facilities

"Oil-industry specialists have considerable experience in capturing and injecting gas into geological formations. We are in a position to offer our company's skills and competencies to companies in related industries – including low-carbon hydrogen production on Sakhalin."

Meanwhile, October also saw significant investment announcements in Europe. Spanish oil and gas company Repsol said it will invest €2.549 billion (\$2.958 billion) in the entire hydrogen value chain by 2030. Renewable hydrogen is one of Repsol's strategic pillars to achieve zero emissions by 2050. Its goal is to become the market leader in the Iberian Peninsula and position itself as a relevant producer in Europe.

Elsewhere in Europe, the UK, which announced its Hydrogen Strategy earlier this year, is seeing growing investment in this nascent market as projects get off the ground.

In early October, Octopus Hydrogen entered a strategic partnership with Innova Renewables and Novus to build green hydrogen production facilities alongside their 4 GW of solar, wind and battery projects currently under development.

Octopus Hydrogen, part of the Octopus Energy Group, will design, build and operate hydrogen production at several of Innova's renewable generation sites across the country, with the installation of electrolysers, compression and mobile hydrogen storage.

Novus is working with Innova Renewables to develop 4 GW of solar, wind and battery capacity across the UK. Innova has agreed to develop hydrogen production facilities at several of its co-located solar and battery energy storage sites for the production and supply of green hydrogen to local businesses, via Octopus Hydrogen.

These combined renewable energy and hydrogen sites will be among the first co-located green hydrogen projects in the UK, helping to establish a green hydrogen market and the model for a decentralised production and distribution business.

In a separate move Octopus Energy also announced a new partnership with RES to invest £3 billion (\$4.1 billion) in building new green hydrogen plants across the country by 2030. Octopus Renewables, which is part of Octopus Energy Group's generation arm, and RES will use their collective expertise and capital to develop, own and operate new green hydrogen plants fuelled by clean, renewable energy.

Also in the UK, Protium recently signed a strategic partnership with Petrofac aimed at leveraging Protium's

green hydrogen expertise and Petrofac's EPC (engineering, procurement and construction) capabilities in the hydrogen project development arena.

Europe is expected to be a hotbed for hydrogen, as the technology marries well with the offshore wind resources of the North Sea.

AquaVentus – a growing consortium of more than 70 companies, organisations and research institutions collaborating toward green hydrogen production in the North Sea – aims to develop 10GW of generation capacity for green hydrogen from offshore wind turbines in the North Sea by 2035. The expectation is that the wind power generated will be used to produce up to one million tons of production capacity of green hydrogen, which will be used to decarbonise Heligoland and transported to land via pipeline.

At the end of September, US company McDermott said it was joining AquaVentus to provide the consortium with its engineering, procurement, construction and installation (EPCI) experience in the onshore, offshore, subsea and storage markets, from concept to completion.



Hitachi ABB Power Grids has now formally become Hitachi Energy.

According to the company, the Hitachi Energy name reflects the rapidly evolving energy landscape and the opportunity to create economic, environmental and social value. It says the brand name enables the business to "effectively position its pioneering technologies and services to existing and future customers expanding beyond the grid – opening up a breadth of opportunities in areas such as sustainable mobility and smart life".

Claudio Facchin, CEO of Hitachi Energy, commented: "With our new name – Hitachi Energy – we are broadening our commitment to creating real impact for our customers and partners, our people and society."

The company is changing its name to coincide with the first-year anniversary since it started operations on July 1, 2020. The business formally registered Hitachi Energy Ltd. on June 30, 2021, and is currently undertaking the

formal process for the change of names globally, with the exception of China, where the business will transition at a later date. Hitachi Ltd. has an 80.1 per cent stake in the joint venture and ABB Ltd. holds the balance.



Facchin: the new name reflects the evolving energy landscape

## Fit for 55 package 'positive' for Europe's utilities

S&P Global Ratings has said it sees the EU's 'Fit for 55' decarbonisation plan as largely positive for the European utilities sector.

In a recent report, 'Fit for 55: The Gains (And Pains) For European Utilities', S&P Global Ratings said the plan would "provoke an investment super-cycle" to massively expand renewables generation fleet and upgrade energy networks.

S&P Global Ratings credit analyst Pierre Georges, warned, however, that the energy transition will not be smooth. "New, greener technologies, which still need to develop further to push down costs and boost efficiency,

will only gradually replace conventional thermal and nuclear generation," he said.

European utilities face a number of rising risks: managing a fragile supply-demand balance in the European energy system at least until 2025; maintaining affordability to minimise social and political risks; and overcoming hurdles in the delivery of new projects, including permitting, inflation, supply chain disruption, and human resources.

'Fit for 55' will drive green electrification, which S&P says will sharply increase growth in demand for electricity, primarily from 2030. Under the plan, electrification would increase to

30 per cent of the final energy demand by 2030 and 57 per cent by 2050, from just 25 per cent today. According to the report this will likely support high power prices in the long run.

To achieve its targets, Europe will need to add between 45 and 55 GW of renewable capacity a year this decade (20-30 GW annually for solar and 25 GW for wind).

At the end of September Italian energy giant, Enel announced a massive hike in its planned renewables capacity. The company intends to triple its renewable power generation capacity to 145 GW by 2030 and phase-out coal by 2027.

## Voith buys Siemens Energy share in hydropower business

Voith Group is to become the sole owner of the Voith Hydro Group Division, which previously was operated as a joint venture with Siemens Energy. The two companies have reached a mutual agreement under which Voith will buy-out the remaining 35 per cent stake in the former Voith Siemens Hydro Power Generation GmbH & Co. KG.

The two parties have agreed not to disclose the financial details of the transaction, which is expected to close near the end of Q1 2022, subject to

antitrust and other approvals.

The two partners established Voith Siemens Hydro Power Generation in 2000 as a joint venture to bundle the turbine knowledge of Voith with the generator know-how of Siemens in order to offer the entire power unit for hydroelectric power plants from a single source.

Voith says the buyout supports its ongoing strategy to strengthen its core business in the field of sustainable technologies, and will allow it to benefit from the growing role of hydroelectric

power in the renewable energy mix.

With its portfolio Siemens Energy focuses primarily on transporting and storing energy, decarbonising industrial processes, and generating electricity with little or no CO<sub>2</sub> emissions. However, it says "thus far the hydropower sector has had a subordinate role".

Dr. Jochen Eichholt, Member of the Executive Board at Siemens Energy, said: "The transaction is further evidence that we're consistently aligning our portfolio with our core business."

## 10 | Tenders, Bids & Contracts

### Americas

#### GE to equip 800 MW Vineyard wind farm

In early October, GE Renewable Energy confirmed that it will be supplying 62 units of its Haliade-X 13 MW offshore wind turbines for the 800 MW Vineyard Wind 1 project off the coast of Massachusetts, USA.

The contract was placed by Avangrid Wind, a joint venture of Avangrid Inc's Avangrid Renewables and Copenhagen Infrastructure Partners. Vineyard Wind 1 will be the first utility-scale offshore wind farm in the USA.

Vineyard Wind will be installed about 15 miles off both Martha's Vineyard and Nantucket and is expected to be brought online in 2023.

#### Empire offshore wind to use Vestas turbines

The 2.1 GW Empire offshore wind project planned for development off the coast of Long Island, New York, USA, will use 138 units from Vestas, each unit of 15 MW.

Vestas has been named as the preferred turbine supplier for the Empire Wind 1 and Empire Wind 2 projects, a joint venture between Equinor and bp. In addition, if an order is placed, Vestas will supply a multi-year service arrangement for the wind farm when operational.

Laura Beane, President of Vestas North America, said: "We are honoured to partner with Equinor and bp as preferred supplier for the Empire wind projects and provide our V236-15.0 MW turbine to help New York achieve its ambitious offshore wind energy goals."

#### Canada's first smart grid by Black & Veatch

Black & Veatch will design and deploy a network for the Sault Smart Grid project for PUC Distribution in Sault Ste. Marie, Ontario, Canada.

The grid is scheduled for completion by late 2022. It will enable PUC to accommodate new distributed energy resources such as rooftop solar, battery storage, cogeneration, and electric vehicles. Once operational, the smart grid will provide voltage optimisation and distribution automation. These features, Black & Veatch said, will help the grid during power disruptions, minimising the size of the outage and the number of affected customers.

Gary Johnson, Regional Director for Black & Veatch, said: "As the energy sector evolves, with broader investments in decarbonation, reliability, and resiliency, this comprehensive smart grid initiative represents the promise of lowering generation and distribution costs while propelling the community's modernisation."

### Asia-Pacific

#### Consortium chosen for Taiwan offshore substations

A Vietnamese consortium of Semco Maritime and PTSC M&C have been selected to construct two offshore substations for the Hai Long 2 and Hai Long 3 wind projects. Located off the Taiwan coast, the sites will deliver over 1 GW once commissioned in 2025-26.

The contract was awarded by Yushan Energy, a consortium of Enterprize Energy and Mitsui & Co, and the Canadian IPP Northland Power. Yushan Energy holds a 40 per cent stake in the Hai Long

Offshore portfolio, and Northland Power owns 60 per cent.

The agreement includes design, EPC, and commissioning of the two offshore substations. The substation jackets will be manufactured at PTSC M&C's yard facilities in Vung Tau, a port city in south Vietnam.

The consortium and ISC Consulting Engineers will execute the project from Q4 2021, with offshore installation planned in 2024 and commissioning in 2026. Semco Maritime will lead the consortium with PTSC M&C, cooperating closely with ISC Consulting Engineers as the primary sub-contractor.

#### JSW Energy orders GE wind turbines

India's JSW Energy has placed an order for 810 MW of onshore wind turbines from GE for projects in the state of Tamil Nadu.

GE Renewable Energy will supply 2.7-132 turbines that are primarily designed and manufactured in India. The machines will be assembled at GE Renewable Energy's multi-modal site in Pune, and blades will be sourced from subsidiary LM Wind Power's factory in Halol, Gujarat.

Deliveries are scheduled to start by the second quarter of 2022 and completed by the first quarter of 2023.

#### Vestas wins 59 MW order in Japan

Vestas announced in late September that it secured a 59 MW order for two onshore wind power projects in Japan from Eurus Energy Holdings Corporation. The order includes supply and supervision of installation of 14 V117-4.2 MW wind turbines for the 21 MW Tabito and 38 MW Sandaimyojin wind projects, to be located in Fukushima prefecture, Japan.

Delivery of turbines for the Tabito project will begin in Q3 2022, with commissioning scheduled for Q2 2023. Delivery for the Sandaimyojin project will start Q2 2023, with commissioning scheduled for Q1 2024.

Vestas will also deliver a multi-year Active Output Management 4000 (AOM 4000) service agreement for the wind farm.

### Europe

#### Vestas to install prototype at Osterild

Vestas will install its V236 15 MW offshore prototype wind turbine at the National test centre for large wind turbines in Western Jutland, Denmark. Installation of the prototype will take place in the second half of 2022, with the first kWh planned for Q4 of that year.

The prototype will be 280 m tall and is scheduled to have a production output of 80 GWh/year. Vestas said that this will make it the tallest and most powerful wind turbine in the world once installed.

Anders Nielsen, Chief Technology Officer with Vestas, said: "Colleagues across Vestas have worked hard and collaborated closely to ensure rapid progress in developing and assembling the V236-15.0 MW prototype. The V236-15.0 MW will raise the bar in terms of technological innovation, industrialisation, and scale in the wind energy industry."

#### Anesco wins battery storage contracts

Foresight Group, on behalf of the JLEN Environmental Assets Group and Foresight Solar Fund, awarded contracts in October to Anesco, to

build and maintain battery storage facilities in South England and Scotland.

Under the terms of the contracts, Anesco will carry out EPC works on two energy storage facilities: a 50 MW facility in Melksham, Wiltshire; and another 50 MW facility in West Gourdie, Dundee. Anesco will also carry out operations and maintenance of the facilities for four years.

Anesco said that the two facilities are scheduled to be operational by Q4 2022.

#### Germany awards offshore wind contracts

Ørsted has signed a contract with Jan De Nul for work on the 242 MW Gode Wind 3 and the 900 MW Borkum Riffgrund 3 offshore wind farms in the German North Sea. Under the terms of the contract, scope of work includes the transport and installation of 106 units of monopile foundations and one offshore substation foundation, with associated topside.

The offshore wind farms will feature Siemens Gamesa Renewable Energy's 11 MW turbines.

Installation is scheduled to start in 2023, with completion set for 2024.

#### Nordex secures 67 MW Ukraine turbine order

The Turkish firm Eksom Holding, building the 67.2 MW Skole wind farm in Poland, has ordered 13 N149/4.X turbines from Nordex for the project. The order also includes a 15-year Premium Service contract with Nordex.

The Skole wind farm will be built near Skole in West Ukraine. Installation of the turbines is scheduled to start in March 2022 and will feed into the Ukrainian grid at full capacity in Q3 2022. Nordex will supply the cold climate version of the turbines.

Patxi Landa, CSO of the Nordex Group, said: "We are pleased to be able to make a significant contribution to the expansion of wind energy in Ukraine with yet another project. We currently have 322 MW in Ukraine connected to the grid."

#### Siemens Energy supplies HL-class GTs to Greece

Siemens Energy announced in September that it is supplying its HL-class gas turbine technology to Greece for the first time. It will be part of a new 877 MW CCGT in Komotini in north-east Greece, which will be the world's most powerful combined cycle plant with a 1x1 configuration.

The new power plant will be fired with natural gas and is designed as a multi-shaft plant, with one gas turbine and one steam turbine each driving their own generator. The Siemens Energy scope of supply includes a power island consisting of an SGT5-9000HL gas turbine, an SST5-5000 steam turbine, an SGen5-3000W generator for the gas turbine, an SGen5-1200A generator for the steam turbine, the heat recovery steam generator, and the SPPA-T3000 control system.

Terna S.A. is building the entire plant for the project company Thermoilektriki Komotinis M.A.E. The company is owned in equal parts by Motor Oil Renewable Energy (MORE) and GEK Terna. Commissioning of the plant is scheduled for mid-2024.

### International

#### PVH wins Saudi solar tracker contract

Guangdong Power Engineering has awarded a contract to the Spanish firm PVHardware (PVH) to supply solar

trackers for a 300 MW solar PV IPP in Rabigh, Saudi Arabia.

The PV facility will be built in Makkah region. It will be equipped with the Monoline solar tracker in 2V bifacial configuration. Under the terms of the contract, PVH will also install controllers featuring the 3D adaptive backtracking algorithm to maximise the plant's production.

#### UAE nuclear service deal for Doosan Heavy

Doosan Heavy Industries & Construction (Doosan Heavy) has signed a maintenance service deal for a reactor at the Barakah nuclear power plant in the UAE.

Under the deal with Nawah Energy, operator of the nuclear power plant, Doosan Heavy will conduct maintenance services for turbines, generators and parts related to the nuclear reactor of the nuclear power plant for three months beginning in April 2022. Doosan Heavy did not reveal the value of the deal.

The plant owner, Emirates Nuclear Energy Corporation (ENEC) announced in April that Unit 1 of the Barakah plant has started commercial operations.

ENEC and Doosan Heavy agreed to strike a new maintenance service deal for each of the four reactors at the plant when they go into operation. The other three units have yet to go into commercial operation.

#### Huawei wins world's largest BESS project

A contract for the battery energy storage solution (BESS) for the utilities project at the Red Sea development in Saudi Arabia has been awarded to Huawei Digital Power.

Huawei Digital Power signed the contract with China's Sepco 3, which is the EPC contractor, for the 400 MW solar PV and 1300 MWh BESS, which will be the largest BESS in the world.

The integrated utilities package for the Red Sea project is being developed by Acwa Power, in consortium with Energy China, which was awarded the contract in November 2020 following a competitive tendering process.

Under the first phase of the Red Sea development, due to be commissioned in 2022, power generation capacity will be required to service a peak demand of 210 MW. Power is planned to be generated for the first phase from solar PV and wind, with 1 GWh of battery storage, to allow the resort to remain completely off-grid and powered by renewables day and night.

Under the second phase, due to be commissioned by 2030, power generation capacity will be required to meet peak demand of 360 MW.

#### CITIC to build 3200 MW Al-Khairat oil fired plant

CITIC Construction of China has won a contract to develop phases 1 and 2 of the 3200 MW Al-Khairat heavy oil power plant in Iraq. The estimated value of each phase of the project is valued at \$2.85 billion.

The Khairat plant will be located next to the Karbala refinery in Karbala province. The project will involve installing eight units, each of 400 MW capacity. Four units will be constructed for each phase.

CITIC has been appointed as EPC contractor for the project, and will be responsible for design, procurement, construction, installation, commissioning, and O&M for ten years. CITIC will also assist with financing for the project.



## Hydrogen

# New policies needed to provide commercial rationale for hydrogen

- Hydrogen production on cusp of major cost declines
- Mississippi Clean Hydrogen Hub will serve as model for US green hydrogen development

Gary Lakes

As oil and gas prices see a surge amid a rise in demand stemming from improvements in some economies, hydrocarbon producing countries and companies argue that this is evidence of the long-term need for oil and gas, despite the urgency to drastically reduce carbon emissions. But proof of the need to transition away from fossil fuels continues to mount. As COP26 got underway as *TEI Times* went to press, there was little doubt that urgency to act was the abiding theme of the conference.

Weeks before the opening of the conference in Glasgow, UK, the International Energy Agency (IEA) urged governments to “move faster and more decisively” on policy measures that would enable low-carbon hydrogen to fulfil its potential in moving towards net zero emissions.

The IEA said in its ‘Global Hydrogen Review 2021’ that current global production of hydrogen is minimal, its costs not yet competitive, and its

use limited, particularly in the industrial and transport sectors, but it added, there are signs that hydrogen production is on the cusp of major cost declines and widespread global growth.

Indeed, there are nearly daily reports of some breakthrough in hydrogen production or an announcement that a company or consortium is planning a new venture designed to expand its development or reduce its cost. But the IEA report focused on urging governments to implement policies that would ensure more attention and investment for hydrogen.

“Governments need to take rapid actions to lower the barriers that are holding low-carbon hydrogen back from faster growth, which will be important if the world is to have a chance of reaching net zero emissions by 2050,” Fath Birol, IEA Executive Director said in the report.

So far, some \$37 billion has been committed by countries to hydrogen development and deployment and the private sector has announced \$300

billion in investment, according to the IEA, but to put hydrogen on course to meet net zero emissions by 2050, the sector will require investments of \$1200 billion by 2030, the agency estimates.

While US President Joe Biden struggles with Congress and his own Democratic Party over legislation to increase spending in infrastructure and social benefits, the US companies Hy Stor and Connor, Clark and Lunn Infrastructure (CC&L Infrastructure) announced in mid-October that they intend to develop and advance the production of a huge green hydrogen project called the Mississippi Clean Hydrogen Hub. Notably, the project 10 times larger than any other green hydrogen project under consideration in the US.

The companies said in a statement that they “will develop, commercialise, and operate large-scale, long-duration hydrogen hubs that will serve as a model for [US] green hydrogen development efforts going forward.” The project is now under active

development and has multiple sites permitted for hydrogen storage, the statement said. It did not provide an estimated cost of the investment.

The Hub is planned to produce 110 million kg of green hydrogen annually and will store 70 million kg of green hydrogen in underground salt caverns. The target for commercial start-up is 2025 and customers will likely be in the transportation, power generation, manufacturing and industrial sectors where green hydrogen can replace fossil fuels.

Meanwhile, Air Products has announced that it will invest \$4.5 billion to build, own, and operate the world’s largest blue hydrogen production facility in nearby Louisiana. The project is scheduled to go into operation in 2026 and produce 750 million cubic feet per day of blue hydrogen, some of which will be distributed to US customers through the US Gulf Coast pipeline network. The balance will be converted to blue ammonia and exported. The project also includes a carbon capture and storage facility

that will capture 5 million metric tons annually of CO<sub>2</sub>, making it the largest such plant in the world.

These companies are examples that many firms are taking towards the energy transition, but policy remains a major consideration for companies who are active in producing energy. In a recent interview with *CNBC*, Siemens Energy’s CEO, Christian Bruch, said there were several steps needed in order for the new fuel to gain momentum.

“We need to define boundary conditions which make this technology and these cases commercially viable,” he said. “And we need an environment, obviously, of cheap electricity and in this regard, abundant renewable energy available to do this,” he added, noting that this is not yet the case.

Bruch said an industry needs to be created to support the commercialisation of green hydrogen and this could take 10 to 15 years.

If COP26 is successful, it will result in practical measures leading to that commercial environment.

## Gas

# Post-COP26 policies to determine success of gas as transition fuel

Gas has been touted as a fuel that will support the transition to clean renewables but discussions at the COP26 climate summit will have an important impact on the fuel’s future.

Gary Lakes

The outcome of the crucial COP26 talks on climate change in Glasgow, UK, is expected to have a major impact on the future actions of corporations, many of which are already under pressure to reduce their carbon footprint. Most will be obliged to take measures determined by the targets set for their respective countries for reduction in greenhouse gas emissions. For many, this will mean divesting away from oil and gas.

Oil and gas have in recent months seen a surge in demand and subsequent rise in their respective prices, but pressure is mounting from governments, shareholders and environmental groups for companies to reduce their involvement with fossil fuels, particularly oil, while gas is being given extended patience for its role as a transition fuel.

During the worst times of the corona virus pandemic, oil demand fell beyond expectations giving rise to speculation that its use would

continue to decline. While, ultimately, crude oil usage must be seriously reduced if the world is to address climate change, for now it is touted by oil producers as an energy source that will be used for decades to come.

Whereas oil is not viewed as having a role in a net zero world, proponents of natural gas argue that gas can play a major role in decarbonising the global economy provided that policies are put into place that will make the best use of the resource.

According to comments made by consulting company Wood Mackenzie, demand for gas is expected to “remain resilient even under accelerated energy transition scenarios”.

“Stricter and faster decarbonisation commitments will hasten demand decline in mature markets like Europe and North America,” the firm said in a COP26 briefing. “But in Asia, the need to rapidly replace coal could mean strong growth in gas demand.”

Strong emissions targets and the retirement of coal will have an important impact on gas, as will policy decisions

stemming from COP26 conclusions, the briefing said. Carbon capture, utilisation and storage (CCUS) is crucial to secure the future of gas in industrial and power sectors, according to the analysis.

Blue hydrogen – produced with electricity generated by burning natural gas – offers a growth opportunity for gas as feedstock, but relies on widespread deployment of CCUS. And carbon pricing will support the switch from coal to gas, but will handicap gas and LNG against renewables, the briefing said. It added that the availability of funding for new projects to ensure adequate supply beyond 2030 will depend on gas being acknowledged as a key transition fuel.

The Edinburgh-based consultancy said that if gas is going to be accepted in this role, then the entire approach of the sector would need to evolve. Developers will need to focus on reducing their carbon footprint and ensure that emissions are reduced throughout the global supply chain. The company stated that the future

business model for the energy industry “must revolve around the marketing and trading of gas and LNG, hydrogen/ammonia and carbon prices and credits”.

Meanwhile, Saudi Arabia, one of the world’s largest producers of oil, and a global leader in refined products and petrochemicals production, stepped up to the plate in late October, announcing that it would attempt to reach net zero emissions by 2060 – a decade later than the 2050 target set by most western and other countries. State-controlled Aramco announced that it would target 2050 for net zero.

Saudi Arabia’s state revenues are based almost entirely on hydrocarbon sales. Saudi Crown Prince Mohammed bin Salman announced on October 23rd that his country would target 2060 for net zero.

The country “aims to reach zero net emissions by 2060 under its circular carbon economy programme,” the Crown Prince said, “while maintaining the Kingdom’s leading role in

strengthening security and stability of global oil markets.” He added that methane emissions would be reduced by 30 per cent by 2030.

The circular carbon economy programme entails “reduce, reuse, recycle and remove,” a strategy that relies on carbon capture and storage technologies.

Saudi Energy Minister Abdulaziz Bin Salman also announced in October that a large portion of the gas produced at the planned \$110 billion Jafurah development will be used to produce blue hydrogen. Carbon dioxide produced during the process will be captured and stored.

Speaking during a climate conference in Riyadh, Prince Abdulaziz said Saudi Arabia has a large gas resource in Jafurah and that it will be used to produce blue hydrogen.

The project is located in eastern Saudi Arabia and Aramco is considering opening the project to foreign investment. Reserves at Jafurah are estimated at 200 trillion ft<sup>3</sup>. Production is to start in 2024.

# A green hydrogen future depends on global partnerships

With the supporting technologies behind green hydrogen still in the early phases of widespread implementation, global collaboration can help to manage and share the risk of producing green hydrogen at scale. His Excellency **Suhail Mohamed Al Mazrouei**, UAE Minister of Energy and Industry.

**His Excellency Suhail Mohamed Al Mazrouei: We must unite, and act now, if we wish to reap the maximum benefits of green hydrogen**



**G**reen hydrogen is becoming increasingly prominent in international dialogue on the energy transition. As countries across the world look to meet the global goal of net zero emissions by 2050, green hydrogen is emerging as a potential solution to decarbonise a range of industries. Although in its early stages, it is being backed by many governments around the world, including in the UK, as evidenced by the recently released National Hydrogen Strategy.

Green hydrogen is also on the agenda in the Emirates, where we have undertaken a Dh600 billion (\$163.4 billion) investment into our energy transition to a cleaner and more sustainable energy mix. The UAE Energy Strategy 2050 aims to meet the growing energy demand and ensure sustainable economic development. Our stated strategic initiative of net zero by 2050 is an evolution of that strategy, with a focus on achieving climate neutrality. This investment by the UAE government will be joined by private sector investments and projects as we realise the substantial economic and commercial opportunities this move opens up.

As COP26 opens, we are seeing an unprecedented movement from nations and organisations across the world to reach net zero. For these to be effective, and to truly create a competitive global market for green hydrogen, we need to reach across borders and cement international partnerships to reap the full potential

of new hydrogen technologies.

So why green hydrogen? An increasing proportion of the world's energy is produced by renewables. However, carbon emissions are not reducing at the rate required to meet the current net zero targets. Decarbonising with renewables remains difficult for many industries – such as metal, steel, chemicals, heating, manufacturing, and even transportation. Electrification may be possible for the likes of cars and buses, but still presents a significant challenge for heavy freight shipping or aviation.

This is where the earth's most abundant element, hydrogen, comes into play. Techniques that harness hydrogen to generate energy have been around for a long time, such as hydrogen produced from fossil fuels (otherwise known as grey hydrogen) or natural gas (referred to as blue hydrogen). However, innovation in its cleanest form, green hydrogen, has the potential to revolutionise energy production. Generated using electricity from renewable sources, green hydrogen can be used to decarbonise industries that are traditionally difficult-to-abate. In addition, hydrogen's greater storage capacity enables it to provide a more stable energy supply by offsetting the intermittency of renewables such as wind and solar.

It's no surprise, therefore, that green hydrogen is a staple of most countries' energy strategies. With green hydrogen a key aspect of the Emirates' future clean energy mix, we're aiming to reduce the carbon footprint of power generation by 70 per cent and increase the consumption efficiency of individuals and corporates by 40 per cent. But currently, green hydrogen only accounts for 0.1 per cent of the world's hydrogen production.

For a developed green hydrogen market to take shape, we need lower electricity prices, incentives to support production, energy system integration and infrastructure development. This will require extensive collaboration between multiple parties and cannot happen overnight. However, this is the route we must take to enable clean, hydrogen-based fuels, produced in zero-carbon processes, to decarbonise the hardest-to-abate sectors of the economy.

Developing an effective and competitive hydrogen market will require building networks between governments, policymakers, the private sector, and academic institutions alike. With the supporting technologies behind green hydrogen still in the early phases of widespread implementation, global collaboration can help to manage and share the risk of producing green hydrogen at scale.

In Dubai, we have launched the first

solar-driven green hydrogen plant in the MENA region in collaboration with DEWA, Expo 2020 Dubai and Siemens Energy. The project takes advantage of the Emirates' geographical strengths in reliable weather conditions for generating solar energy to produce hydrogen.

The facility will provide clean fuel to power all transportation during Expo 2020 Dubai, an early demonstration of the real-world applications for green hydrogen, including re-electricification, transportation, and other industrial uses. This is a clear example where multiple partners have pooled resources, expertise, and technologies to pioneer new clean energy assets in the Middle East.

Similarly, Emirati waste management leader Bee'ah and UK-based Chinook Sciences' partnership to build the first waste-to-hydrogen facility in the UAE represents the potential that can be achieved from leveraging long-standing partnerships. The project is particularly impressive for its dual-purpose approach. The new facility includes a plant that generates green hydrogen from waste – and a station to fuel large vehicles with hydrogen power, helping to decarbonise transportation.

An additional partnership with ambitious plans to decarbonise transportation includes an electrolysis facility launched by Masdar, Siemens Energy, the Abu Dhabi Department of Energy, Etihad Airways, Lufthansa, Marubeni Corporation and Khalifa University. While this will initially test green hydrogen for road transport, the planned kerosene synthesis plant will convert most of it into sustainable aviation fuel, with plans to explore maritime fuel also.

Formal agreements on hydrogen co-operation between countries are also crucial. Two such agreements – with Japan and Germany – have spurred cooperation to increase hydrogen production and create international supply chains. The agreement with Japan aims to increase annual hydrogen demand in Japan by a million tonnes by 2030, and to 20 million tonnes by 2050, along with boosting hydrogen production in the Emirates. The Energy Partnership with Germany has not only increased our dialogue on the energy transition but has led to a framework for collaboration between the public and private sectors across both countries, including a technical hydrogen committee in the UAE to align all existing work.

But this isn't all just happening in the Emirates. There are many other countries that are also forming hydrogen partnerships. Germany and Australia announced a Hydrogen Accord to increase technological innovation

and R&D between the two nations and boost sustainable hydrogen production. Not to mention, Portugal and Morocco earlier this year signed an agreement announcing a joint working group to implement a roadmap for green hydrogen production.

The UK is also making significant strides with the launch of its National Hydrogen Strategy. When it comes to producing green hydrogen, there are similarities between the UK and the UAE: both are geographically blessed with abundant sources for producing renewable energy – the UK with wind, the UAE with solar.

There is significant potential in the UK's plan to invest in offshore wind infrastructure to generate green hydrogen by the 2030s and increased funding to help businesses decarbonise. This potential is being recognised by international private sector firms, with Ørsted bidding for offshore wind projects in Scotland, Ineos investing significantly in its UK facilities to progress decarbonisation efforts, and the OYSTER Consortium developing plans for a marinised electrolyser project in Grimsby.

The progress that the UK and UAE have made in advancing towards a hydrogen-based economy can be amplified with further collaboration: both with each other and with other nations. These partnerships allow us to share knowledge, bring together engineering talent and technologies, and more closely align policy and regulatory activity between markets, stimulating a boost in supply. Collaborating will also allow us to manage the risks of early adoption and create a larger shared market for initial implementation of green hydrogen.

Together, we can use green hydrogen to not only meet our own domestic net zero targets but create a competitive market in which other countries can benefit as well.

The imperative to act is now. Green hydrogen has the potential to be the fuel of the future – but it will require urgent efforts between stakeholders across the world. We have so much to learn from each other in engineering, policy and regulation, energy system integration and infrastructure development. But we cannot afford to miss the opportunity of hydrogen's growing place at the forefront of international agendas. We must unite – and act now – if we wish to reap the maximum benefits of green hydrogen to swiftly reduce carbon emissions.

*His Excellency Suhail Mohamed Al Mazrouei is UAE Minister of Energy and Industry, and a board member of the Abu Dhabi National Oil Company ADNOC and Mubadala Investment Company.*



# Placing energy at the heart of communities

The current crisis is a concerning example of how the continued heavy dependency on gas and other non-renewable fuels can lead to sharp price increases. Placing energy at the heart of communities, as has been done in Spain, can be a blueprint for countries like the UK. Lumenaza's Tereza Borges explains.

**Borges: It will be exciting to see how the UK will evolve its existing regulation and policies to remove existing barriers and follow Spain's positive track**



Energy markets across Europe are at the centre of public attention once more. Rising electricity and gas prices are putting pressure on energy suppliers, policy makers, businesses and not least the consumers. The current crisis is a concerning example of how the continued heavy dependency on gas and other non-renewable fuels can lead to sharp price increases.

A fully renewable energy system with distributed production and smart, connected consumption would be more resilient, decreasing the reliance on gas imports and the goodwill of certain foreign actors. Energy communities are a meaningful way of contributing to such a system, creating more flexibility to balance production and consumption. The current developments are an opportunity to learn and adapt lessons and model from other countries, with the Spanish market being a prime example of progress in the right direction.

Since 2018, Spain has significantly progressed the mass deployment of renewable energy generation. Until then, the controversial "sun tax" in the country taxed the self-consumption of renewable energy generation, mostly photovoltaics (PV). Spain accelerated digitalisation in the energy sector, reaching a 100 per cent smart meter rollout at the end of 2018. With renewables now providing 44 per cent of the national electricity consumption, Spain took additional measures to accelerate these developments.

This year, Spain implemented a 'National Integrated Energy and Climate Plan', supporting the continued expansion of renewable energy on a mass scale. Several draft Royal Decrees outline specific regulatory measures regarding renewable energy feed-in, as well as access and connection to the transmission and distribution networks. This focus on renewables is mirrored in measures adopted to boost economic recovery post-Covid. As energy demand diminished due to widespread industry shutdowns during the pandemic, therefore impacting fossil fuel consumption, subsidies for fossil fuel infrastructure started being phased out.

Another key reason for Spain's promising development is the transposition of EU directives on prosumers, energy communities and the collective self-consumption of green energy into national regulation. Vital regulatory aspects include the simplification of the approval processes for the installation and access to the grid for small-scale PV and the removal of network charges for the collective self-consumption within a 500 m radius.

This supportive regulation provides concrete financial benefits that can be captured through collective self-consumption. A household, small business, or public entity with rooftop or terrain available can invest in PV-generation and ensure a return on investment by sharing their surplus with neighbours, who benefit from the reduced electricity price.

Compared to Spain, the status of decentralised energy production in the UK is patchy. The country lacks the concrete and empowering conditions to enable collective self-consumption models and rewarding the local matching of renewable production and consumption.

In 2019, the Feed-in Tariffs (FiT) scheme was closed. Since early in 2020, energy suppliers are expected to offer prosumers export tariffs for their surplus exported to the grid. The reality is that most of the tariffs offered are still not attractive as they offer very limited remuneration.

While there are several programmes to incentivise energy communities, there are no location-based network charges to reward the local matching of production and consumption that is evident in Spain. Some organisations have been working to enable community models despite the lack of incentives.

Fundamentally, there is a mismatch between local power generation and consumption. Renewable providers can sell their power at 7-8 p/kWh, and people living close-by need to buy that electricity back for two or three times that price. Local clean

power generators do not currently receive a fair price for the power they generate that reflects its true value.

Energy communities offer opportunities for rural and urban areas. One key feature of energy communities is the principle of matching renewable generation to consumption. In rural areas, energy represents a great portion of the cost for agriculture and related industrial processes, as well as supporting sustainable practices. In Spain, co-operatives have been investing in generation and now the opportunity to capture more value is clear.

In urban areas, property developers and housing providers can differentiate their offering, incorporating sustainability to their build-to-rent properties. In Spain, besides building or renovating their properties to lower energy consumption, they can add electric heating and cooling, EV charging, fed by on-site renewable generation, batteries with a collective self-consumption arrangement and green electricity residual supply. Those services can even be bundled as part of the rent, offering the convenience of all-in-one rental package.

Software platforms play a key role in enabling the shift to shape a fully renewable energy system. As described, decentralised energy production opens multiple methods of use, such as storing the electricity in a battery, charging EVs and of course consuming it.

Open, modular cloud platforms are needed that work across the full end-customer lifecycle. As energy service providers need to integrate new offerings into their current portfolios, software platforms help to strengthen existing legacy systems and provide easy access to the energy market.

As the example of Spain emphasised, regulatory changes supported the facilitation of self-consumption models across the country. Businesses, communities, or private individuals outside the traditional energy market seized on this opportunity. These groups need solutions that are fast and ready-to-use, without having to deal with complex energy regulation.

Establishing distributed energy products on the market efficiently and effectively requires personalised and precise billing models. This becomes even more prevalent as energy is being shared between members of a community or if bundles or time-of-use-tariffs are included. Integrating smart meter data for granular billing is complex and demands experience, as well as the ability to process large quantities of data quickly. It also requires openness to ensure transparency in a

customer-centred way.

Spain could serve as a blueprint for the UK's transition. The energy price crisis has once again proven that the current UK energy system is not resilient. With strong dependencies on gas, as well as foreign countries and their particular interests, consumers and businesses are prone to hefty price fluctuations.

Countries such as Spain are exploring concrete paths to shift their energy system to a fully renewable supply, in line with their net-zero ambition. A key element in the transformation from a centralised, fossil-fuel-based system to a decentralised, renewable energy system is the ability to balance generation and consumption of power locally, regionally or at country-level.

Of course, regulation plays a key role, especially for a complex market such as energy. The developments in Spain underline how regulation can support innovative and green technologies. The abolition of the "sun tax" led to a boom of self-consumption models, driving the transition to a green supply of energy.

This shift is a pivotal point for businesses, communities and individuals. It is a moment to be empowered and regain control over the energy supply. As well as addressing concerns regarding the traditional environmental impact of energy generation, moving towards decentralised renewable energy production also offers attractive new business opportunities.

It is a chance for both rural and urban communities to accelerate the transition to green electricity. As the energy market opens up for non-traditional players such as property developers, hardware manufacturers or SMEs, they can profit economically and support the necessary transition to renewables.

The increase of EVs and other assets such as heat pumps or HVAC running on electricity will mean an explosion in data for electricity production, consumption and storage. Existing legacy systems struggle to manage this amount of data efficiently and cost-effectively. Instead, energy service providers need to use scalable digital platforms to offer smart tariffs and build energy concepts for a zero-carbon future.

Spain is setting a concrete example of placing energy at the heart of communities – it will be exciting to see how the UK will evolve its existing regulation and policies to remove existing barriers and follow Spain's positive track.

*Tereza Borges is International Business Development Executive, Lumenaza GmbH.*

# Asia decarbonisation: financing vital to hit net zero

As COP26 opens, sourcing financing to help decarbonise parts of Asia will be a key issue. Asian energy market specialist

**Joseph Jacobelli** says there is plenty of capital available but there will be bumps in the road ahead.

Asia will need trillions of dollars in investments to successfully decarbonise and realise net zero emissions (NZE) goals by 2050. Sourcing the capital is not a challenge. Plenty is available. The public equities and credit markets are, and will continue to be, an important source of funding. Financial institutions lending will also rise exponentially. Pools of private capital will supplement these sources of financing.

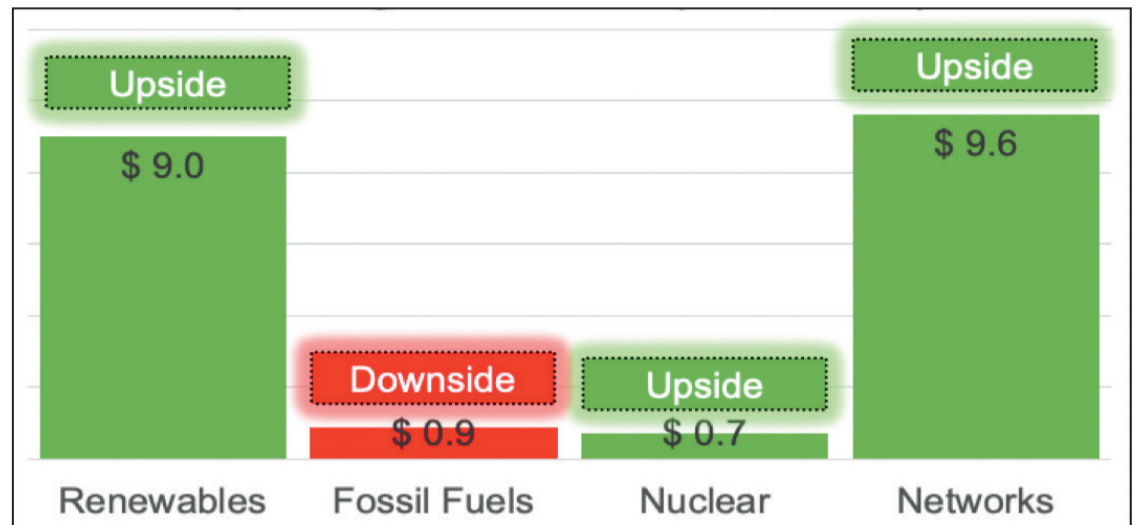
There will of course be some speed bumps, which will likely be addressed. They include lagging financing-related regulation and policies in many jurisdictions, some corporates' 'green washing', and funding struggles for small projects.

Asia accounts for almost half of the world's electricity consumption. Only one-tenth is used in developed Asia, including Australia and Japan, while almost 90 per cent is consumed by emerging markets, including China, India, and Indonesia. Hundreds of billions of dollars will be spent annually on electricity infrastructure through 2050. The massive expenditure will go towards addressing demand growth as well as for the transition from fossil fuels to green and sustainable energy.

The Asian Development Bank estimates that the region accounts for about four-fifths of global coal consumption, and up to 60 per cent of CO<sub>2</sub> emissions. Spending forecasts over the next 30 years range between \$20 and \$37 trillion. One lower end estimate uses \$20 trillion as a base. It expects that \$19.3 trillion will go towards renewables, nuclear power, and networks, with the balance dedicated to fossil fuels generation (see chart).

As explained in the book 'Asia's Energy Revolution', the actual expenditure is likely to be higher except for coal and gas generation, which may prove to be lower. This would be driven by such factors as a faster than expected adoption of electric mobility, which increases power demand, and heavy investments in digital technologies and solutions for energy. A highly realistic annual spending amount through 2050 would be about \$1 trillion.

Most of the public equity markets at domestic stock exchanges in the Asia region have seen a strong performance in the past few months, just like the rest of the world. There have



Asia electric power infrastructure potential spending 202-2050 (US\$, trillion)

Source: Adapted by Author, September 2021. Source of data: Asia Investor Group on Climate Change (2021). Asia's Net Zero Energy Investment Potential. [online] The Asia Investor Group on Climate Change (AIGCC). Available at: [https://www.aigcc.net/wp-content/uploads/2021/03/March-2021\\_-\\_Asias-Net-Zero-Energy-Investment-Potential-English.pdf](https://www.aigcc.net/wp-content/uploads/2021/03/March-2021_-_Asias-Net-Zero-Energy-Investment-Potential-English.pdf) [Accessed 20 Sep. 2021]

been many initial public offerings from many sectors. But few were companies operating renewable energy (RE) assets. Possible reasons include the fact that some companies are still in growth-mode and also that in many jurisdictions the RE assets are held by larger energy groups.

Looking at the share price performance of some RE stocks in major stock markets globally, it is evident that investors are keen on the sector. One example is looking at the Chinese domestic equity markets. On a one-year view the broader index was relatively flat whereas that of the new energy sector, which includes RE assets operators, has more than doubled. Of course, the historical performance of shares is not representative of future performance; still, looking 30 years out, one certainty is that there will be a great number of RE companies' offerings in the region.

Saying that the credit market for green and sustainable bonds is rocketing is an understatement. Bond investors in recent years have been increasingly raising their sustainability exposure as issuers and financial institutions face political and societal pressures. A driver of this may be the 2050 NZE goals published by governments and corporations.

Looking at one data provider, the highly respected Climate Bond Initiative, global issuance of Green, Social and Sustainability-themed (GSS) debt has risen to almost \$229.9 billion in the first half of 2021 alone from \$26.6 billion in 2018. Asia's share is about a quarter, with China and Japan being the primary issuers. Asian and global bond issuance will steadily increase over the coming three decades and the share of GSS-themed bonds will also rise; it was only about 5 per cent of global bond issuance in the first half of 2021.

The supply of green finance by the world's commercial lenders has lagged. In the past 12 months there have been more financial institutions publicly adopting NZE goals. They aim at ensuring that the totality of their lending portfolio is net zero. One NGO, BankTrack, is following this area. It identified only three institutions in Asia with such commitments: Mitsubishi UFJ Financial Group, Commonwealth Bank of Australia, and National Australia Bank.

Yet there are many large Asian financial institutions, especially the Chinese banks, looking at making commitments. Green finance is a global trend, and it is logical to assume that the amount of commercial lending by Asian financial institutions toward green and sustainable projects will continue to increase.

The private markets in Asia are also raising investments in environmentally friendly energy projects. Like in the rest of the world, private equity funds in Asia have deployed more capital toward RE projects. Examples are far too many to list; they include the Asia-focused ADM Capital \$500 million debt fund dedicated to RE and the BlackRock globally focused Yen55 billion (\$500 million) fund, which targets developing infrastructure for the transportation of green energy in emerging markets.

Many energy corporations in Asia are also progressively raising the amount of capital they devote to green energy projects. They include Australian energy retailer AGL Energy, Chinese coal power generator Huaneng Power International, and

vertical electricity quasi-monopolies CLP Holdings and Kansai Electric Power Corp. Again, the list is enormous, but their path is pretty much set in stone as they have made long term commitments

While the amount of capital available for Asia to decarbonise is rapidly growing, the road is not flat and smooth. Probably the biggest hurdle is that many Asian governments have been slow in producing clear decarbonisation blueprints. Some, like China and South Korean, have done a decent job. Others, such as Japan and Indonesia, have been relatively lagging. A rare few, like Australia and India, are completely behind the curve. Another hurdle is green washing by corporates. Many claimed to have embraced decarbonisation and said they would set NZE goals. Unfortunately, only a small number have executed on this as of today. Globally there is a growing understanding of what is and what is not green. Individual countries in the region and many global organisations are coming through with taxonomies that should allow this particular hurdle to be surmounted over the next few years.

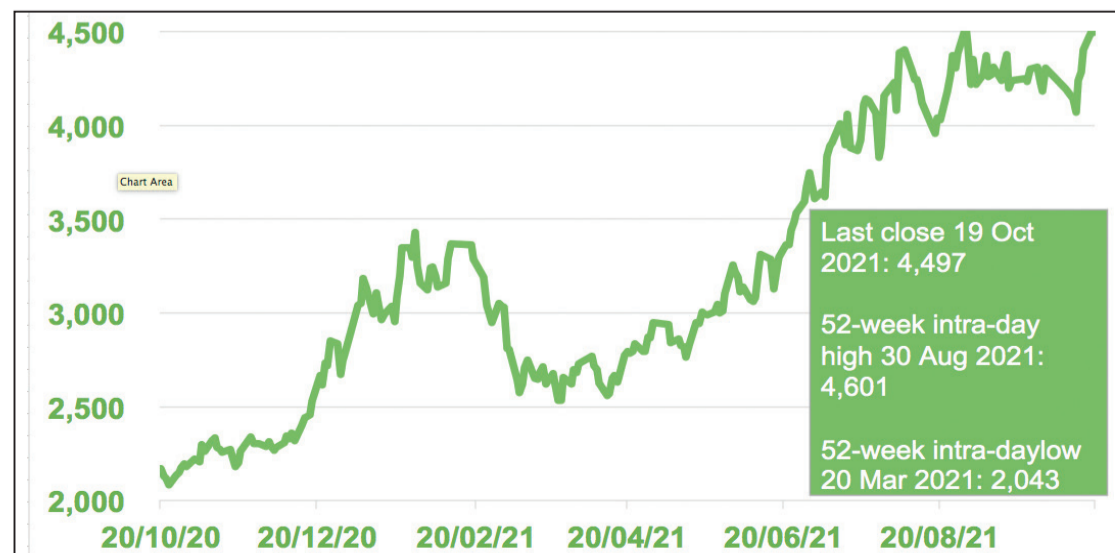
A final bump in the road is financing smaller RE projects, such as rooftop programmes for residential users or microgrids. As they are smaller, they do not attract capital from large corporations or financial institutions. These projects are falling between the cracks, despite being absolutely essential for decarbonisation.

The positive news is that this particular shortcoming is on the radar screen of some governments, multilateral agencies, and financial institutions, so there is hope this hurdle too will be addressed in the coming years.

Joseph Jacobelli is a well-respected clean energy business executive, analyst, and author with over 30 years' experience in Asia. He runs a family office and direct investments advisory firm Asia Clean Tech Energy Investments. In 2021, he published: 'Asia's Energy Revolution: China's Role and New Opportunities as Markets Transform and Digitalise'.

## China's CSI new energy index

Source: Author, 19 October 2021. Data sourced from Google Finance, [online]. Available at: [https://www.google.com/finance/quote/399808:SHEN?sa=X&ved=2ahUKEwj76ZpI3zAhUdx4sBHWsSC1EQ\\_AUoAXoECAEQAw&window=1Y&comparison=SHA\\_per\\_cent3A000300](https://www.google.com/finance/quote/399808:SHEN?sa=X&ved=2ahUKEwj76ZpI3zAhUdx4sBHWsSC1EQ_AUoAXoECAEQAw&window=1Y&comparison=SHA_per_cent3A000300) [Accessed 19 Oct. 2021]



# Battery design for a circular economy

The use of batteries in the power and transport sectors is growing rapidly but little attention is given to dealing with battery waste. Clean-tech company Aceleron has built a battery that is easy to take apart, service or upgrade and put back together as a fully renewed product with an extended life. Aceleron's **Carlton Cummings** explains the need to work smarter with battery technology to improve the resilience of energy supply within the context of a circular economy.

**Cummings: While testing thousands of batteries, together with co-founder Dr. Amrit Chandan, realised that batteries are not designed to be maintained**



The current global energy crisis has been widely reported with Europe facing a winter with its lowest reserves of gas in at least ten years and the UK appearing vulnerable to the risk of gas shortages.

According to OGUUK, the UK imported 56 per cent of the gas needed to keep the nation's homes warm and power stations running during the coldest months (January and March) this year. With no clear resolution to the gas crisis and prices going up across the world, it is essential to build a domestic, more resilient energy supply that relies less heavily on natural gas.

This can be done by using more freely available renewable energy, but the industry needs to work smarter to capture, store and leverage the renewable power regardless of what the weather is doing at the time. This is where energy storage – and more specifically, battery storage, comes into the mix.

Due to climate change, the UK now has hotter, drier summers which offers more access to renewable energy. If this energy could be harnessed and stored, distributing it during the colder months and supplementing it with wind generated power, the reliance on natural gas would diminish.

There are undoubtedly complexities when it comes to the distribution of renewable power, however. What is not needed is a centralised system, where an enormous amount of batteries are stored in one place, leading to the challenge of storing the batteries and distributing the power across the country. Instead, the UK should create a 'smart grid', where houses and buildings capture renewable energy in their own localised battery storage system and share it where needed.

Using a smart grid system, the process of energy sharing needs to be fine-tuned to the extent that householders can store and sell electricity



**Aceleron's battery design can be used for a host of applications including stationary power systems and electric vehicles**

generated from renewable energy sources at specific times and specific rates. This would work digitally, where the utility sends a digital request for battery capacity to battery owners who would like to trade, then the battery capacity is provided at an agreed rate. It's an automated trade and exchange, much like digital stocks.

Other countries are already starting to work in this way. For example, Australia has a 'virtual power plant' which began as a government backed trial in 2017 and is now being rolled out by Tesla. In the same country, if residents install solar panels on their homes, they are required to also install smart energy storage. This allows homeowners to sell solar electricity as it is produced and sell battery stored energy at times of need.

But there are challenges with current battery technology. The supply of raw materials continues to be difficult to navigate, and putting them together to find 'the perfect battery solution' still has not been achieved. Lithium-ion is actually a catch-all phrase because there are several different versions which address different needs. For example, some lithium-ion batteries use cobalt, which is expensive and has an extremely volatile supply chain. Yet cobalt is key for boosting energy density and battery life.

On the other hand, some lithium-ion batteries use phosphate which is more cost effective and has a longer lifespan than cobalt but lithium-ion phosphate does not hold as much energy. The lithium-ion phosphate battery has been widely commercialised but is not ideal for all uses. The good news is that chemical engineers in the UK and worldwide are working hard to unlock these challenges.

No matter the design, application or technology, all batteries are electro-chemical devices that have been optimised to store and release energy which can be a safety issue, with risk of fire being the main concern. There is room for improvement with battery safety, whilst the chemistry has not improved safety, the way the battery is built contains the risk more effectively. There are people looking at battery safety in different ways,

both at what goes into the battery as well as how it is put together.

Another issue for battery use in energy storage is longevity. Solar panels have a life expectancy of 20 to 25 years and wind turbines last for 15 to 20 years whereas most batteries have a warranty life of seven to 10 years, creating a mis-match in the system.

The conversation around battery recycling is of huge importance and something that is widely talked about. As the world increasingly comes to rely on batteries for a host of purposes, batteries absolutely have to become more sustainable.

While dismantling and testing hundreds of battery packs, Aceleron's co-founders realised that batteries are not designed to be maintained. Currently, most batteries are held together with adhesives and spot welding, meaning that when one part fails, the entire battery in its current form becomes obsolete.

Batteries today are built like a consumer electronic product, for disposal rather than to be serviced, repaired and upgraded. This approach needs to change; batteries should not be seen as consumable products. Instead, a battery should be viewed as an asset, to be used in a long term capacity. Besides, disposable batteries are not what the energy and power sector is used to. A generating asset is designed to be maintained and so should a battery storage system.

The industry also needs to be mindful of continuous technological advancement, especially where renewable technologies are concerned. Although a system must have longevity, asset owners do not want to invest in a battery with a long lifespan now, which will be old technology in five years time.

Aceleron has addressed the topics of battery waste, technological advancement and the harmful impact on the environment. There is a lot of recoverable energy stored inside used lithium-ion batteries and, using a unique compression method, the company has designed and built a battery that is an ongoing asset, not a disposable product.

A key component of the unit is a special tray design and material that evenly spreads the force between cells so that all the battery cells are

compressed by the same amount in order to perform in the same way.

The battery is built so that it is easy to take apart, service or upgrade and put back together as a fully renewed product with an extended life. The main goal is to optimise the materials used, thereby reducing waste and creating something that can be upgraded as technology advances.

The battery has smart capabilities and can be run in series allowing for mass energy storage and remote communication. Methodologies are still being developed for testing, failure prediction and performance optimisation to ensure that no precious resources are wasted.

Cost management is an important area. It will require a three-level approach by the industry, based around:

- Safety and performance: making sure a smart grid works at full capacity, detecting any faults and offering optimal performance;

- Making lithium-ion cells more cost effective, so that they are serviceable;

- Charging the batteries intelligently: charging batteries when the energy is cheap (on sunny or windy days) and releasing it to meet demand.

A decentralised smart grid is without a doubt key to the successful transition to supplying sustainable energy. Batteries and their maintenance are of course going to cost – particularly in the short term – but the benefits of having a localised, reliable and renewable energy supply far outweighs the initial outlay and subsequent maintenance costs.

In today's world, wireless communication coupled with other technology (such as Aceleron's circular economy battery) unlocks new capabilities for power generation. The power industry has the means and the opportunity – not to mention the necessity – to create an 'energy bucket' which can be drawn upon and re-filled with renewable energy.

The industry must now make sure it keeps an eye on the future, building to last rather than focusing on short term solutions to meet current needs.

*Carlton Cummings is Chief Technical Officer and co-founder, Aceleron.*



Junior Isles

# Change can be painful

Change is never easy but is often necessary. World leaders must keep reminding themselves of this as they go into crunch negotiations at the COP26 climate summit in Glasgow.

Last month the International Energy Agency published its annual flagship 'World Energy Outlook 2021', with the top line being that a new energy economy is emerging – but not yet quickly enough to reach net zero by 2050.

The Outlook was released one month earlier than usual in order to provide guidance for the COP26 discussions and comes at a critical time. The world's climate hangs in the balance and positive outcomes at COP26 are imperative. At the same time, the world is struggling with energy prices that are so high, some are placing blame at the door of the energy transition.

Since September world energy markets have witnessed staggeringly high gas and coal prices, as well as electricity prices. Oil prices are also on the rise. This will not only put a brake on global economic growth but is also bad news for emissions. According to the IEA, this year has already seen the second highest growth in global carbon emissions in history.

This is all in spite of the ongoing rapid shift in an energy mix that the IEA predicts will see continued strong growth in renewables, particularly for wind and solar, at the expense of fossil fuels.

A key highlight of the WEO 2021 is the mismatch in the balance between investment in clean energy and fossil fuels, when considering the world's climate target, and the implications. If investment in the energy sector continues on the current trajectory, the IEA sees a growing risk of increased

turbulence in energy markets.

Launching the report, Dr. Fatih Birol, the IEA's Executive Director, noted that natural gas has been presented as a reliable, affordable fuel that can compliment intermittent renewables in electricity generation. He stressed, however, that the current situation of record-high gas prices is "not good news" for the natural gas industry. "The natural gas industry did not get good marks from millions of consumers around the world," he said. "It should take note of this."

He added: "If you look at oil and gas investments in 2020 and 2021, they are in line with the oil and gas investments required in a 1.5°C trajectory... but the important thing is, demand is growing so we have to increase investments in clean energy and reduce investment in oil and gas. Current clean energy investments are not sufficient; in order to have an orderly transition we need to triple clean energy investment or we may well see a lot of turbulence in the energy market, as we are experiencing today."

Dr. Birol stresses that the current volatility is not related to clean energy transitions or climate policies, adding that the mismatch creates risks for the future.

"Some people are portraying this situation as the first crisis of the clean energy transition," he said. "This is not accurate. This is wrong. It is a gross mis-characterisation that we don't share, to say the least. If it is something to do with green energy, the issue is not that we have too much clean energy but that we have too little."

This was made all too clear in a report issued last week by the UN Environment Programme. Its Emissions Gap report says country pledges will fail to keep the global temperature under 1.5°C this century. The UNEP analysis suggests the world is on course to warm by around 2.7°C.

Notably, for the first time the IEA in its Outlook analysed global net zero climate pledges and the implication on CO<sub>2</sub> emissions in energy markets. The Paris-based organisation stated that "for the first time in human history we are entering the decade of the turning point".

Laura Cozzi, the IEA's Chief Energy Modeller, said: "We will be experiencing economic growth with declining CO<sub>2</sub> emissions. We have never managed to do something like this. It is a turning point, not only for emissions but also for energy markets. What we see clearly, is that if we go ahead with policies currently engraved in law, the past looks very much like the future... we will see stormy weather and stormy markets. There will be increasing oil, increasing gas and of course increasing renewables. However, announced pledges do change the energy market."

She said oil will rebound for the next couple of years but from 2025 there would be a flattening in demand, largely due to a switch to electric vehicles. The IEA predicts the share of EVs in the market would grow from 5 per cent today to 30 per cent in 2030.

She paints a similar picture for gas – an increase to 2025 before flattening out. She explained that gas demand for the buildings sector would go into structural decline. In the electricity sector, the move towards clean energy, particularly wind and solar, would also see less gas use. Cozzi says that for the first time – after two decades where the share of fossil fuels in the energy

mix "stood stubbornly" at around 80 per cent – this decade will see the start of a decline where that share falls to around 70 per cent.

For coal, the IEA sees "no way out". Its 'Announced Pledges Scenario' reveals a very clear turning point. Installations of unabated coal fired power plants will be halved during this decade and fall to "very low" levels. It noted that the recent news that China would end support for coal fired plants abroad, would further cut into new additions. It said this would be the last decade for any new coal fired plants.

In its Announced Pledges scenario, the IEA calculates there is still a huge gap in the emissions reduction. As it stands, the pledges for 2030 going into Glasgow only cover 20 per cent of the required emissions reduction.

"If you want to look at it another way," said Cozzi, "We are going into the Glasgow negotiation not with the glass half empty but actually 80 per cent empty."

A study by the WMO issued less than two weeks after the WEO 2021 report showed that global warming gases were at a new high last year, despite the pandemic. This data combined with the UNEP report is seen as "another thundering wakeup call", according to UN Secretary General, Antonio Guterres.

UNEP's Gap report finds that when added together, the latest plans submitted by 120 countries cut greenhouse gas emissions in 2030 by around 7.5 per cent compared to the previous pledges made five years ago. To keep 1.5°C alive would require 55 per cent cuts by the same 2030 date.

"To stand a chance of limiting global warming to 1.5°C, we have eight years to almost halve greenhouse gas emissions: eight years to make the plans, put in place the policies, implement them and ultimately deliver the cuts," said Inger Andersen, Executive Director of UNEP. "The clock is ticking loudly."

But all is not lost. Yet. The IEA report also provides analysis of how to move in a well-managed way towards a pathway that would have a good chance of limiting global warming to 1.5°C.

The report stresses that the extra investment to reach net zero by 2050 is less burdensome than it might appear. More than 40 per cent of the required emissions reductions would come from measures that pay for themselves, such as improving energy efficiency, methane abatement, or installing wind or solar in places where they are now the most competitive electricity generation technologies. It also said nuclear could be expanded through new plant and life extension, along with new hydropower.

As Cozzi pointed out: "For us, it's tough to understand why those emissions reductions are not on the table because there is no economic rationale behind not doing those [measures]."

The energy transition requires the buy-in of all stakeholders – companies, communities, civil society, investors – but none have the same capacity and influence as governments to influence change. Government leaders must send a clear message in Glasgow that they are committed to rapidly scaling up the clean, resilient technologies of the future.

It might be painful but the pain is absolutely necessary.

Cartoon: jemsoar.com

