THE ENERGY INDUSTRY TIMES

May 2021 • Volume 14 • No 3 • Published monthly • ISSN 1757-7365 www.teitimes.com

Partnership of equals

Decarbonisation and digitalisation go hand-in-hand, as data and technology will be key in the decarbonised, decentralised energy system of the future. *Page 13*

Low-carbon transmission

Hitachi ABB Power Grids explains the thinking behind its strategy to use a new gas mixture in its high voltage equipment. *Page 14*

Final Word

Junior Isles unwraps climate leaders' Earth Day gifts. *Page 16*

News In Brief

This decade "crucial" as UK raises bar in climate battle
The UK, which will host COP26 in Glasgow in November, has announced what is the most ambitious pledge so far but achieving the new target makes this decade crucial. *Page 2*

Debate over US electricity grid upgrades to face new stresses
The Biden administration has announced a new 100-day initiative to better protect the US power grid against cyber threats. *Page 4*

India calls developed countries' climate goals "pie in the sky"
India's Energy Minister R K Singh has labelled targets set for 2050 or 2060 as "a pie in the sky", arguing that developing countries such as India should not be forced to cut their emissions to net zero. *Page 6*

Technology Focus: Spreading microgrid roots
As the world moves towards distributed networks with a high penetration of renewables, a project is underway that is taking inspiration from nature to make microgrids more resilient. *Page 15*

World leaders ramp up climate ambition ahead of COP26

Biden: "We have no choice, we have to get this done"

The return of the US to the world climate stage has galvanized the global effort to cut carbon emissions in the run-up to COP26 but new pledges still fall short of what is needed, and financing will be a sticking point in Glasgow. **Junior isles**

Ambitious carbon reduction targets set by leaders of some of the world's biggest emitters of the greenhouse gases could go some way to achieving a successful outcome at the COP26 climate meeting in Glasgow, UK, this year.

Last month at the Leaders Summit on Climate Change hosted by US President Joe Biden, 40 leaders gathered to discuss how the world can work together to achieve the climate targets set out under the 2015 Paris Agreement, with several announcing new pledges on reducing CO_2.

Opening the virtual conference, Biden said he aims to cut US emissions by 50-52 per cent below 2005 levels by 2030 and stressed that the new US climate target would boost "millions of good-paying, union, middle-class" jobs.

Biden called climate change "the existential crisis of our time" and pledged that the US would work to limit warming to 1.5°C – the more ambitious of the two targets in the Paris climate agreement. "We are here at this summit to discuss how each of us, each country, can set higher climate ambitions that will in turn create good-paying jobs," he said. "We have no choice, we have to get this done."

According to Climate Action Tracker, the new goal will lower US annual carbon emissions by 1.5-2.4 billion tonnes of carbon dioxide equivalent by 2030 compared to its current trajectory.

Commenting on the announcement, Arshad Mansoor, President and CEO of the Electric Power Research Institute (EPRI), said: "We know the timing, we understand the trajectory, and we have the technical expertise to get there. We must redouble collaboration across all stakeholders to accelerate an affordable and reliable clean energy transition."

The US' return to the global climate stage following the withdrawal of the previous administration from the international climate debate, has prompted other countries to redouble their climate efforts.

At the summit China's President Xi Jinping welcomed "the US return to the multilateral climate governance process", and pledged to "phase down" coal consumption in the five years from 2025. Last year the country commissioned nearly 39 GW of coal fired power capacity, more than three times the rest of the world combined. President Xi also restated a goal for China to peak its carbon dioxide emissions before 2030 and reach "carbon neutrality" by 2060, stressing that China's targets require the country to reduce emissions over a shorter time period than most developed nations.

Continued on Page 2

Continued from Page 1

Japan and Canada, meanwhile, also unveiled new increased targets. Japan promised to cut emissions by 46 per cent by the end of this decade, relative to 2013 levels, while Canada said it would work towards achieving a 40-45 per cent reduction in greenhouse gas emissions by 2030, relative to 2005 levels.

The commitments followed even more ambitious new targets announced earlier by Europe and the UK. Just prior to the summit, the EU finally agreed that it would increase its target from 40 per cent to at least 55 per cent below 1990 levels by 2030. The UK, which will host COP26 in Glasgow in November announced what is the most ambitious pledge so far. Prime Minister Boris Johnson committed to a 78 per cent cut in CO_2 below 1990 levels by 2035.

Despite these new improved National Determined Contributions, however, the pledges made under the 2015 Paris agreement, which was endorsed by 197 nations, remain far off track from what would be necessary to hit the 1.5°C goal.

Global annual carbon emissions will be about 33 billion tonnes this year, according to the International Energy Agency.

Greta Thunberg, the Swedish climate activist, said the targets were "very insufficient" and full of loopholes. She said in a video released on Twitter: "We are not so naive that we believe that anything will be solved by countries and companies making vague distant targets."

Global temperatures have increased more than 1°C since 1850, and the UN COP26 climate summit later this year will try to get the world on track to the targets agreed in Paris.

Johnson urged richer countries to give more money

Looking ahead to COP26, the UK has urged other rich countries to give more money to climate finance, an issue that will be a key sticking point in Glasgow.

Johnson noted that a successful summit would require "the richest nations coming together and exceeding the commitment they already made for $100 billion [in annual climate finance]."

Commenting on the pledges coming out of the Washington conference, Mohamed Adow, Director of Nairobi-based think tank Power Shift Africa, said: "Until now the actions of all rich countries including those in Europe as well as Australia, Japan and Canada have been hugely underwhelming. This summit is a major turning point that now shifts attention towards the laggards and concrete near-term actions. They need to come back with much stronger pledges, including climate finance for poorer nations."

This decade "crucial" as UK raises bar in climate battle

- UK to cut CO_2 to 78 per cent below 1990 levels by 2035
- Sixth Carbon Budget in line with net zero goal

Junior Isles

The UK, which will host COP26 in Glasgow in November, has announced what is the most ambitious pledge so far but achieving the new target makes this decade crucial.

Last month Prime Minister Boris Johnson committed to a 78 per cent cut in CO_2 below 1990 levels by 2035. The pledge, which will become enshrined in law by the end of June 2021, includes international aviation and shipping emissions for the first time.

Johnson said: "We want to continue to raise the bar on tackling climate change, and that's why we're setting the most ambitious target to cut emissions in the world.

"The UK will be home to pioneering businesses, new technologies and green innovation as we make progress to net zero emissions, laying the foundations for decades of economic growth in a way that creates thousands of jobs."

But in legislating for such a strict new target in just 14 years' time, the government has set itself a very difficult task. Eliminating emissions from transport, buildings and industry will be major hurdles.

Commenting on the announcement, Dale Edwards, a Strategic Consultant in Green Energy at national law firm Clarke Willmott LLP, said: "With a two-stepped approach of 68 per cent emissions reduction on 1990 levels by 2030, increasing to 78 per cent by 2035, the challenge has been set not just within the UK but also what other countries will be looking to achieve over the coming years. It is fantastic as a country we have ambitious targets, but the challenge of achieving them must not be underestimated." He added that in previous decades UK governments have made bold environmental announcements, a number of which have not been realised.

James Diggle, Head of Energy and Climate Change at the CBI business group, said the new target meant the government was "front-loading" its emissions cuts in the years to 2035 and warned, therefore, that this decade would be "crucial".

Connor Schwartz, a climate campaigner with Friends of the Earth said: "The UK government is already struggling to meet its existing, less ambitious climate change goals. Targets for cutting emissions are important, but without the right policies they won't be met."

In line with the recommendation from the independent Climate Change Committee (CCC), this sixth Carbon Budget limits the volume of greenhouse gases emitted over a five-year period from 2033 to 2037, taking the UK more than three-quarters of the way to reaching net zero by 2050.

The Carbon Budget will ensure Britain remains on track to end its contribution to climate change while remaining consistent with the Paris Agreement temperature goal to limit global warming to well below 2°C and pursue efforts towards 1.5°C.

Greenpeace UK's head of politics, Rebecca Newsom, said: "Targets are much easier to set than they are to meet, so the hard work begins now. In order to actually deliver on this commitment, new measures to slash emissions from homes and transport should already be well underway. So unless the government's policies urgently fall in line with its ambitions, there could still be awkward questions for Boris Johnson at the global climate talks in the Autumn."

IEA and European Commission to collaborate as CO_2 rises

The European Commission and the International Energy Agency (IEA) recently joined forces ahead of an important climate summit to underline the essential contribution of the energy sector to achieving a climate neutral economy with net zero greenhouse gas emissions

At the end of March, the European Commission and the IEA agreed to work together on several key points:

- Accelerate and expand the net-zero movement of governments and companies committed to helping deliver the energy sector's contribution to achieving net-zero economies;
- Develop a collaborative international net zero campaign with interested partners to raise awareness and accelerate the transitions to net zero, as an urgent call for action;
- Team-up with willing partners in support of African countries' efforts to develop access to affordable modern energy services from sustainable sources and clean technologies, leapfrogging to advanced stages of sustainable development;
- Feed into the global conversation on net zero greenhouse gas economies, welcoming the upcoming IEA global Net Zero in 2050 Roadmap on 18 May, which will be guiding future work across the IEA, including the annual World Energy Outlook, and contributions to the first Paris Agreement Global Stocktake in 2023 on progress towards multilateral climate goals.
- Enable citizens to benefit from transition opportunities and to navigate disruptions. Governments in the EU and elsewhere should continue to explore and step-up new ways to share best practices in designing energy policies towards climate neutral economies that are inclusive, including as part of the work of the IEA's Global Commission on People-Centred Clean Energy Transitions.

The announcement came just ahead of the IEA-COP26 Net Zero Summit, which brought together representatives of 40 countries covering more than 80 per cent of global GDP, population and emissions, to focus on the urgent need for international collaboration and policy implementation to accelerate clean energy transitions ahead of COP26 in November.

A recent report by the IEA revealed that global energy-related carbon dioxide emissions are on course to surge by 1.5 billion tonnes in 2021 – the second largest increase in history – reversing most of last year's decline caused by the Covid-19 pandemic.

The IEA's 'Global Energy Review 2021' estimates that CO_2 emissions will increase by almost 5 per cent this year to 33 billion tonnes, based on the latest national data from around the world as well as real-time analysis of economic growth trends and new energy projects that are set to come online. The key driver is coal demand, which is set to grow by 4.5 per cent, surpassing its 2019 level and approaching its all-time peak from 2014, with the electricity sector accounting for three-quarters of this increase.

EU seeks regulatory framework to incentivise hydrogen

The Council of the European Union has said that attracting international investments in hydrogen energy is a priority. Noting that it is a competitive and predictable market, the Council recently highlighted the need to create a "stable regulatory framework" for the industry.

"Public and private investment must ally, and governments have a responsibility to give the right signals, creating the conditions for the private sector to invest with stability and security," said Portuguese Minister of Environment and Climate Action Joao Pedro Matos Fernandes.

The Council called for mobilisation of public sector investment for the implementation of the European strategy but warned that private investors will only be interested in moving forward if there is transparency.

The call came as France released a legal framework for incentivising renewable and low-carbon hydrogen. Under ordinance n° 2021-167, dated February 17, 2021, three different types of hydrogen are now subject to dedicated regulations: renewable, low-carbon, and carbonaceous (fossil) hydrogen.

Guarantees of origin are common in French energy regulations for renewable energy or biogas, but this new ordinance creates an unprecedented guarantee of traceability for low-carbon or renewable hydrogen.

The ordinance also provides for a support mechanism for renewable or low-carbon hydrogen production by water electrolysis. Additional remuneration and, as the case may be, investment aid will be awarded to certain projects or infrastructures after a tendering process.

Eran Chvika, Partner at law firm Pinsent Masons, noted that this ordinance "comes at the right time" for businesses investigating the potential of hydrogen. He noted, however, that although it provides more clarity, "one may question the need" to distinguish between renewable hydrogen and low-carbon hydrogen.

Writing in *Out-Law*, he said: "If the main objective of the French government is the decarbonation of the industry in France, this could easily be achieved with hydrogen produced from nuclear electricity or from electricity powered by renewable sources. This could be a sign that French energy policy has definitively taken a 'green' turn."

France has set the objective of developing low-carbon and renewable hydrogen and its industrial, energy and transportation uses, with the prospect of reaching around 20-40 per cent of total hydrogen and industrial hydrogen consumption by 2030.

A recent a study by BloombergNEF claims that green hydrogen will soon plunge in cost, in large part due to lower prices for solar photovoltaic power (PV), becoming cheaper than natural gas in many areas.

"We now think that PV electricity will be 40 per cent cheaper in 2050 than what we had thought just two years ago," BNEF specialists said. "The costs of producing 'green' hydrogen from renewable electricity should fall by up to 85 per cent from today to 2050."

In the majority of 28 markets covered by the study, green hydrogen could cost less than $1/kg by 2050. In 15 of those markets – which represented one-third of global gross domestic product in 2019 – it was forecasted to become cheaper than natural gas.

Nuclear wins new support across North America

- Canada, US, agree next steps on SMRs
- TVA chief says nuclear a low-carbon mainstay

Janet Wood

Alberta has joined New Brunswick, Ontario and Saskatchewan in signing a Memorandum of Understanding on collaborating on the advancement of small modular reactors (SMRs).

Premier Jason Kenney said: "Small modular reactors are an exciting new technology that could be used in the future to significantly cut greenhouse gas emissions, for example by generating power for Canadian oil sands producers."

A recent SMR Feasibility Study, conducted by Ontario Power Generation, Bruce Power, NB Power and SaskPower, concluded that SMRs would support domestic energy needs, curb greenhouse gas emissions and position Canada as a global leader in the emerging technology.

It suggests three streams of SMR project proposals for consideration by the governments of Ontario, New Brunswick and Saskatchewan, who are set to draft an action plan this quarter. They are:

- A 300 MW SMR at the Darlington nuclear site in Ontario by 2028. Subsequent units in Saskatchewan would follow, with the first SMR projected to be in service in 2032;
- Two advanced SMRs to be developed in New Brunswick at the Point Lepreau site;
- A new class of micro-SMRs to replace diesel engines in remote communities, following on from a 5 MW gas-cooled demonstration project at Chalk River, Ontario.

Meanwhile Japanese engineering firm JGC Holdings recently announced that it will join a US project to build an SMR in Idaho. It plans to invest $40 million in partnering with US reactor developer NuScale Power on engineering, procurement and construction for a plant to be built at Idaho National Laboratory, JGC said. NuScale secured approval for its design in August last year and is aiming to commercialise it by the end of the 2020s.

Over the longer term, JGC said it will work with Fluor Corp, a major investor in NuScale, to expand SMR projects globally.

Nuclear has sparked new interest in the USA since President Joe Biden announced plans to cut carbon emissions, and it remains an industry workhorse in several states.

For example, the Tennessee Valley Authority (TVA) has more than halved its carbon emissions since 2005 by shutting down half of its 59 coal fired power plants and has another closure in its sights within the next year at the Bull Run plant. To replace the lost coal generation, TVA has boosted its nuclear power output, which now supplies 42 per cent of its electricity, along with new gas fired plants and solar farms. TVA Chief Executive Jeff Lyash told a Senate committee that more nuclear power will be needed to achieve zero-carbon emissions and said that the existing fleet could operate safely for up to 100 years.

US takes a lead on storage

The US tripled its energy storage installations in 2020, according to new research from Wood Mackenzie, accounting for 38 per cent of all new storage capacity installed globally in 2020, a year that saw global installations jump by 51 per cent, with over 15 GW/27 GWh installed worldwide.

Meanwhile analysis by Frost & Sullivan said US investment would help North America hold second place in storage installations by 2030, behind Asia Pacific. Maria Benintende, energy and environment research analyst said North America would have a 32.4 per cent share of a 134.6 GW global market in 2030, up from just 8.5 GW in 2020.

This includes developing storage technologies. New York Power Authority (NYPA) recently signed an agreement with Zinc8 Energy Solutions and the University at Buffalo to deploy a long-duration Zinc-Air Energy Storage System.

"NYPA continues to place a priority on fighting climate change and promoting a clean energy economy, and this first-of-its-kind long-duration solution has the potential to be deployed into a range of scalable applications," commented Gil C. Quiniones, NYPA President and Chief Executive.

Storage in the US is set to triple in 2020

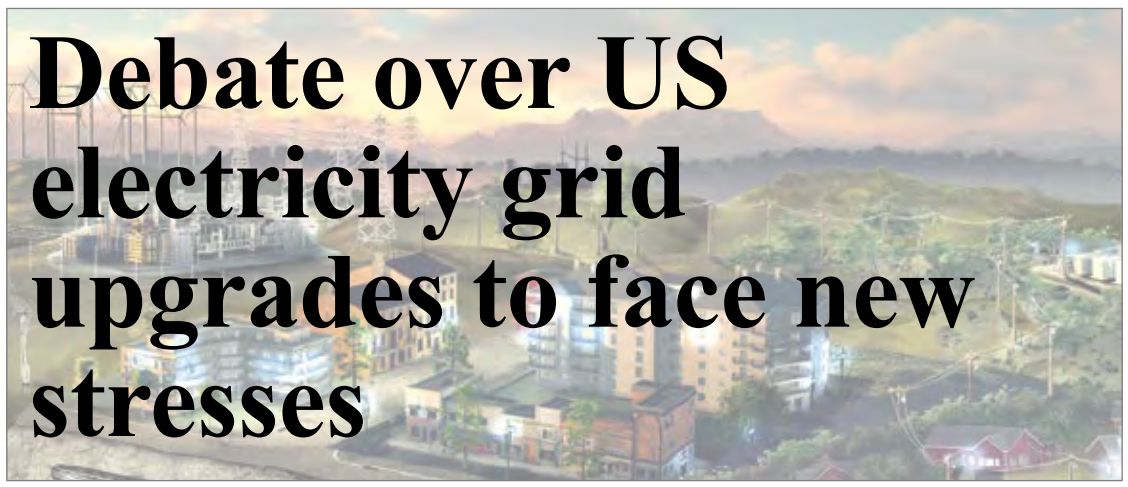
Brazil's subsidy deadline sparks solar rush

Solar power developers in Brazil have reacted to plans for a reduction in subsidy next year with a rush of new applications. In March alone, developers submitted applications that would double Brazil's current installed capacity of 3.3 GW.

The recent surge follows the government's announcement of plans to cut the subsidy, which halves the price that renewable projects pay to use the electricity network.

At the start of the last quarter of 2020 when the plan was announced, investors had submitted applications to ANEEL for the development of 8.7 GW of new projects. By March, once the new law had been passed, applications for new projects had soared to 18 GW.

According to ePowerBay, investors who had acted to get ahead of the change included Voltalia (4 GW in new solar projects), Iberdrola (2.1 GW), EDP Renewables (1.75 GW), Atlas (1.2 GW), EDF (1 GW) and Enel Green Power (910 MW) along with oil majors Shell (1.5 GW) and Total (49 MW).



Debate over US electricity grid upgrades to face new stresses

- Biden wants cybersecurity strengthened
- Texas reopens debate on winterisation

Janet Wood

The Biden administration has announced a new 100-day initiative to better protect the US power grid against cyber threats.

The initiative includes concrete milestones to install new technologies that can spot and respond to intrusions in real-time.

Emily Horne, a spokeswoman for the White House's National Security Council, said it was key to include the private sector because, "innovative partnerships like these are essential to addressing the urgent cybersecurity challenge because much of our critical infrastructure is owned and operated by the private sector".

The effort also involves the Cybersecurity and Infrastructure Security Agency and reveals the concern about the prospects for cyberattacks that disrupt the power supply.

A Government Accountability Office report recently found that distribution networks, are at risk. It said hackers use a variety of techniques to gain access, including compromising the supply chain by manipulating software or hardware or exploiting virtual private network connections. It recommended that the Energy Department, the primary federal agency for the energy sector, do more to address the risks.

Meanwhile Texas is still under pressure to protect its electricity grid from more familiar risks in the form of extreme weather and especially cold winter weather and snow.

"Without question, these extreme weather events are coming with greater frequency and intensity and with rising costs and loss of life," Sylvester Turner, the Mayor of Houston, Texas' biggest city, recently told a hearing that was investigating blackouts caused by an unexpected cold snap early in the year. Plants closed because of cold weather effects such as frozen instrumentation.

Texas had been advised to 'winterise' the grid after a similar cold snap in 2011 but decided it was too costly. But recently the Texas legislature debated proposed new rules that would require power plants to winterise their facilities and fund the cost, along with proposed penalties for failing to comply that could be up to $1 million a day.

US offshore wind industry highlights job creation

The US has set a national target of 30 GW of installed offshore wind capacity by 2030 – a pathway to deploy 110 GW or more of offshore wind capacity by 2050 – as a centrepiece of a newly introduced plan by the Biden Administration to jumpstart offshore wind.

The 2030 target could trigger more than $12 billion per year in capital investment in projects on both US coasts.

The Biden-Harris administration highlighted that more than 44 000 people are expected to be employed in offshore wind by 2030, with nearly 33 000 additional jobs in communities supported by offshore wind activity.

John Rousakis, former head of legal affairs for New York City's Dept. of Environmental Protection, said: "If ambitious policies like these are rolled out on a national scale, they would deeply reduce greenhouse gases and put a lot of people to work converting the economy from older to newer technologies."

To boost offshore wind investment the Department of Interior's Bureau of Ocean Energy Management (BOEM) plans by 2025 to sell leases and complete reviews of construction plans for at least 16 wind farms, representing more than 19 GW of capacity.

BOEM announced a new priority Wind Energy Area in the New York Bight, an area of shallow waters between Long Island and the New Jersey coast.

Coal use could jeopardise China's carbon targets

- China commissioned nearly 39 GW of new coal plants in 2020
- President Xi pledges to "phase down" coal consumption in the 2026-2030 period

Syed Ali

China has set aggressive goals on renewable energy aimed at helping it achieve a pledge to be carbon neutral by 2060, but the growing amount of coal fired generation could threaten that goal.

According to a recent report by the Global Energy Monitor (GEM) in San Francisco, USA, and the Centre for Research on Energy and Clean Air (CREA) in Helsinki, Finland, China commissioned 38.4 GW of new coal plants in 2020 – 76 per cent of the 50.3 GW global total. This resulted in the first increase in global coal capacity development since 2015.

Ahead of the Leaders Summit on Climate in the US last month, researchers were doubtful that China could meet President Xi Jinping's pledge for carbon dioxide emissions to peak before 2030, a key milestone if the country is to meet the 2060 deadline.

"If the central government allows the current levels of coal plant development to be maintained, it will at best divert important resources away from its clean energy transition, and at worst make China's carbon neutral goals difficult if not impossible to achieve," said the GEM-CREA report.

After accounting for shutdowns, China's net coal capacity additions last year was 29.8 GW, compared with the world's net reduction of 17.2 GW. The pace of construction approvals also tripled to 36.9 GW last year alone, five times more than those initiated outside China, according to the report.

"That has put the central government's emphasis on new climate commitment in a bad light," said Greenpeace East Asia's climate and energy project manager Zhang Kai in Beijing.

At the US-led summit, however, President Xi re-affirmed his pledge and, notably, added some new details on how the goals will be achieved. Xi pledged to "phase down" coal consumption in the five years from 2025, the first time the Chinese leader has vowed to reduce coal consumption.

In a press briefing by Beijing officials after Xi's speech, however, it was noted that this would still allow China's coal consumption to grow until 2026, followed by a phase-down in the 2026-2030 period.

Su Wei, Deputy Secretary-General of China's state planner, said: "We need a stable source of electricity and have no other options, so for a period we will need coal power to supplement unstable renewable energy sources."

At the end of March for the first time China outlined a systematic plan to achieve its carbon emission targets. The plan proposes that in 2030, China's installed clean energy capacity will account for 67.5 per cent, and 48 per cent of the country's electricity will be provided by solar and wind energy. By 2060, China's coal power installed capacity will be completely withdrawn; the industrial sector will be dominated by electric power, supplemented by hydrogen energy; the number of electric vehicles will reach 390 million, and the replacement rate will exceed 90 per cent.

In a draft rule issued in April, the National Energy Administration said that solar and wind power generation will need to increase each year over the next five years and reach around 16.5 per cent of total power use by 2025.

India calls developed countries' climate goals "pie in the sky"

India's Energy Minister R K Singh has labelled targets set for 2050 or 2060 as "a pie in the sky", arguing that developing countries such as India should not be forced to cut their emissions to net zero.

Speaking at a virtual summit hosted by the International Energy Agency and the UN COP26, Singh said richer countries should adopt "net negative" emissions targets.

"2060 is far away. By that time, if the people continue to emit at the rate at which they are emitting, the world won't survive," he warned. "So what are you going to do with the next five years?…When are you going to bring your emissions down to the world average, or below the world average?

"I believe that it's important for all the developed countries to talk about, not net zero, but about removing more carbon from the atmosphere than they are adding – net negative is what they need to talk about."

India itself, however, does not have a target for when it will cut emissions. Instead the world's second most populated country aims to reduce emissions intensity (the amount of pollution relative to GDP) by 33 per cent by 2030, relative to 2005 levels.

Despite growing calls from environmentalists to reduce coal use and international political pressure in the run up to the COP26 climate conference in Glasgow in November, a recent document showed India is still planning new coal fired plants.

According to a draft electricity policy document seen by the *Reuters* news agency, it may build new coal plants because they generate the cheapest electricity. The 28-page February draft of the National Electricity Policy (NEP) 2021 – which has not been made public – showed India may add new coal fired capacity, though it recommended tighter technology standards to reduce pollution.

"While India is committed to add more capacity through non-fossil sources of generation, coal-based generation capacity may still be required to be added in the country as it continues to be the cheapest source of generation," the NEP draft read.

At the start of April, India's environment ministry delayed anti-pollution guidelines for coal fired power plants further, extending the compliance deadline by as much as two years.

Plants located close to populated cities, including the capital, New Delhi, will now have to meet the standards by December 2022 – a seven-year extension from the original plan to cap toxic emissions, including particulate matter, sulphur dioxide and nitrous oxides.

R K Singh says richer countries should adopt "net negative" emissions

Australia looks to polish green credentials

In a move to enhance its green credentials ahead of the Leaders Summit on Climate held in the US, Australia's Prime Minister Scott Morrison last month proposed spending an extra $417 million on hydrogen and carbon sequestration projects.

Noting that the country would play an enormous role in achieving the global aim of emission neutrality by 2050, Morrison said the money would be spent on building new hydrogen-producing hubs and carbon capture technologies. The government wants Australia to become a major global hydrogen supplier by 2030, aiming to reduce production costs to less than $1.54/kg.

Morrison, who has shown a slow shift in his energy policy, which is strongly in favour of fossil fuels, said the country was headed towards a low-emission future but not at the cost of imposing taxes on major industries.

Of the total budget announced, $212.5 million is to speed up the development of four hydrogen production centres. Another $203 million would help develop projects for the storage and capture of carbon.

The Morrison administration has an investment roadmap for technology that assigns $13.88 billion of public funds over the next ten years to these projects and seeks to set aside at least $53.99 billion in investments for low-carbon energy technology by 2030.

Research, commissioned by the Australia Institute think-tank and released at the end of March, found clean technologies provided the fast frequency response service and voltage control needed to secure the energy grid and reduce cost. But the report says regulatory barriers currently limit the ability of renewable energy and batteries to provide system security.

The research was commissioned to assist the energy security board as it redesigns the national electricity market. Australian energy ministers are due to determine a new "post-2025" design for the national market in June 2021.

South Korea goes cold on coal

South Korea has pledged to stop its state institutions financing coal power overseas and says it will announce a new target to reduce its domestic carbon emissions.

The pledge, made at the US-led Leaders Summit on Climate last month, came after John Kerry, the US climate envoy, visited the country earlier in the month.

South Korea also said it plans to strengthen its 2030 climate goal this year, which currently targets an emissions reduction of 24.4 per cent compared with 2017 levels. Last year it pledged carbon neutrality by 2050 but has been criticised by environmentalists for the lack of a robust road map to achieve its carbon reduction targets.

The country does not have an official plan for completely phasing out coal or significantly boosting renewables.

Coal still accounts for about 40 per cent of the domestic electricity generation and a quarter of national emissions, according to a report published last month by London-based think-tank Carbon Tracker Initiative (CTI), South Korea's Chungnam National University, and Seoul-based NGO Solutions for Our Climate.

CTI analyst Valeria Ehrenheim, commented: "Without quickly phasing out coal power, the country would struggle to raise its currently highly insufficient NDC [Nationally Determined Contributions], which is aligned with catastrophic warming scenarios."

South Korea is, however, in the process of rolling out its Green New Deal as part of its post-pandemic recovery. The package will incentivise investment in industries such as electric vehicles and hydrogen, solar and wind energy.

In April it revised the renewable portfolio standards (RPS) system to have power companies utilise more sustainable resources. Under the new rules, power companies are requested to produce up to 25 per cent of all their power output from renewable sources, up from the previous 10 per cent, according to the Ministry of Trade, Industry and Energy.

The policy will be implemented in October.

Europe halfway to end-game for coal

- Cost of carbon emissions increases pressure on owners
- Ireland's Moneypoint shows way forward for coal sites

Janet Wood

The UK is weaning its electricity grid off coal power at the fastest pace of any country in the G20 according to new analysis from the energy think-tank Ember.

Since 2015, coal use in the UK has collapsed by 93 per cent, well ahead of any other G20 nation and coal now accounts for just 1.7 per cent of all electricity generated in the UK.

However, a recent announcement by EDF that it would close its West Burton coal fired station in England was another milestone: it marked the shutdown of half of Europe's 324 coal fuelled power plants, of which 162 have either closed or announced a retirement date before 2030.

Burning coal has become increasingly expensive for power plant owners, partly thanks to the emissions trading scheme (ETS), which has seen the price of emitting CO_2 from EU power plants increase from €5 per tonne of CO_2 to almost €40 per tonne since 2016.

Kathrin Gutmann, Campaign Director at Europe Beyond Coal, said: "We are in the end-game for the coal industry in Europe. Fourteen European countries understand [the economic and political realities] and have washed their hands of coal."

Poland, Romania and Bulgaria have no phase-out planned and the Czech Republic and Slovenia are still considering dates that could miss the 2030 deadline for a coal phase-out laid out in the Paris Agreement.

Germany is expected to exit coal in 2038. However, Environment Minister Svenja Schulze said recently that the exit could happen years sooner. Planned stricter emissions targets will mean emissions certificates will become more expensive, meaning the amount emitters will have to pay for their greenhouse gas emissions will go up. Coal energy will be "forced out of the market", Schulze said.

ESB's Moneypoint site in Ireland is an example of how coal is being pushed out. ESB has recently announced that the site – Ireland's only coal fired station – will be transformed into a green energy hub.

It will house a synchronous condenser to help stabilise the grid when it carries mainly renewable energy, a connection point and construction hub for offshore wind and eventually a hydrogen production, storage and generation facility.

Pat O'Doherty, ESB Chief Executive, said: "We have long signalled our intention to cease burning coal at Moneypoint. Today we are unveiling plans for a reimagined Moneypoint, which will not only create hundreds of jobs, but will also help Ireland to meet its climate targets and maintain secure supplies of electricity into the future."

New nuclear reaches milestone in Finland but faces questions elsewhere

- Olkiluoto 3 begins loading fuel
- New reactor projects hit by questions over 'sustainable' status

Fuel loading has begun at Finland's Olkiluoto 3 nuclear power plant. The plant owned by Finnish power company Teollisuuden Voima in Eurajoki is finally expected to begin electricity generation in October and go into commercial service in February 2022.

However, TVO is still negotiating project completion terms with the plant supplier consortium, which comprises Areva and Siemens, and disputes over delays in the project. The reactor is Areva's first European EPR. It is over 12 years behind schedule – it was originally scheduled to begin commercial operations in May 2009 – and is three times over its original €3.2 billion ($3.55 billion) budget.

Two other EPRs are under construction in France (Flamanville) and the UK (Hinkley Point C).

The design is also one potential contender for a new-build project at Dukovany in the Czech Republic. America's Westinghouse Electric Company, and South Korea's KHNP, are also expected to be competing to secure the contract to build a new reactor at the site.

The potential new projects – Poland and Romania have also begun consideration of new nuclear plants – come as the nuclear industry struggles to ensure its technology gets a clean bill of health within the European Commission's so-called Sustainable Finance Taxonomy.

Reacting to the findings of the Joint Research Centre's (JRC's) scientific assessment of whether nuclear energy meets the "do no significant harm" criterion of the proposed taxonomy, Dr Sama Bilbao y León, Director General of the World Nuclear Association, said: "The JRC report is clear in its conclusions. There are no scientific arguments supporting an exclusion of nuclear energy from the Sustainable Finance Taxonomy."

Dr Bilbao y León added: "We are facing the dual challenge of economic recovery following the pandemic, and climate change.

"Enough time has been spent procrastinating. Nuclear energy, the single-largest low-carbon electricity source in the EU, has already played a major role in terms providing reliable cost-effective 24/7 sustainable electricity for the last 40+ years, and it will be crucial in building a sustainable tomorrow."

Nuclear is not the only power source whose proposed classification in the taxonomy has been challenged.

Fierce debates have recently begun over whether gas fired generation should be included in the taxonomy. Some argue that it should because it represents lower emissions than coal and they can be abated with carbon capture and storage (CCS), but others say that its inherent carbon emissions should exclude it from the list.

Norway set to connect more renewables, start export/import with Germany

NordLink partners TenneT, Statnett and KfW have taken over a new high-voltage direct current (HVDC) link between Norway and Germany and moved it from the trial to the operational phase.

Tim Meyerjürgens, TenneT's COO, said: "Building on a trusted partnership we delivered the "green cable" within the specified expectations in time, budget and quality."

Hitachi ABB Power Grids was responsible for the HVDC technology in the converter stations in Norway and Germany, while Nexans and NKT supplied the cables. "We are delighted to be contributing to this milestone project, which brings Europe another step closer towards its vision of an interconnected and carbon-neutral energy system," said Niklas Persson, Managing Director of Hitachi ABB Power Grids' Grid Integration business unit.

Meanwhile Norway's grids are set to connect more renewables after the Norwegian government decided to change the grid connection regulations. Grid operators will now sign agreements with new customers that allow for the electricity supply to be reduced or cut-off if the network is constrained. The change could speed up 300 connection applications, which are handled by Norwegian energy authority NVE. The aim of the change is also to make ferry operators, data centres and oil platform electrify their operations sooner.

Spain the target for new renewables ventures

Spain has recently become attractive for new joint ventures focused on renewables development.

Iberdrola has formed a joint venture with Spanish insurer Mapfre to invest in up to 1 GW of renewable energy projects in Spain. Mapfre will take an 80 per cent stake in the venture, with Iberdrola owning the remainder and taking on the developing, construction and wind farm operation duties.

The investment vehicle will start out with two operating wind farms with a combined capacity of 100 MW and 130 MW of solar photovoltaic (PV) projects due for commissioning in the third quarter of 2022, Iberdrola said. But over time it will acquire operating assets and develop new renewable energy projects from Iberdrola's pipeline, until the portfolio reaches 1 GW.

Meanwhile Renewable Power Capital (RBC), the investment platform backed by the Canada Pension Plan Investment Board, has formed a joint venture with Spanish PV specialist Benbros Solar. The new 50:50 joint venture aims to co-develop 3.4 GW of solar projects in Spain, and so far has 14 projects located in Andalusia, Extremadura, Castile-La Mancha, Aragon and Murcia. This is RPC's first entry into the Spanish renewables market.

Wind energy investment 'has to step up to meet targets'

Europe saw investments in new wind farms rise by 75 per cent in 2020, according to a report by WindEurope.

That will finance 19.6 GW of capacity, around 13 GW of which is in the EU. Offshore wind projects will be 7.1 GW of that total, whereas investment in new onshore wind farms, was the lowest since 2017 at 12.5 GW.

Investment is expected to step up again this year, because the European Commission recently gave State Aid clearance to Germany's support scheme for offshore wind energy. It will increase Germany's target for installed offshore wind capacity from 15 GW to 20 GW by 2030.

However WindEurope said more was needed because the EU needs to build 27 GW of new wind energy a year to deliver its new 55 per cent emission reduction target. The main problem, it said, is the slow rate of permitting of new wind farms. "The money's out there, but not enough new projects are coming through," the report stated.

Green Investment Group Europe head Edward Northam said mature, proven wind projects are an extremely attractive large-scale opportunity for investors.

"The challenge currently facing the sector therefore lies not in access to capital, but in accessing a pipeline of investable projects," he said.

Azerbaijan commits to offshore wind energy push

- Offshore wind to spearhead renewables build-out
- Caspian Sea identified as wind resource hotspot

Nadia Weekes

Azerbaijan's Ministry of Energy has signed a Memorandum of Understanding (MoU) with the World Bank's International Finance Corporation (IFC) to cooperate on the development of offshore wind energy.

A roadmap will be developed following an assessment of the potential of offshore wind power in Azerbaijan's Caspian Sea. At the next stage, cooperation will focus on managing offshore wind tenders, defining partnerships with the private sector, and implementing auxiliary investments.

"It is necessary to use the offshore wind energy potential to ensure that renewable energy has a significant position in production and consumption," said Energy Minister Parviz Shahbazov, pointing out that renewable energy had been identified as a "significant priority" for Azerbaijan's socio-economic and diversified development.

"One of IFC's strategic priorities in Azerbaijan is to support the country's move to a new private-sector led growth model," said Wiebke Schloemer, IFC Director for Europe and Central Asia. He added that helping an oil- and gas-rich nation like Azerbaijan explore and develop offshore wind energy would increase private sector participation and support the energy transition.

The technical potential of offshore wind energy in Azerbaijan is estimated at 157 GW, of which 122 GW on floating foundations, according to a preliminary assessment by the World Bank's Energy Sector Management Assistance Program (ESMAP).

In a report by Aegir Insights, the Caspian Sea is identified as having the best wind resources in the region and shallow waters optimal for fixed-bottom turbines. Alongside the Black Sea and the Eastern Mediterranean, it offers ideal sites for offshore wind development, with projected levelised cost of energy (LCOE) levels as low as €50/MWh ($60/MWh).

Ukraine on the Black Sea has a technical offshore wind potential of 314 GW, followed by Turkey at 90 GW. The offshore wind market in Ukraine, however, is at a very early stage as no political actions aimed specifically at offshore wind have been taken.

The Turkish offshore wind market is expected to be a frontrunner in the eastern Mediterranean and Black Sea region, due to political commitment to the energy transition and an already well-developed local supply chain for onshore wind.

A tender for 1.2 GW of offshore wind scheduled for 2018 was postponed due to demanding requirements and a lack of site data. Depending on when the auction happens, Turkey could have operational offshore wind capacity by 2030 or the early 2030s, according to the report.

Aegir Insights acknowledges signs of political action on offshore wind in Azerbaijan but says the market is at too early a stage to support predictions of a build-out timeline.

Anglo American divests from South African coal

Thermal coal operations and exports to emerging economies will continue under Thungela Resources Ltd., **Nadia Weekes** reports.

Anglo American has announced it will spin-off its thermal coal operations in South Africa, as it strives to meet its commitment to be carbon neutral by 2040.

Subject to the approval of Anglo American's shareholders on May 5, the thermal coal operations in South Africa will be transferred to a new holding company, Thungela Resources Ltd, which will have a primary listing on the Johannesburg Stock Exchange and a standard listing in London.

Thermal coal still generates about 40 per cent of electricity worldwide, but investors are increasingly reluctant to support the commodity because of its significant contribution to climate change.

"Anglo American has been pursuing a responsible transition away from thermal coal for a number of years now," said Anglo American Chief Executive Mark Cutifani. "As the world transitions towards a low carbon economy, we must continue to act responsibly – bringing our employees, shareholders, host communities, host governments and customers along with us."

Thungela will be a leading South African thermal coal exporter, with 16.5 million tonnes of attributable export saleable production in 2020. "Thungela is... well positioned to benefit from improved market conditions, and providing a reliable and affordable energy source to our customers mainly in developing economies," said Thungela Chief Executive, July Ndlovu.

Anglo American will provide an initial cash injection of ZAR2.5 billion ($174 million) and could provide further capital support until the end of 2022. Following completion of the proposed demerger, 100 per cent of the issued share capital of Thungela will be held by Anglo American shareholders, who will receive one Thungela share for every 10 Anglo American shares. If approved, the demerger is expected to be effective on June 4.

Meanwhile, South African state-owned utility Eskom said that operations started at Unit 3 of the Kusile coal fired power station, 50 miles east of Pretoria, marking the halfway point in a long-delayed ZAR118.5 billion project that began in 2008.

South Africa has been suffering severe power shortages. Energy Minister Gwede Mantashe announced in late March that eight preferred bids and three eligible bids had been selected to provide an additional 2 GW of emergency electricity to support the national grid over the short term.

The bids include solar photovoltaic and wind power, as well as liquefied natural gas and battery storage. The offered prices range from ZAR1 468/MWh to ZAR1 885/MWh. Financial close has to be reached by the end of July 2021, with first power being produced from August 2022.

Uzbekistan raises ambition for Zarafshan wind farm

Construction started on April 1st at the Zarafshan wind farm, with the ceremony also marking an agreement between Uzbekistan's Energy Ministry and the UAE's Masdar Company to increase the project's design capacity from 500 MW to1.5 GW.

Energy Minister Alisher Sultanov said the wind farm will be the largest facility of its kind in the Central Asian region, and a big step towards Uzbekistan's goal of installing 3 GW of wind power by 2030. By the same date, the share of renewable energy sources in the energy mix should reach 26 per cent.

Development of the Zarafshan project, in the Navoi region, started last year and is scheduled to be completed by 2024. It is expected to raise $1.8 billion in foreign direct investment. Once operational, the wind farm will supply electricity to 1.5 million households and avoid 3.3 million tonnes of carbon dioxide emissions a year.

In a separate development, Turkish Aksa Enerji said it will build two gas power plants for a total of 470 MW and a cost of $300 million in Uzbekistan's Tashkent region. The construction has already begun and 900 new jobs are to be created upon its completion scheduled for the fourth quarter of this year.

Another power plant contract was awarded to Dutch firm Stone City Energy, for the development of a 1.56 GW thermal power plant in the Surkhandarya region.

The Dutch firm will design, build, finance, operate and maintain the plant, featuring HL steam and gas turbine units manufactured by Germany's Siemens Energy, for a period of 25 years.

Total project cost is estimated at $1.2 billion, with the plant scheduled to be operational by the end of 2024.

And Saudi Arabia's Acwa Power reached financial close for the $1 billion, 1.5 GW Sirdarya combined cycle gas turbine (CCGT) power plant, meeting 15 per cent of Uzbekistan's power demand and forming 8 per cent of the country's total power capacity.

A syndicate of seven international lenders including the European Bank for Reconstruction and Development, German Investment Corporation and Standard Chartered Bank will provide $750 million worth of financing for the project.

UAE's largest electricity generation facility goes live

Several months after connecting to the grid in August 2020, Unit 1 reactor at the Barakah nuclear power plant in the United Arab Emirates has started commercial operations.

Dr Sama Bilbao y León, Director General of the World Nuclear Association, congratulated all those involved in the project. Once completed, the Barakah plant will have a capacity of 5.6 GW and supply a quarter of the electricity used in the UAE.

Located in the Al Dhafra region of the Emirate of Abu Dhabi, Unit 1 has a capacity of 1.4 GW and will be the largest single source of electricity in the UAE.

Barakah-1 will supply "clean and cost-effective electricity… [and provide] rewarding employment opportunities to the people of the UAE for many decades to come", Dr Bilbao y León said.

The facility is expected to generate electricity round the clock, seven days a week, for the next 60 years. It will be paused every 12-18 months for refuelling.

The plant's remaining three generating units are expected to be brought online over the coming years. Fuel loading has just been completed at Unit 2, with startup due later this year. Units 3 and 4 are in the final stages, being 94 per cent and 89 per cent complete, respectively.

Insurers form alliance as more corporates consider carbon impact

- Insurers could be accountable for net zero pledges
- Companies put internal price on carbon

Junior Isles

A group of seven global insurers and reinsurers have formed an alliance, as the financial sector faces warnings from US climate envoy John Kerry that they will be held accountable for net zero pledges.

The Net-Zero Insurance Alliance, to be launched in November at the UN's COP26 climate summit, will be chaired by Axa and includes Allianz, Aviva and Zurich and reinsurers Munich Re, Scor and Swiss Re.

Insurers have come under scrutiny, having been quicker to overhaul their investment portfolios in light of the climate threat than they have been to withdraw coverage from carbon-heavy groups. All of the companies in the net-zero insurance group are already part of a broader net-zero alliance for asset owners, founded in 2019.

Insure Our Future, a coalition of non-governmental organisations and campaign groups, said the alliance "would only be worthwhile" if it took steps that include stopping insurance for new and expanded coal, oil and gas projects, and phasing out cover for oil and gas companies.

In March Aviva's Chief Executive Amanda Blanc told the *Financial Times* that "underwriting needs to catch up with the investments". "We need to be having conversations with corporates around our ability to underwrite something which is no longer sustainable," she said.

The news comes as a growing number of corporations are taking the environmental impact of carbon emissions into their decision-making.

Global environment impact disclosure group CDP (Carbon Disclosure Project) recently revealed that more than 2000 companies, worth more than $27 trillion in market capitalisation, either already have or are planning to set an internal price on carbon within two years.

Prices can be hypothetical, where no money is spent, but the company calculates an additional cost based on the carbon intensity of the investment, with the objective being to encourage low-carbon spending.

"What you're trying to do is trigger a different investment decision," said Nicolette Bartlett, the CDP's Global Director of Climate Change. "Depending on the price, what it covers, and how much importance a company attributes to the calculation, it can be very or not at all influential."

The CDP said the number of companies that factored the cost of carbon into their business plans, or were planning to do so within two years, had increased by 80 per cent in five years.

Just last month the retail arm of Ikea said it would invest €4 billion in the next decade in renewable energy, especially in countries such as Russia, India and Australia, where it has little wind and solar power.

The flat-pack furniture company, which has spent €2.5 billion in the past decade attempting to ensure that it produces the same amount of renewable energy as it consumes worldwide, says it wants to reach 100 per cent renewable energy throughout its supply chain as part of its ambition to become "climate positive" by the end of the decade.

Partnerships target ammonia and hydrogen

Several companies formed partnerships in April aimed at boosting supplies of ammonia and hydrogen.

Most recently, Siemens Energy and Messer Group entered into a cooperation agreement with the goal to work on green hydrogen projects in the 5-50 MW range for industrial and mobility applications. Within the framework of this agreement Messer Ibérica has already submitted three clean hydrogen projects in the chemical complex of Tarragona to the Spanish government. These projects will have a total electrolyser capacity of 70 MW.

The intention of the partners is to achieve the most economic operation possible, by maximising cost efficiency and the utilisation of all co-products in an integrated hub concept. In the Tarragona chemical park Messer Ibérica operates a pipeline network for oxygen where this electrolysis co-product will be used.

The news followed an announcement by Mitsubishi Heavy Industries, Ltd. (MHI) that it has invested in Starfire Energy Inc., a developer of modular chemical plants for the production of green ammonia and hydrogen with a patented catalyst technology located in Denver, CO, USA. The partnership will be used to advance the development of commercial scale applications to decarbonise ammonia production and unlock its potential as a zero-carbon energy carrier.

Ammonia is a promising solution with an energy density comparable to fossil fuels and significantly higher than Li-ion batteries, compressed or liquid hydrogen. It can be affordably and easily stored and transported, leveraging established infrastructure and shipping networks, and is regulated by well-developed codes and standards. It can be used directly as a fuel or it can be 'cracked', and its hydrogen harvested, to provide a stable, efficient means of hydrogen storage and transportation.

Ammonia is increasingly attracting the interest of industry players. In March Haldor Topsoe and Nel entered a memorandum of understanding (MOU) with the intent to offer customers complete renewable electricity to ammonia and methanol solutions.

Under the MOU, Haldor Topsoe intends to supply license, engineering, proprietary hardware, catalyst and technical service for its ammonia and eMethanol technologies, as well as system integration engineering. Nel intends to supply its alkaline or PEM electrolysis technology and proprietary hardware, and sub-system engineering.

"This cooperation speaks directly to our customers' needs as we see massive interest from the market requesting basic engineering, license, and process guarantee in one package," said Amy Hebert, Chief Commercial Officer of Haldor Topsoe.

The company is currently engaged in several projects to produce green hydrogen, green ammonia, eMethanol, and green fuels. An example is the Helios project in NEOM, Saudi Arabia, announced in July 2020, which includes the world's largest ammonia loop (1.2 million tons per year) delivered by Haldor Topsoe.

European majors lead on low-carbon preparedness but oil and gas far from ready

European oil companies, including Total, Galp, Equinor, BP and Royal Dutch Shell lead a group of the 39 most publicly-traded oil and gas companies in preparedness for a low-carbon world, but all these companies still invest most of their capex in fossil fuels, according to the Bloomberg Climate Transition Scores.

The Climate Transition Scores, supported by BloombergNEF and Bloomberg Intelligence research, also shows the oil and gas industry remains far from transition-ready

Jonas Rooze, Head of Sustainability Research at BloombergNEF, said: "When it comes to deploying low-carbon technologies, these companies do a lot of marketing, but their disclosure is limited and patchy, making comparison impossible. What makes these scores unique is that the bottom-up BNEF datasets shine a light on what these companies are actually doing – or not doing – to develop new low-carbon business models."

Patricia Torres, Global Head of sustainable finance solutions at Bloomberg, added: "The transition to a low-carbon economy in the oil and gas sector is a complex undertaking, requiring considerable change and a shift away from fossil fuels-based business models. The Bloomberg Climate Transition scores, combined with Bloomberg's research, provide insight into how prepared companies are for a net zero world and are a supplement to Bloomberg's broader environmental and social scores."

Following the report BP announced that it expected to hit its $35 billion net debt target in the first quarter of this year, sooner than expected.

BP plunged to a $5.7 billion loss last year and had a debt pile of $39 billion at the end of 2020. It had expected that debt level to rise in the first half of 2021 due to several payments due. However, in the first quarter it generated around $4.7 billion from sale proceeds.

As part of the company's plan to shift the focus of the oil major to low-carbon energy investments, BP is aiming to sell $25 billion of assets by 2025.

As disclosed at the time of the fourth quarter 2020 results, net debt was expected to increase in the first half of 2021, driven by: severance payments spread across both quarters; the payment to Equinor following completion of the US offshore wind joint venture, which occurred during the first quarter; and the approximately $1.2 billion pre-tax annual Gulf of Mexico oil spill payment scheduled for the second quarter.

Mitsubishi extends branding

Mitsubishi Power has extended its branding to include PW Power Systems. As part of a larger effort to apply synergies that will benefit its aeroderivative gas turbine customers, PW Power Systems has officially changed its name to Mitsubishi Power Aero.

According to PW Power Systems, the strength of the aeroderivative product and services portfolio will be enhanced by further leveraging the resources and technologies of Mitsubishi Power Aero's parent company.

"We are utilising Mitsubishi Power supply chain assets around the world to support new equipment manufacturing as well as aftermarket services," said Mitsubishi Power Aero President and CEO Raul Pereda. "Our Engineering teams are collaborating to make our gas turbines more competitive, including applications with hydrogen fuel, remote monitoring, and Tomoni artificial intelligence."

As electrification expands and the need to support variable renewable energy sources grows globally, the role of fast-start aeroderivative gas turbines has become even more critical.

Mitsubishi Power is a core subsidiary of MHI Group that offers technologies and energy solutions that support affordable and reliable power supplies in regions throughout the world.

- Mitsubishi Heavy Industries, Ltd. (MHI) has changed the name of its London-based European subsidiary from Mitsubishi Heavy Industries Europe, Ltd. to Mitsubishi Heavy Industries EMEA, Ltd. (MHI-EMEA). The change reflects the entity's expanded role as MHI's regional headquarters for the Europe, the Middle East and Africa (EMEA) region.

Americas

Framatome signs deal with Dominion Energy

Framatome has signed a contract with Dominion Energy to support the long-term operation of the company's nuclear fleet. The contract covers nuclear plant outage and maintenance work, including fleet steam generator services, refuel services, and inspections until 2026.

In addition, Framatome will provide refuelling services for the V.C. Summer Power Station and extend its existing contracts for refuel services at the Millstone, North Anna, and Surry power stations to 2024.

Catherine Cornand, Senior Executive Vice President of the Installed Base Business Unit at Framatome, said: "Dominion is one of our long-standing and valued customers. We are proud to offer them our team's strong expertise and excellence in inspection and maintenance to support the long-term operation of their reactor fleet."

Onshore cables for Vineyard Wind

Vineyard Wind has selected Southwire to design, manufacture, and install the onshore cables for the 800 MW Vineyard Wind 1, the first commercial-scale offshore wind farm in the USA. Southwire's facility in Huntersville, North Carolina will manufacture the high voltage cable for the onshore portion of Vineyard Wind 1.

The plant will manufacture over 32 miles of high voltage cable. The cable is scheduled for installation by the first quarter of 2023. Vineyard Wind 1 will consist of 62 GE Haliade-X wind turbines, with installation of the wind turbines scheduled to start in Summer 2023.

Lars T. Pedersen, CEO of Vineyard Wind, said: "Partnerships with US companies at all levels of the supply chain and in different regions of the country will be essential to maximising the potential of this industry here in the USA. Vineyard Wind 1 has already teamed up with some strong local partners and we look forward to many more partnerships like this as we take the next step to construct the project."

Siemens Gamesa to supply wind turbines for Peru

Siemens Gamesa has been selected by Engie to install 260 MW of wind power at the Punta Lomitas project in Peru. The project is Engie Energia Peru's first wind farm in the country. The order also includes a long-term O&M contract.

Punta Lomitas will have 50 units of the SG 5.0-145 onshore wind turbine, each turbine producing between 5 MW and 5.2 MW. The wind farm is scheduled to be commissioned by the first quarter of 2023.

Rik de Buyserie, CEO of Engie Energia Peru, said: "The future Punta Lomitas Wind Power Plant is a clear example of our commitment to the development of renewable energy in Peru and of our determination to accelerate the transformation towards a carbon-neutral economy."

GE announces 1.48 GW agreement with Invenergy

GE Renewable Energy has been selected to provide onshore wind turbines for the 1485 MW North Central Wind Energy Facilities in Oklahoma, USA. GE will deliver 492 units of 2.X-127 wind turbines, and 39 units of 2.X-116 wind turbines. These will have a variety of nameplate outputs and hub heights.

The North Central Wind Energy Facilities is a group of three wind farms in north central Oklahoma being developed by Invenergy. The three wind farms are the 999 MW Traverse Wind Energy Center, the 287 MW Maverick Wind Energy Center and the 199 MW Sundance Wind Energy Center. Maverick and Sundance will be completed in 2021 and Traverse in 2022. All three projects will be owned by American Electric Power (AEP) upon completion.

Asia-Pacific

GE to equip 110 MW of Indian wind projects

GE Renewable Energy will supply 42 units of its 2.7-132 wind turbines (2.7 MW) for three wind projects with a combined capacity of 110 MW. This is part of a multi-year framework agreement with CleanMax Enviro Energy Solutions. The agreement includes a 10-year full-service agreement.

The three onshore wind hybrid projects will be in the states of Karnataka and Gujarat. The announcement said that the new wind farms will meet the power demand of various industrial companies.

GE said that product design for this turbine takes place primarily at its technology centre in Bengaluru, blades are being made in Vadodara and Bengaluru, while assembly is done in Pune.

Vestas secures 42 MW order from Japan

Vestas has secured a 42 MW order with Toko Electrical Construction for the Miyagi Kami Wind Farm in Miyagi prefecture, Japan. The wind farm will be owned by Japan Renewable Energy and constructed by Toko Electrical Contractors. The project will involve ten V117-4.0 MW turbines in 4.2 MW operating mode with 94m towers.

Vestas will service the wind turbines under a 20-year Active Output Management 5000 (AOM 5000) service agreement for the wind farm, providing an energy-based availability guarantee.

Vestas will begin delivery of the turbines in the first quarter of 2023, with commissioning scheduled for the end of 2023.

Europe

Vestas to supply turbines to Faroe Islands

A 25 MW onshore wind project in the Faroe Islands will be equipped with turbines from Vestas Wind Systems. Vestas will supply six V117-4.2 MW turbines in high-wind operation mode for the Torshavn project. The turbines are scheduled to be commissioned by the end of 2021.

The order was awarded by Vindrokt, owned by Rokt and Effo, the project developers. The order also includes a 20-year Active Output Management 5000 service agreement for the wind power facility.

The Torshavn project will more than double the wind power capacity of the Faroe Islands. It advances the goal of meeting all Faroese electricity needs with renewable energy by 2030.

Two STATCOM systems from Siemens

German transmission system operator Amprion has commissioned Siemens Energy to construct two SVC PLUS series static synchronous compensator (STATCOM) systems to further stabilise the German transmission grid. The plants will be in Polsum (North Rhine-Westphalia) and Rheinau (Baden- Württemberg).

Both systems are designed for a reactive power range of +/- 600 Mvar, making them among the most powerful systems in the world. In addition, the STATCOMs will feature innovative grid-supporting control mechanisms allowing the systems to efficiently compensate for increasing voltage fluctuations in the electrical transmission network.

The growth of renewable energies and the reduction in large central power plants is leading to a greater need to avoid voltage fluctuations by regulating the reactive power. German transmission system operators calculate that it will need 23-28 Gvar additional voltage compensation, most of which it expects to be covered by STATCOM systems.

GE wind turbines for German wind projects

Czech energy group EPH said in mid-April that it has signed agreements to buy 300 MW of wind turbines from GE Renewable Energy for projects in Germany. The order is for the supply of 50 units of 6 MW turbines, to be used in projects located in former open-cast coal mining areas with EPH-owned renewables unit EP New Energies (EPNE) as the developer. First construction is expected to start on 2023.

The 100 MW Forst Briesnig II wind development is among the projects. This is owned by LEAG, a lignite miner and energy company 50 per cent owned by the EPH group.

Under the terms of the contract, GE Renewable Energy will supply GE 6.0-164 wind turbines, and will be responsible for installation and maintenance.

Wood appointed owner's engineer on Önusberget

John Wood Group has been appointed by Luxcara as owner's engineer on its 753 MW Önusberget wind farm development, near Piteå in Sweden's Norrbotten County. The project, when completed, is set to become Europe's largest onshore wind farm.

The project will involve 137 units of GE Renewable Energy turbines. Installation of the turbines is scheduled to start in July.

Andy Hemingway, President of Energy, Innovation & Optimisation at Wood, said: "As the largest of its kind in Europe, the Önusberget wind farm will make a significant contribution to the European clean energy market."

International

Mitsubishi Power wins Uzbekistan order

Mitsubishi Power, a subsidiary of MHI, has won an order for two M701JAC gas turbines for a 1500 MW natural gas fired combined cycle power plant under construction in Sirdarya, Uzbekistan. The order follows the conclusion of an equipment supply agreement for the Sirdarya project between ACWA Power and China Gezhouba Group as the appointed project EPC contractor.

In addition to providing two gas turbines as the plant's core equipment, Mitsubishi Power will also provide technical advisers to support construction and commissioning and has signed a 25-year long-term service agreement to support reliable operation.

The Sirdarya plant will have capacity equivalent to 8 per cent of Uzbekistan's total generation capacity and will be able to meet 15 per cent of the country's overall power demand when complete.

JAC series gas turbines have a forced-air-cooled combustor system and an optimised cooling structure. They also have an extra-thick film thermal barrier coating that enables improved cooling of turbine blades. They have a compressor with a high pressure ratio.

ACWA Power appoints Larsen & Toubro

The renewables arm of India's Larsen & Toubro (L&T) has been appointed as the EPC contractor for the 1.5 GW Sudair PV solar project in Saudi Arabia, which will be developed by Acwa Power. The Sudair PV project will be the largest solar power plant in the country.

Acwa Power signed a 25-year power purchase agreement (PPA) for the project in early April. The project will have a tariff of $0.01239/kWh, which Acwa Power says is the second lowest PV solar tariff in the world.

Wärtsilä wins Senegal gas conversion project

Wärtsilä will convert the 90 MW Bel-Air power plant in Dakar, Senegal, to operate on LNG. The plant, owned by Senelec, Senegal's public utility company, currently operates on heavy fuel oil. The order was booked in Q1 2021.

Bel-Air's existing six Wärtsilä 46 engines will be converted to six Wärtsilä 50DF dual-fuel engines. Wärtsilä's current O&M agreement covering the existing engines is being renegotiated. The Wärtsilä 50DF engines allows for the use of multiple fuels, enabling them to operate on gas with liquid fuel as back-up.

As part of the EPC contract, Wärtsilä will manage all phases of the project, which is expected to be completed before the end of 2021.

Papa Mademba Biteye, Managing Director of Senelec, said: "Our two main aims were to improve the plant's environmental profile and to lower operating costs. This conversion enables us to achieve both goals. At the same time, we are preparing the plant for the country's future gas supply infrastructure."

SEC gives Bilfinger three-year contract extension

The Saudi Electricity Company (SEC) has extended its inspection and maintenance contract with Bilfinger at Ghazlan power plant by three years, and it has signed a similar new contract with a base term of six years for the Shuqaiq power plant. The order is valued at around €35 million.

The 4 GW natural gas fired Ghazlan power plant is located 60 km north of Dammam on the east coast of Saudi Arabia. The 2.88 GW Shuqaiq power plant is located 600 km south of Jeddah on the west coast of Saudi Arabia.

Bilfinger is responsible for inspection and maintenance of various plant components at the power plants.

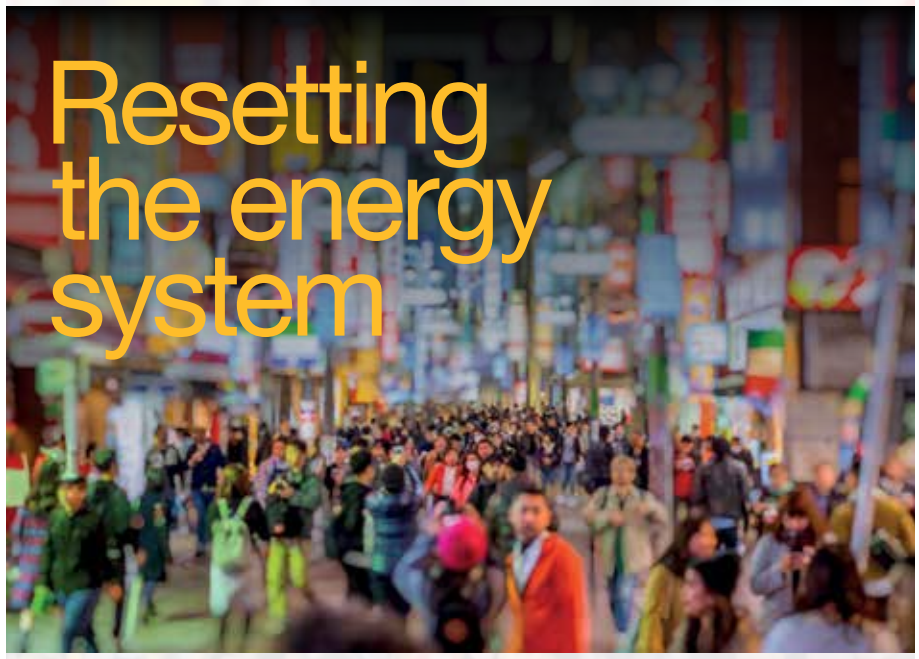
The scope of service includes repair of deaerators, steam drums, boiler ducts, boiler casings blowdown and flash tank test and the repair of burners and burner gas valves and actuators, and repairs at sea water intake areas.

Bilfinger has been conducting maintenance and repair work at the Ghazlan power plant since 2013.

Citizens Energy Congress
Virtual 15–16 June 2021

#CEC2021
#citizensenergycongress

Resetting the energy system



The Citizens Energy Congress, taking place virtually 15 – 16 June 2021, will bring together a broad spectrum of energy industry professionals, policy makers, investors, and civil society. Together, these groups will challenge the concepts and constraints of the existing energy models and foster consensus-driven foundations for a low carbon energy system.

Join us as we help reset the energy system.

Be a part of the Citizens Energy Congress
Partner | Speak | Attend
Visit **citizensenergycongress.com/about**
Call **+44 (0) 203 239 0515**
Email **info@citizensenergycongress.com**

Strategic Insights Partner: BCG
Organised by: dmg events

Enlit Africa

DIGITAL EVENT
8 - 10 June 2021

Formerly African Utility Week | POWERGEN AFRICA

Connect. Engage. Evolve.
Enlit Africa, formerly African Utility Week and POWERGEN Africa, invites you to learn, connect and engage with industry leaders and Africa's power and energy community across our 3-day, not-to-be-missed digital event on 8 – 10 June 2021. Register for your front-row seat to highly topical webinars, roundtables, tech showcases and the world's leading suppliers and their latest solutions and so much more.

Why you should attend:
- Understand the role and opportunities of the energy transition in Africa
- Gain insight into the implications of climate change for the energy sector
- Access the world's leading suppliers forwarding the progress of the energy sector
- Engage with participants in real-time via our Enlit Africa-Connect platform
- Take advantage of AI powered matchmaking to meet like-minded professionals and industry experts.

REGISTER NOW at www.enlit-africa.com/digital

Your inclusive guide to the energy transition.
enlit-africa.com

Brought to you by: CLARION ENERGY
In partnership with: ESI AFRICA

CIRED
20 – 23 SEPTEMBER 2021
GENEVA + SWITZERLAND

The **26th** International Conference and Exhibition on

Electricity Distribution

REGISTER YOUR PLACE TODAY!

Enjoy our Early Bird rate and save up to €150
by registering before 19 July 2021

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

Meet face-to-face and network with hundreds of key decision leaders from the utility, product, consultancy, service and business sectors of the distribution industry.

cired2021.org

Hydrogen

Biden to boost clean energy through investment in infrastructure, innovation

One of the goals of US President Biden's pledge to 'Build Back Better' is to create a pollution-free power sector by 2035. The expanded production and use of hydrogen has been earmarked to play a major role towards this end.

Gary Lakes

US President Joe Biden on April 22 announced a series of initiatives that his administration will take to reduce greenhouse gas emissions by 50-52 per cent from their 2005 levels by 2030. Biden's team will build on what progress has been made to date and use new programmes designed to boost employment and US industry to achieve that goal.

Moving on his campaign pledge to 'Build Back Better', Biden has set a target for the US to reach net zero emissions by 2050, in line with the 2015 Paris Agreement, which the US re-entered shortly after Biden entered office on January 20 this year. He also created the National Climate Task Force in order to take steps in line with UN goals of addressing climate change.

The green hydrogen and green ammonia industries are expected to see major investments and the rapid expanded use of their products in the short term. Numerous hydrogen-focused companies have expressed their support for Biden's proposals.

Biden announced his plan during the online Leaders Summit on Climate Change and comes as part of his $2.5 trillion infrastructure programme to revamp the US economy in the wake of the coronavirus pandemic. A statement released by the White House on April 22nd said the administration has analysed how "every sector of the economy can spur innovation, unleash opportunities, drive competitiveness, and cut pollution."

The statement lists steps to meet those goals as: invest in infrastructure and innovation; fuel an economic recovery that creates jobs; breathe clean air and drink clear water and advance environmental justice; and 'Make it in America," a call for US industries to produce and export clean energy projects.

One of the goals is to build a pollution-free power sector by 2035, and the expanded production and use of hydrogen will play a major role towards this end. Biden's plan calls for the US to address carbon pollution from industrial processes by supporting carbon capture as well as new sources of hydrogen – produced from renewable energy, nuclear energy, or waste – to power industrial facilities.

In conjunction with the Leaders Summit, the US Department of Energy announced six initiatives designed to move the administration's energy programme forward.

Secretary of Energy Jennifer Granholm said that within the coming weeks, the DoE will take steps to achieve lowering the cost of next-generation clean energy technologies, including clean renewable hydrogen, battery cells for electric vehicles and energy storage, and industrial and atmospheric carbon capture. She added that the US is entering a number of cooperative deals with other countries such as India, the UK, Sweden, the UAE and Canada that are designed to boost clean energy production and a reduction in greenhouse gases.

She said the administration's programme "will marshal" the US' National Labs, universities, and private sector to "unlock major breakthroughs".

"We've already announced a goal of cutting the price of solar in half yet again by 2030. And next, we'll start lowering the cost of clean, renewable hydrogen by 80 per cent before 2030, making it competitive with natural gas," she said.

Days prior to Biden's Leaders Summit, several major US energy companies provided examples of the innovation, cooperation and investment that the administration is talking about. Chevron USA and Toyota Motor North America on April 21st announced their agreement to "explore a strategic alliance to catalyse and lead the development of commercially viable, large-scale businesses in hydrogen, with the goal to advance a functional, thriving global hydrogen economy."

The same day, Southern California Gas (SoCalGas) announced that it will partner with H2U Technologies to carry out testing for a new, less expensive type of proton exchange membrane (PEM) electrolyser, a device that produces green hydrogen from water and renewable electricity. H2U Technologies said the cost target for their product is half that of current PEM electrolysers. The new electrolyser is designed in 200 kW blocks that can be stacked to produce 80 kg of green hydrogen per day, enough to power 80 homes in a microgrid. The blocks can be manufactured in large numbers and added at any time to match hydrogen demand.

Chevron and Toyota said they have three priorities: collaborate on hydrogen-related public policy measures that support the development of hydrogen infrastructure; understand current and future market demand for light-duty and heavy-duty fuel cell electric vehicles and supply opportunities for that demand; and jointly pursue research and development in hydrogen-powered transport and storage.

Gas

LNG bounces back from Covid low-point but climate concerns threaten its future

- LNG imports rose 5.8 per cent in March compared to last year
- EU needs to cut gas consumption by 36 per cent by 2030

Gary Lakes

LNG demand appears to be making a comeback as some countries begin recovering from the harsh impact that the coronavirus pandemic made upon their economies. Supplies that had run down in Europe and Asia during the last year are now being replenished, and the trend looks likely to continue as growing concern over climate change presses some economies, notably China, to reduce its use of coal for power generation and heating.

Data compiled by Bloomberg shows that LNG imports rose 5.8 per cent in March this year compared to a year earlier. Global exports during the month increased by 4.2 per cent year-on-year. Meanwhile, China saw a rise in LNG deliveries of 30 per cent during March. Shipments to Pakistan and Bangladesh also increased. Europe boosted its LNG imports from the US during the first quarter of 2021. LNG imports into Western Europe during March reached their highest levels since record amounts were delivered in December 2019, Bloomberg reported. Of that, the US supplied some 30 per cent.

The pandemic and a number of hurricanes in the Gulf of Mexico put a crimp in the burgeoning US LNG production sector during 2020. However, the market began to turn around last autumn, when the pandemic began to wane in China and Korea and cold weather started to push up demand, prompting prices to rise to around $5.70 million Btu.

This proved positive for the US LNG market despite the disagreements on trade shared by Washington and Beijing. China became the primary destination for US LNG, total exports of which rose to 9.4 billion cubic feet during November last year. There are currently six LNG export facilities in the US and two more under construction, and licenses have been awarded for the construction of several others.

A recent article published by the Atlantic Council pointed out the strategic benefits gained by both the US and China with LNG trade. First it noted the economic benefits to US communities, and it said cooperation between the US and China on cleaner sources of fuel would not only have the highest impact on reducing global carbon emissions but it will encourage other countries to adopt and pursue climate commitments as defined under the Paris Agreement.

Besides reducing its carbon output, China would benefit from purchasing US LNG, the report said, because the Henry Hub-linked gas prices for US LNG reduces China's exposure to oil price-linked contracts across its imported energy portfolio and improves the long-term stability of energy prices in China.

In this respect LNG demand is forecast to increase, yet, citing the rapid rise in developments with renewables and hydrogen, there are questions that investors and market analysts pose regarding how much development of LNG infrastructure will be necessary over the next three decades.

An example of this dilemma can be seen in Europe, where the use of renewables and hydrogen are emphasized in European Union plans for future energy sources. According to a recent report by Global Energy Monitor (GEM), Europe is building or planning to build natural gas infrastructure worth €87 billion that will see the expansion of gas pipelines and LNG terminals, although under current recommended guidelines, Europe will need to halve its carbon emissions by 2030.

The European Commission has said it needs to cut gas consumption by 36 per cent by 2030, but the planned public and private infrastructure investments would boost consumption by 35 per cent from current levels, the report pointed out. It said if the investment plans go through, "the EU risks locking itself into a more polluting future or wasting billions on infrastructure".

To ensure energy supply security, the EU has supported the construction of numerous pipelines, especially in Eastern Europe. Most of the projects will connect the gas transmission grids of countries and in most cases link them to new LNG terminals. The projects are designed to reduce Eastern European countries' reliance on Russia for gas supplies.

Europe is pushing for a sharp decline in gas consumption between now and 2030 and a steady decrease in demand through to 2050, but if all the infrastructure projects go through to completion, the EU runs the risk of overspending by billions on pipelines and terminals that it may not need. But when that actually happens remains to be seen.

In the meantime, China and Europe will be looking to transition to a cleaner energy future with LNG and natural gas, but infrastructure will be required to make that transition happen.

Decarbonisation and digitalisation: a partnership of equals

Decarbonisation and digitalisation go hand-in-hand as data and technology will be key to advancing and successfully participating in the decarbonised, more complex, and decentralised energy system of the future. But there is still much to be done to bring energy assets into the digital era, says **Niek den Hollander**, Uniper's Chief Commercial Officer.

The energy industry is undoubtedly going through large-scale upheaval as it accelerates efforts to decarbonise. Coal power stations are being shut down or converted, while renewables and hydrogen are being deployed with high levels of investment under President Biden's Climate Agenda and the EU Green Deal.

But another, less public, revolution is occurring as energy companies make great strides to digitalise. In fact, the two movements go hand-in-hand as data and technology will be key to advancing and successfully participating in the decarbonised, more complex, and decentralised energy system of the future.

Many power plants are highly sophisticated engineering assets, but until recently they were still largely operated manually in analogue control rooms. This left much to be desired in terms of digital modernisation. There's still much to be done to bring global energy assets into the digital era but to maximise the potential gains from digitalisation we need to digitalise energy assets rapidly.

Artificial Intelligence (AI) and the Internet of Things (IoT) both go hand-in-hand with cost efficiency and emissions savings. Implementing IoT and AI-based platforms helps to provide a visual overview of an asset's health, whether it's a power plant, carbon capture storage facility, or an energy grid. Advanced data analytics paints a picture of how to decrease repair and maintenance costs, improve a power plant's efficiency, reduce outages, and extend the lifetime of an asset.

Decarbonisation and powering the energy transition cannot take place without a significantly developed digital bedrock, says den Hollander

Additionally, technologies used by energy generators in conjunction with cloud computing vendors, such as Uniper's in-house digital platform, Enerlytics, can detect changes in efficiency and allow early counter-measures to increase the energy produced with fewer emissions.

Smart energy generation requires constantly updating the technology embedded within the power plant, but this also needs to extend far beyond the plant itself. Everything from storage facilities to customers' operational sites needs to have real-time monitoring and performance management.

There's both a financial and a climate imperative to invest in data-driven energy efficiency. The International Energy Agency's report on digitalisation highlighted potential savings of up to $80 billion per year, or about 5 per cent of total annual power generation costs based on available digital technologies were globally deployed to all power plants and network infrastructure. These data-driven technological innovations not only help create value for energy companies and decrease costs but crucially, reduce carbon emissions and free-up investment towards the energy transition.

The life of energy commodity traders has changed drastically over the last few years. Just as is the case in financial markets, energy traders no longer spend most of their time on phone calls making trades themselves but increasingly rely on algorithms as markets get faster and more complex. An energy company's pool of data scientists and software developers has become an extremely valuable resource in efforts to program algorithms.

Algorithmic trading is key to playing in a world when supply is intermittent as the energy transition accelerates. Despite the slump in carbon prices and drop in emissions during the first lockdowns, global carbon markets grew by 19 per cent in 2020. This counter-intuitive outcome is a consequence of industry efforts to mitigate climate change, as much tighter emissions caps have led to market predictions of a decreased supply of carbon permits in years to come. This has driven prices up and led to much higher trading volumes. In this way, carbon pricing is helping to achieve more ambitious emission targets under the Paris Agreement.

At the same time, digital trading algorithms also help to avoid a mismatch of supply and demand as renewables become a larger constituent of the energy mix. Traders are trading much shorter-dated contracts, with a much higher frequency, to help support the intermittency of wind and solar. If there is not enough wind or sun for a given period, market participants need to respond swiftly to make up for this shortfall in supply. This need will only increase over time and is key to bringing cleaner energy sources online faster while ensuring the lights are kept on.

Creating real value for the energy industry derives from linking the data gathered from assets such as power plants and market prices with trading algorithms. Synchronising these two sets of data helps to both drive efficiency and profitability for energy generators.

Combining data from both asset management and trading gives energy generators further insight into how to optimise their assets and allocate their energy production portfolios. For example, data helps generators to know when certain power plants should be run to maximise their commercial viability, or how to distribute production between renewables, hydrogen, and other energy sources to meet market demand.

However, the sheer volume of data being created makes this synchronisation difficult. Collecting the data and then storing this data in cloud-based data hubs is the first step. The scalability of data storage infrastructure is also key; the ability to deal with vast lakes of data further increases energy companies' ability to invest in assets that will aid the transition to cleaner energy. But the challenge for energy generators now lies in being able to efficiently mine large pools of data for the data that is most valuable for effective decision-making.

The ability to swiftly retrieve this data is vital for a sector that's relied upon for stable energy supply to society while the energy transition accelerates. Increasingly, energy generators will earn revenue not from megawatt-hours alone, but through ensuring this stability of energy supply and capacity – like how internet providers make their money from providing a stable internet connection.

All organisations have had to adapt to new ways of working since the onset of Covid-19, but the energy sector faces its own unique set of challenges. While office-based workers have made the shift to remote work, the industry still relies on physical assets maintained by in-person. Extensive contingency plans had to be built to ensure the health of employees, while still keeping the lights on.

Digital partnerships and ecosystems proved to be of huge value during this time – partnering with Microsoft enabled thousands of our employees in multiple locations to keep the lights on while working from the safety of their homes.

Automation will have a greater role to play for energy generators in the future. Automating operations that occur in power plants improves energy security. Allowing mapping of business processes to take place remotely increases a company's flexibility and adaptiveness in ensuring energy supply is not disrupted during extraordinary circumstances, such as a pandemic.

But creating a digitally resilient workplace is about so much more than just ensuring business continuity and minimal disruption. Enhancing employee productivity and wellbeing is another benefit that can come from being a digitalised, data-driven energy company. Developments in data analytics have demonstrated how they can help staff to take care of their wellbeing, plan their time more effectively and grow their network virtually. Co-operation with the help of AI and encouraging a workplace to join in with automating repetitive tasks will create more time spent for its people on more rewarding and value-adding work.

Decarbonisation and powering the energy transition cannot take place without a significantly developed digital bedrock. Clean energy transformation will be unable to occur without an equally paramount digital transformation first. Building the conditions for financing decarbonisation technologies and future fuels stems from energy generators' ability to create digital-first organisations.

Digitalisation initiatives are at the heart of value creation and cost reduction for energy companies, optimising the effectiveness of their energy generation and providing a real-time bird's eye view of operations. Cloud-based platforms provide the scalability needed to invest in new infrastructure and drive commercial innovation for the energy business. Securing digital sales channels such as through commodities trading platforms creates another avenue to improve customer experience and match energy supply and demand. Finally, digital workplace programmes are just as key in the energy industry as for any other. Not only will remote working and automation help to maintain energy security – but both measures also have the potential to significantly improve employee experience and drive value creation.

It's no secret that achieving the energy system of the future will require significant investment. As energy generators look to empower widespread decarbonisation, we must realise that this can only come to fruition with parallel consideration of data and technology.

Cutting carbon in power transmission

The transmission and distribution sector also has a role to play in the direct reduction of carbon emissions in the power sector. Hitachi ABB Power Grids recently explained the thinking behind its strategy to use a new gas mixture in its high voltage equipment, which it expects will become the industry standard replacement for SF_6 in switchgear.
Junior Isles

Much of the focus for achieving environmental and sustainability goals in the power sector tends to be on generation, with the electricity transmission and distribution part of the chain often overlooked. Yet as utilities attempt to reach carbon neutral – with many aiming to do so by 2050 – there is a growing emphasis on how developments in transmission and distribution (T&D) can contribute to cutting global carbon emissions.

Hitachi ABB Power Grids, which has long been at the cutting edge of research and development in the sector, recognises the importance of T&D on the road to net zero. Dr Markus Heimbach, Executive Vice President, Managing Director, High Voltage Products at the company and Dr Christian Ohler, Head of Portfolio Management High Voltage Products, both recently gave their views on the key developments and challenges within the sector and outlined what the company is doing to help grid operators achieve their environmental and sustainability goals.

"The non-specialist is completely unaware of the role that the T&D sector has in the energy transition," said Dr Ohler. "For most people, it's there and invisible. But with the addition of wind and solar, there's a need for grid expansion since this [renewable] capacity is usually added in more remote places. On average, the power travels maybe five times the distance from the source to the user compared to the traditional system where the power plant might be close to the city. Travelling that greater distance means the power has to go through more substations, which will impact system reliability. This means each substation needs to have a higher availability."

Certainly the role of substations in the overall decarbonisation picture is currently one of the most important areas of development within Hitachi ABB Power Grids – and not just as a key part of an expanding network based on renewables.

Sulphur hexafluoride (SF_6) has been traditionally used as the gas for insulation and switching in high-voltage electrical equipment due to its superior qualities compared to air. However, it comes with an environmental penalty. Although it is not continuously escaping to the atmosphere, as is the case with fossil fuelled generation, if leaked, SF_6 still has an impact on global warming.

Dr Heimbach said: "Unfortunately it is a greenhouse gas that is approximately 23 000 times more harmful from a global warming potential than CO_2. In the past we have worked on, and still work on, containing the SF_6. This means we make sure there are no leakages – neither in processes nor in seals, etc. You can't contain 100 per cent but we work to contain it as perfectly as possible. The ultimate goal, however, especially as there is greater focus on sustainability, is to replace SF_6 where possible."

Hitachi ABB Power Grids has been using SF_6 alternatives in various parts of its portfolio since 2010, introducing its AirPlus portfolio of SF_6-free products several years ago. However, it has just embarked on what it believes is a "game-changing" technology strategy.

"It will ensure that the biggest impact of SF_6 is eliminated by using a gas mixture that is reasonably good in insulation and switching but is much less harmful from a global warming viewpoint," said Heimbach.

Dr Ohler noted that although there is very little SF_6 leakage – it accounts for less than 0.01°C of global warming – public perception is very important. "In light of this and knowing the power grid is used for renewable energy, people don't want SF_6 in their equipment," he said. "I don't want to play down the problem. SF_6 is something that should be avoided in future products because it lives for a long time in the atmosphere. So even if there are very small quantities, we are committed to finding better solutions."

Following more than two decades of intensive R&D, Hitachi ABB Power Grids has now announced the first products that will use an alternative gas, which it expects will become the industry standard in gas insulated switchgear (GIS).

A GIS using SF_6 has a volume that is about 20 times smaller than an AIS (air insulated substation) so any equipment using a new gas will have to occupy a similarly reduced footprint. This is important, as GIS is often installed indoors and in places where space is a premium.

"To maintain this compactness, you need to have a gas that has good insulation properties," said Dr Heimbach. "We are not only replacing SF_6 in the circuit-breaker, but across our whole switchgear equipment. This means many kilograms of gas in a complete substation."

The new eco-efficient brand launched in late April is known as EconiQ. This will see Hitachi ABB Power Grids use a fluoronitrile-based gas mixture in place of SF_6 across its entire high-voltage portfolio. According to the company, it will cut SF_6-related CO_2 equivalent emissions from GIS by 99 per cent.

A key aspect of this new approach is that it has broad support in the industry, making it more likely it will become the standard gas used in switchgear. Launching the new brand, Hitachi ABB Power Grids also signed a non-exclusive, cross-licensing agreement with GE Renewable Energy's Grid Solutions business related to the use of the fluoronitrile gas.

Dr Heimbach: The ultimate goal is to replace SF_6 where possible

Under this landmark agreement announced just before Earth Day 2021, both companies will share complementary intellectual property related to their respective SF_6-free solutions.

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

Explaining this more industry-wide collaborative approach, Dr Ohler said: "We made this agreement in response to requests from users who are confused by the variety of different solutions that are proposed by the various vendors. There needs to be some technical coordination between vendors in the industry."

Certainly the technical variety of solutions poses problems. It means utilities need different gas handling equipment, different gas monitoring sensors, and also have to implement different training programmes for operating staff.

"At the moment the industry standard is SF_6," said Heimbach. "If vendors now come with different solutions, utilities have to make multiple efforts.. Switching to a new industry standard is extremely important. As part of our commitment towards a carbon-neutral future and accelerating the energy transition, we have chosen to work towards a standard solution to address the needs of our customers through this cross-licensing agreement."

Hitachi ABB Power Grids believes this agreement could be the move that starts a "process towards standardisation in this question". The company recognises that a standard solution will make it as easy as possible for utilities to make the switch to a more sustainable gas.

Heimbach notes, however, this is just the beginning. "What we have announced is a game-changing technology for a carbon-neutral future, but having the technology does not mean it is done. We will have to develop the portfolio. We have started with 145 kV, which is the sub-transmission level, and the portfolio now has to be extended to the highest voltage level."

Heimbach stressed that this will call for ongoing development work, since higher voltages call for higher gas volume. "A lot of R&D is needed to make sure that the insulation is working properly, and even more research is needed on how to redesign the circuit breaker for the new gas mixture. We have announced a new technology base but now the real hard work is going to start to build a portfolio that matches an SF_6 portfolio that has been built over several decades."

Dr Ohler likened the work needed to that required for the recent flight of a helicopter in the thin CO_2 atmosphere of Mars. "Changing the gas means that all the flow inside our GIS and circuit breaker needs to be adapted to this new atmosphere. Inside a circuit-breaker has a very sophisticated design, which will have to be changed for the new gas."

During the course of this year, likely this summer, Hitachi ABB Power Grids will announce the roadmap for the development and launch of the new SF_6-free high voltage portfolio. It expects to make first deliveries of GIS equipment featuring the new gas some time in the coming months.

With the global commitment to net zero, the company is expecting widespread uptake of the technology. Dr Heimbach concluded: "There will always be certain applications, such as generator circuit-breakers where it doesn't make sense for the customer to use the new gas. But by 2030 I think that the vast majority of our new deliveries from our factories will be with the new gas."

"We are very excited about the new launch. It gives us the opportunity to develop something completely new that is also good for the environment and society; it's a beautiful combination you don't often see."

Dr Ohler: There needs to be technical coordination between vendors

Spreading microgrid roots

As the world moves towards distributed networks with a high penetration of renewables, a project is underway that is taking inspiration from nature to make microgrids more resilient. **Junior Isles** explains.

Microgrids capable of distributing renewable energy have an important role to play in global decarbonisation efforts and in connecting remote communities. Yet building greater flexibility and resilience into these grids is crucial if they are to achieve their full potential.

A few months ago, a group of key industry players took a small but significant step along the road to making microgrids more resilient with news of what could be an important development. In February, LF Energy – an open source foundation focused on the power systems sector, hosted within The Linux Foundation – along with its newest member, Sony Computer Science Laboratories, Inc. (Sony CSL), announced Hyphae, a microgrid initiative to automate the resilient peer-to-peer distribution of renewable energy.

LF Energy believes Hyphae is the seed contribution or foundation for a suite of energy web services that will be able to meet what it predicts could be an explosion in flexibly built nano, mini, and microgrids.

Unveiling the Hyphae initiative, LF Energy said in a statement: "With energy resources and infrastructure increasingly challenged to meet the coming impacts of climate change and natural disasters, Hyphae aims to make microgrids more resilient."

The Hyphae project takes its inspiration from nature. Hyphae (pronounced *hai-fee*) are white filament-like threads that share energy from photosynthesis and resources under the ground between fungi, plants, trees, and the many organisms that make-up forest eco-systems. Hyphae enable complex community building activities in a diverse environment.

The name Hyphae is also Greek for the word 'web'. LF Energy sees it as a fitting name for microgrid software that will enable the connection of buildings, homes, and energy-consuming devices to energy-producing devices like storage, EV batteries, and PV. At the core of the software is physical peer-to-peer (P2P) trading, much like what happens in a forest between trees.

Explaining the thinking behind the project, Dr Shuli Goodman LF Energy Executive Director, said: "There are a couple things that are happening. First, there are network operators that are working to onboard renewables and move from traditional centralised fossil and nuclear generation where electrons flow consistently, to being able to manage a system with growing intermittency and variability.

"The other thing that is happening is network operators are looking at whether the distribution of energy is being done in an organised way. If energy is principally local, then having these big complex transmission and distribution systems maybe isn't the best way. If we were given a greenfield to provide everyone the energy they need, would we design it that way?"

She believes microgrids provide the possibility to "re-imagine or reconfigure" everything from the system architecture of the home – as a consumer or producer of electricity – to a neighbourhood, community or region.

Dr Goodman sees the Hyphae Initiative as the start of a "10-20 year journey" of building-out the software and hardware that will enable the power sector to optimise a low carbon distributed energy system in terms of operation and economics. She estimated that the current 50¢/kWh for electricity transferred by microgrids could be shifted to an "optimal 7-10 ¢/kWh".

She noted, however, that in order to do that, "you have to have commodity software and commodity hardware" i.e. open source software and universal hardware.

"This means you have to move towards plug-and-play, where you would go to the store to pick up what you need, plug-in the router and you would be in business. But we are really a long way from that."

Part of the problem, stresses Dr Goodman is linked to how devices that consume energy are built. "Who is to say, for example, that a refrigerator shouldn't come with its own battery to provide power back to the grid, or have the ability to reduce or increase its demand? You could view a laptop as a microgrid – it has the ability to disengage itself from the grid and continue to operate. We have to take the notion of the microgrid and apply it all the way down to as many things as possible that are at the edge of the grid."

Perhaps the biggest challenge, she says, is around creating commodity hardware to address problems such as different electrical plugs and outlets in different countries. A good example of commodity hardware that goes some way to solving this problem is USB3, since it allows both data and electricity to be transmitted using a universal connector.

Dr Goodman notes that the Linux open-source operating system, which is the dominant operating system for servers and smart phones, has allowed a similar thing to happen in the field of software, and sees this as the way forward. "With the internet we were able to move away from really customised solutions. The Linux kernel allowed Linus Torvald to create a high-powered computing environment using open-source software and commodity hardware to provide a cheap Unix box. That's what I see us doing as well."

The Linux Foundation is the home of the Linux kernel and about 400 other projects. There are about 25 million open-source projects hosted on GitHub – a provider of internet hosting for software development. The Linux Foundation essentially provides a legal framework that enables collective investment.

LF Energy is building a series of projects connecting the "lego block" around which the grid will be built, essentially providing a neutral "ecosystem" that allows utilities, OEMs, and system operators to work together to build and integrate software.

"Some of those projects are around industrial software but some need to be specific to energy," said Dr Goodman. "Whatever it is you need to manage in terms of power, there's the energy part – getting the electrons – and then there's the power part, using the electrons and keeping the signal steady. That's the software that we are hosting and our goal is decarbonisation."

Sony CSL, which has a long history with the Linux Foundation, has a small team of developers working within LF Energy on developing Hyphae. According to LF Energy an open-source, automated microgrid controller and peer-to-peer trading platform like Hyphae will allow for faster innovation while decreasing costs for everyone.

The project builds on work carried out as part of Sony CSL's Open Energy System (OES) – the core module for a microgrid power system that is decentralised, scalable and, moreover, resilient to disasters. In order to maximise the benefits of the microgrid, OES has established a series of technology systems centred on direct current (DC) physical peer-to-peer autonomous power integration technology, and has been conducting demonstration research at the Okinawa Institute of Science and Technology (OIST).

The Okinawa project comprises 19 inhabited houses each equipped with an in-house microgrid system, including batteries that are connected to a dedicated, shared DC power bus as well as a communication line. The goal of OES is to allow energy flows between independent microgrid systems within a community, allowing neighbours to share their energy, similar to a peer-to-peer network.

A distributed control software manages the energy exchanges between houses according to various scenarios and the community size can reduce or expand as new microgrids are plugged into it. This provides a level of flexibility for electricity grids that is not possible with the current grid infrastructure.

The demonstration research at OIST was completed in March 2020, and based on the results of five years of stable operation, it was judged that the system was reaching a practical level.

In December last year, Sony CSL announced that it will make its Autonomous Power Interchange System (APIS) – the power-interchange management software that comprises the core module of microgrid OES and the proprietary P2P power interchange technology they develop – open-source, meaning it will be freely available to the public.

Under the Hyphae project, the aim is now to transition Sony CSL's APIS software, to work with AC grids. This will allow remote communities to store and distribute energy autonomously without connecting to large-scale power stations or electrical distribution networks but with the ability to also integrate with the grid.

"Partnering with Sony CSL on the project brings LF Energy closer to its goal of building the first interoperable AC- and DC-ready microgrid that is self-contained, operational off-grid and able to connect to an electrical distribution network with utility oversight," said Dr Goodman.

Dr. Hiroaki Kitano, President and CEO of Sony CSL, said: "By working with LF Energy, we see a path toward an interoperable, cloud-native, configurable microgrid that will revolutionise the world's relationship with networking energy."

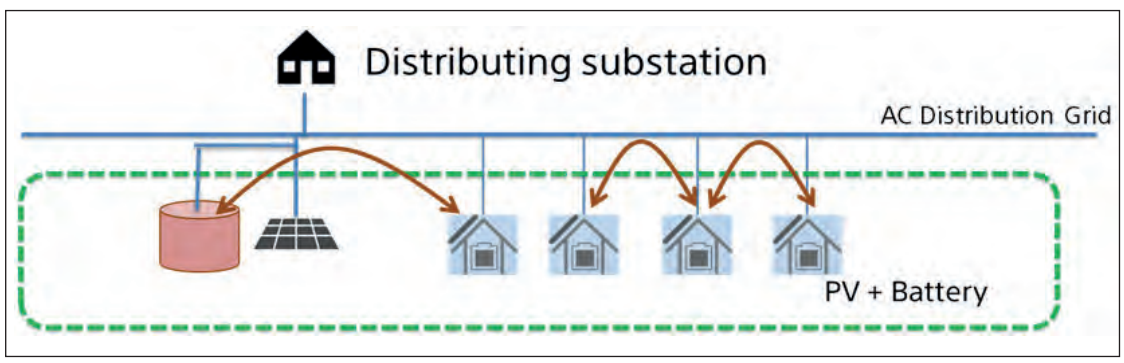
Sony CSL will also be "re-imagining" the software as a series of micro-services. Dr Goodman explained: "Instead of what we might refer to as a forklift application, micro-services allow for rapid integration and rapid iteration. When they shift it to micro-services, they also want to be able to manage AC. At the moment it's not integrated to the grid; it's currently a standalone micro-grid."

Sony CSL is now looking for hardware manufacturers to participate in the project and it is this hardware development that will be the main challenge going forward.

"We have to start working with the hardware parts in order to begin building commodity hardware, so that the pace of this all begins to shift," said Dr Goodman. "This means building white label solar, white label inverters. Right now we are paying a premium and we want to be able to shift the economics even more."

She concluded: "Then it will be about trying to create commodity software to enable fast transformation of systems. Cloud is now ubiquitous and we have to do the same thing with energy."

Sony CSL is looking to modify its Autonomous Power Interchange System to work with AC grids and deliver similar functions to those at the Okinawa project



Junior Isles

Unwrapping Earth Day gifts

The world's leaders came bearing gifts for the planet on the 51st annual Earth Day on April 22nd. At the Leaders on Climate Summit hosted by US President Joe Biden and timed to coincide with Earth Day, many leaders unwrapped what could be viewed as their piece of Lego, each of which will be needed to deliver the real gift to the world – a planet fit for the generations to come.

The Summit, attended virtually by 40 world leaders, marked the return of the US to the international climate policy stage. And the opening act did not disappoint.

Kicking off proceedings, Biden told leaders: "We are here at this summit to discuss how each of us, each country, can set higher climate ambitions that will in turn create good-paying jobs. We have no choice, we have to get this done."

He then revealed the US' new climate pledge: a commitment to reduce carbon emissions by 50-52 per cent compared to 2005 levels by 2030. It is a move that would lower the country's annual carbon emissions by about 2 billion tonnes of carbon dioxide equivalent – three times the rate of carbon reduction achieved from 2005 to 2020.

It is a laudable ambition and the world welcomes the emphasis the new administration is putting on climate action. Yet none underestimate the difficulty in reaching the goal.

"It's very difficult to do and it's going to need every available option; every available lever is going to have to be pulled," said Ed Crooks, Americas vice-chair at Wood Mackenzie.

Even if US ambition is achievable, questions remain on whether it goes far enough. "The plan laid out by President Biden is hugely welcome and shows the kind of ambition we need to see from rich, polluting nations. But truth must be told," said Mohamed Adow, Director of Nairobi-based think-tank Power Shift Africa. "It still falls short of what is needed from the biggest historical emitter and wealthiest country to stabilise global heating to below 1.5°C."

Christian Aid's climate policy lead, Dr Kat Kramer said this should be "the start of climate action in 2021, not the end". "This pledge by the US is a welcome first step but we need to see countries around the world accelerating actions and providing needed support to make it a global reality."

Although the pledges made are way off track of what is required to hit the 1.5°C goal, US re-engagement appears to have galvanized the global effort.

The EU used the summit's timing to push through a proposal to increase its ambition to cut the bloc's emissions by "at least 55 per cent" by 2030. Although agreed by European leaders in December 2020, it was only on April 20th that the European Parliament finally accepted the increase from the previous 40 per cent target. It had been pushing for 60 per cent as the new target. The deal between the Parliament and the European Council means that the European Climate Law will enter into force and be legally binding.

Although no longer a member of the EU, the UK showed that it still aims to maintain and even go beyond regional goals. Keen to show global leadership on climate in the run-up to COP26 planned for Glasgow in November, just two days ahead of the summit UK Prime Minister Boris Johnson grabbed the headlines. He announced the UK would cut its emissions by 78 per cent compared with 1990 levels by 2035 – a legally binding pledge that includes international aviation and shipping emissions for the first time.

"We want to continue to raise the bar on tackling climate change, and that's why we're setting the most ambitious target to cut emissions in the world," Johnson said.

At the summit China's President Xi Jinping pledged to "phase down" coal consumption in the five years from 2025 – the first time the Chinese leader has vowed to reduce coal consumption.

South Korea also joined the war on coal, using the meeting to announce a pledge to stop financing coal projects overseas.

Meanwhile, both Japan and Canada revealed new climate pledges. Yoshihide Suga, Japan's Prime Minister, said his country would cut emissions by 46 per cent by the end of this decade, relative to 2013 levels. It is a notable increase from the previous target of 26 per cent. Canada promised it would work towards achieving a 40-45 per cent reduction in greenhouse gas emissions by 2030, relative to 2005 levels. This compares to its previous plan of cutting emissions by 30 per cent in the same time frame.

"Canada is now on track to blow past its old target," said Prime Minister Justin Trudeau, putting it in a position to be able to "raise climate ambition".

While Russia made no new climate pledges, its participation was significant. Vladimir Putin, President of a country that has been a laggard on climate change and engaging with the international community on the global effort, said cutting methane emissions, supporting nuclear power, and ensuring carbon capture and storage projects, are all on his climate agenda. "I am convinced that the fight for preserving our climate, should certainly unite the international community as a whole," he said.

Such increased ambition by so many of the major emitters shows commitment at the highest level to meet the climate challenge head-on. Yet setting targets is in some ways the easy part. The real challenge will be realising them at the national level and navigating the stumbling blocks in collectively achieving that 1.5°C Paris goal.

With only a razor-thin majority, the US Biden-Harris administration first has the delicate task of getting carbon-reducing legislation and regulations through Congress.

The White House said the new target was based on wide-ranging analysis that explored a range of pathways to dialling back emissions. "Standards, incentives, programmes, and support for innovation were all weighed," it said. Details on precisely what these are, however, will not be known until publication of the administration's national climate strategy due later this year.

Efforts will probably focus on the administration's big infrastructure push, which is likely to include hundreds of billions of federal dollars in clean technology spending and green tax credits. It could also include "clean energy standard" (CES) legislation to mandate an 80 per cent reduction in emissions from the power sector by 2030.

Just ahead of the new climate pledge, 13 of the nation's leading electricity companies sent a letter to President Biden urging the administration to design a wide-reaching energy agenda to cut carbon emissions in the power sector by more than 80 per cent below 2005 levels by 2030. "A federal policy framework can be designed to support the power sector's deployment of strategies that are technically feasible, ensure reliability, and maintain affordability for customers," the companies wrote.

But although the power sector will provide the heavy lifting, it cannot do it alone. In a statement, Arshad Mansoor, President and CEO of the Electric Power Research Institute (EPRI), a non-profit organisation that conducts research, development, and demonstration projects for the benefit of the public in the US and internationally, said: "The power sector has an early lead in the race to decarbonise, but every sector must cross the finish line to be successful. Near-term decisions and actions – from policy to regulation to technology deployment – will be crucial to drive economy-wide decarbonisation in the decade ahead."

At the international level, there is no telling how trade conflicts between the likes of the US and China might scupper efforts. A potential carbon border adjustment mechanism to be levied on carbon intense imports to level-out cost differentials between European and foreign manufacturers could also be a factor.

The issue of how to finance a green transition for all will no doubt be key. A successful COP26 will require "the richest nations coming together and exceeding the commitment they already made for $100 billion [in annual climate finance]", said the UK Prime Minister.

Some may see this as costly. But the gift of a habitable planet to subsequent generations is priceless. And for the current generation, the transition offers a way of rebuilding economies and driving jobs. As Johnson put it: "Cake, have, eat, is my message to you."

The cake is tempting but the Lego-set still needs to be unwrapped and put together.

Cartoon: jemsoar.com