

THE ENERGY INDUSTRY TIMES

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Cementing the case for WHR

Waste heat recovery is an under-utilised solution for decarbonising hard-to-abate industrial processes such as cement-making. *Page 13*



Net zero game changers

The ramifications of China and India's carbon-cutting strategies go far beyond their borders. *Page 14*



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Mexico plans low-carbon additions as US offers support

Mexico has announced plans to add 30 GW of new wind, solar, geothermal, and hydroelectricity capacity by 2030, as part of a new ambition to raise its greenhouse gas emissions reduction target. *Page 4*

Indonesia's coal retirement plan takes shape

Indonesia's plan to reduce its dependence on coal fired generation is taking shape as the country signed significant deals to finance its transition to clean energy. *Page 5*

Europe 'must invest to shift to LNG instead of Russian gas'

Europe has to pivot to liquefied natural gas (LNG) if it wants to wean itself off Russian gas, according to a new report from S&P Global Ratings. *Page 7*

GE sells Steam Power nuclear activities to focus on gas and renewables

GE has signed a binding agreement to sell GE Steam Power's nuclear activities to French state-owned power company EDF as part of a plan to focus on its gas turbine and renewable energy businesses. *Page 9*

Technology Focus: Evolving energy storage for time-shifting

Battery energy storage systems can help operators cut dependence on traditional energy sources by avoiding curtailments of wind and solar farms. *Page 15*

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COP27 makes progress on climate financing but falls short on emissions ambition

Sherry Rehman, Pakistan's Climate Change Minister, hailed the deal as "historic"



Last month's COP27 climate conference secured a "historic" deal on financial support for countries affected by extreme weather events but failed to act on calls to accelerate much-needed cuts in carbon emissions. **Junior Isles**

World climate change ministers and negotiators struck a "historic" deal at this year's UN COP27 climate summit in Egypt to support countries most affected by climate change but failed to make progress on how to cut greenhouse gas emissions faster.

Almost 200 countries attending the conference in Sharm El-Sheikh agreed to set up a "loss and damage" fund to rescue and rebuild the physical and social infrastructure of countries devastated by extreme weather events.

There is still no agreement on how the finance should be provided, where it will come from, or the criteria to

trigger a payout. There are also questions on the size of the funding. The EU has contributed €60 million to Pakistan against the \$30 billion costs resulting from the floods that devastated the country in September.

Nevertheless the deal has been welcomed by developing countries that have been seeking financial assistance for loss and damage for nearly 30 years.

Sherry Rehman, Climate Change Minister of Pakistan, hailed the deal as "historic". She said: "This is not about accepting charity. This is a down payment on investment in our futures, and

in climate justice."

The deal however, has to some extent been overshadowed by the summit's failure to accelerate cuts in carbon emissions.

Simon Stiell, the UN climate chief warned that time was short to take action on the targets agreed, and there was "no room for backsliding". He said the national plans that countries had submitted on cutting greenhouse gas emissions by 2030 were not enough to meet the vital goal of limiting global temperature rises to 1.5°C above pre-industrial levels, in line with scientific advice. "The [national

plans] just don't add up," he said.

There had been calls for an agreement to peak emissions by 2025 but this was removed from the final text following strong lobbying from a group of oil and gas producing countries emboldened by the global energy crisis.

One person involved in the eleventh hour discussions said Saudi Arabia had been "playing hardest" in its resistance to faster progress in cutting emissions. China also held back progress but was less vocal than the Arab

Continued on Page 2

Developing countries raise clean power policy ambitions

Policymakers in emerging markets and developing economies are raising their sights when it comes to renewable energy, research company BloombergNEF (BNEF) finds in the latest edition of its annual Climatescope survey.

More than nine in 10 (92 per cent) developing countries have made public commitments to install and consume certain volumes of renewable power with specific deadlines. That is up from 82 per cent a year earlier and 67 per cent in 2019, according to BNEF.

Possible reasons for the change, says BNEF, could include a desire to demonstrate progress ahead of the COP27 global climate talks, anxiety over energy security amid rising fossil fuel prices, fears about climate change, or simply the appeal of building renewables because they are affordable.

According to the report, emerging markets' long-term clean energy goals can only be met if policymakers adopt accompanying implementation policies. These markets, are, however, making progress.

Climatescope finds that 56 per cent

of emerging markets now have policies to hold reverse auctions for clean power delivery contracts, up from 49 per cent last year. The popularity of net metering has also grown, with such policies in place in 53 per cent of emerging markets in 2022 compared with 49 per cent last year. Further, 30 per cent of emerging markets have established feed-in tariffs, increasing from 27 per cent in 2021.

The gap between the long-term targets and the shorter-term implementation policies suggests policymakers have substantial work ahead. Even in countries that have promised to adopt renewables auctions, net metering or feed-in tariffs, follow-through can be lacking.

"Without supporting regulations, policy implementation alone cannot guarantee that a country attracts the amount of investment needed to kick off its energy transition," said Sofia Maia, Climatescope's Project Manager. "Among the 15 developed and emerging nations that finished at the bottom of the Climatescope power policy scoring table, only one managed to secure more than \$2 billion in clean power investment from 2017

to 2021."

The report was released during the COP27 climate summit in Sharm El-Sheikh, where financing climate change efforts in emerging economies was high on the agenda.

Nordic pension funds announced that despite financial challenges and a volatile economic environment, they are on course to reach their target of \$130 billion towards climate investments by 2030. The initial reporting follows the landmark announcement made at COP26 last year. This is also the case for new investments in emerging markets and developing economies, which are proving to be on track. The total, collective reporting of annual investments from Climate Investment Coalition pension funds is expected to be announced in the first quarter of 2023.

Separately, the Emerging Market Climate Action Fund ("EMCAF") announced a \$25 million investment into Alcazar Energy Partners II, a fund providing early-stage equity financing to develop, construct and operate renewable energy projects in the Middle East, North Africa, Eastern Europe and Central Asia. This

commitment is in parallel to EIB Global, the dedicated arm for outside the EU of the European Investment Bank (EIB) Group, which provides \$75 million to the fund.

COP27 also saw publication of the 'Sharm El-Sheikh Guidebook for Just Financing'. The Guidebook aims to translate commitments into implementable projects, while capturing opportunities to leverage and catalyse needed finance and investments to support climate action.

The Guidebook defines "Just Financing", as financing that accounts for historical responsibility for climate change while ensuring equitable access to quality and quantity climate financing that supports resilient development pathways leaving no one behind.

It sets forth 12 core principles that serve as a framework to guide stakeholders to adopt innovative climate finance modalities and instruments. These will enable unlocking of needed financing from public and private capital providers to scale up and drive the transition required to address climate adaptation and mitigation goals.

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League countries in the negotiations, those familiar with the talks said.

The Arab group of nations and Russia resisted wording that emphasised the need for renewable power. Saudi Arabia pushed for the UN agreement to allow for carbon capture and storage technology, which would limit emissions and enable continued oil and gas production.

UN climate summit observer Alden Meyer, a senior associate at the E3G think-tank, said the playbook was familiar. "They [the oil states] traditionally play hard ball in the end stages," he said. "Clearly they have more influence with this presidency than they have with some others."

Last year's COP26 President Alok Sharma expressed his disappointment in the text, seeing it as a missed opportunity.



Jetnil-Kijiner: hoped for fossil fuel phase-out

"I'm incredibly disappointed that we weren't able to go further," he said. "Emissions peaking before 2025, as the science tells us is necessary. Not in this text," he said. "Clear follow-through on the phase down of coal. Not in this text."

The failure to agree on the phase-down of all fossil fuel use was cause for particular frustration.

"I wish we got fossil fuel phase out," said Kathy Jetnil-Kijiner, the Climate Envoy of the Marshall Islands, who along with other island states fear annihilation if temperatures rise above 1.5°C.

"The current text is not enough. But we've shown with the loss and damage fund that we can do the impossible. So we know we can come back next year and get rid of fossil fuels once and for all."

There were other significant announcements on the sidelines of the summit aimed at accelerating the energy transition. Notably, global industry organisations representing wind, solar, hydropower, green hydrogen, long duration energy storage and geothermal energy industries officially joined forces under one Global Renewables Alliance, with the signing of a Memorandum of Understanding.

The Global Renewables Alliance will use the collective weight of its member technologies to overcome the challenges affecting the global energy transition and increase the share of voice for renewables where fossil fuels are still disproportionately present.

Ben Backwell, Global Wind Energy Council CEO, said: "Massive deployment of renewable energy is the critical element in the battle against climate change and countries will need all of the key technologies represented by this alliance in order to be successful, and it is important that we take a collaborative approach and work together as technologies to help governments and communities achieve the just energy transition to ensure a sustainable and prosperous future."

Swift cut in coal emissions central to reaching climate targets, says IEA

- Emissions from existing coal assets will tip world across the 1.5°C limit
- Replacing coal plant will cost \$6 trillion

Junior Isles

The world must move quickly to reduce carbon dioxide emissions from coal significantly in order to avoid severe impacts from climate change, a new International Energy Agency (IEA) report says. There must also be immediate policy action to rapidly mobilise massive financing for clean energy alternatives to coal and to ensure secure, affordable and fair transitions, especially in emerging and developing economies.

The new IEA special report – 'Coal in Net Zero Transitions: Strategies for Rapid, Secure and People-Centred Change' – which is part of the IEA's 'World Energy Outlook series, says replacing the use of coal to generate electricity will cost \$6 trillion and "will not be easy".

According to the report, the overwhelming majority of current global coal consumption occurs in countries that have pledged to achieve net zero emissions. However, far from declining, global coal demand has been stable

at near record highs for the past decade. If nothing is done, emissions from existing coal assets would, by themselves, tip the world across the 1.5°C limit.

"Over 95 per cent of the world's coal consumption is taking place in countries that have committed to reducing their emissions to net zero," said IEA Executive Director Fatih Birol. "But while there is encouraging momentum towards expanding clean energy in many governments' policy responses to the current energy crisis, a major unresolved problem is how to deal with the massive amount of existing coal assets worldwide."

The IEA highlights the countries where coal dependency is high and transition likely to be most challenging: Indonesia, Mongolia, China, Viet Nam, India and South Africa stand out. In developed countries, the use of coal to generate electricity will fall by 75 per cent by 2030, while in developing nations there will be a peak in 2025 and thereafter it will start to decline.

In total, countries have announced

commitments to reduce coal use for power generation by 20 per cent by 2030, which is a "significant step forward", according to the IEA.

The report came as the Global Carbon Project, a coalition of international climate science bodies, issued a separate report that said global carbon dioxide emissions from energy are on track to rise 1 per cent to reach 37.5 billion tonnes in 2022, with the biggest increases coming from India and the United States.

Today, there are around 9000 coal fired power plants around the world, representing 2185 GW of capacity. Their age varies by region, from an average of over 40 years in the US to less than 15 years in developing economies in Asia.

A massive scale up of clean sources of power generation, accompanied by system-wide improvements in energy efficiency, is key to unlocking reductions in coal use for power and to reduce emissions from existing assets. In a scenario in which current national climate pledges are met on time

and in full, output from existing global unabated coal fired plants falls by about one-third between 2021 and 2030, with 75 per cent of it replaced by solar and wind. This decline in coal output is even sharper in a scenario consistent with reaching net zero emissions by 2050 and limiting global warming to 1.5°C. In the Net Zero by 2050 Scenario, coal use falls by 90 per cent by mid-century.

An important condition to reduce coal emissions is to stop adding new unabated coal fired assets into power systems.

New project approvals have slowed dramatically over the last decade, but there is a risk that today's energy crisis fosters a new readiness to approve coal fired power plants, especially given the IEA report's finding that around half of the 100 financial institutions that have supported coal-related power projects since 2010 have not made any commitments to restrict such financing, and a further 20 per cent have made only relatively weak pledges.

High power prices threaten EU shift away from fossil fuels

Europe's plans to reduce dependence on imported fossil fuels by increasing installed renewable energy capacity and using electric vehicles could be frustrated, if power prices do not come down, says Rystad Energy.

According to the Norway-based energy research and business intelligence company 35 GW of solar PV manufacturing and more than 2000 GWh of battery cell manufacturing capacity could be mothballed "unless power prices quickly return to normal levels". Some 25 per cent of the European solar and battery manufacturing capacity remains at risk today it said.

The research noted that recent months had seen European power

prices hit €1500/MWh during peak hours. "Although prices have retreated significantly since these record highs in August, rates remain in the €300-400 range, many multiples above pre-energy crisis norms," it said.

High gas prices, exacerbated by the virtual cut-off of Russian gas to Europe, have had a knock-on effect on power prices and seen Europe launch a desperate scramble to secure alternative gas supplies. Some argue this could threaten the bloc's ambition to achieve its climate goals.

New analysis from the Climate Action Tracker claims the world has "overreached" in its bid to respond to the energy crisis, to the extent that emissions from new gas capacity now

threaten the 1.5°C warming limit.

In its COP27 update, the Climate Action Tracker has calculated the CO₂ emissions from all the under-construction, approved and proposed liquefied natural gas (LNG) production projects between 2021 and 2050, finding they could add up to around 10 per cent of the remaining global carbon budget for 1.5°C warming by mid-century.

In 2030, oversupply of LNG could reach 500 Mt of LNG, equivalent to almost five times the EU's 2021 Russian gas imports, and double total global Russian exports. This oversupply of fossil gas could lead to excess emissions of just under 2 Gt of CO₂ per year in 2030, well above emission

levels consistent with the IEA Net Zero by 2050 scenario (2022).

"The energy crisis has taken over the climate crisis, and our analysis shows proposed, approved and under construction LNG far exceeds what's needed to replace Russian gas," said Bill Hare, CEO of CAT partner organisation Climate Analytics.

Meanwhile, a new report released by Bloomberg Philanthropies and BloombergNEF (BNEF) said that G20 member countries provided \$693 billion in fossil fuel support in 2021, thereby slowing down progress on reaching the goals of the Paris Agreement. The Climate Policy Factbook noted that coal still attracted \$20 billion of government support in 2021.

Hydrogen commitments balloon

While policymakers and commentators continue to debate whether hydrogen is the "silver bullet" we need to achieve Net Zero, developers' commitments have ballooned over the past six months.

According to Aurora Energy Research's latest global electrolyser database, published with the bi-annual Hydrogen Market Attractiveness Report, the current pipeline of electrolyser projects totals 957 GW worldwide – up by 592 GW since April 2022 and dwarfing the 270 MW of electrolyser capacity operational today.

The report notes, however, that only a handful, just 11 per cent, of these

projects have advanced beyond the early planning stage. The Spirit of Scotia project in Canada has added 500 GW to the global electrolyser pipeline since April 2022, but does not yet have a targeted commissioning date.

Electrolyser manufacturing capacity is set to surpass 30 GW/year by 2025, Aurora's database shows, with 70 per cent of planned capacity to be located in Europe.

Global electrolyser manufacturing capacity will rise to over 30 GW/year by 2025, up from 8 GW/year operational capacity today, Aurora finds. Europe is again the dominant region,

with 70 per cent of planned manufacturing capacity to be located there. Belgian engineering firm John Cockerill is positioning itself to be the largest global electrolyser manufacturer by 2030, followed by German industrial group ThyssenKrupp. If all manufacturers were to operate at their maximum capacity, 231 GW of electrolysers could be manufactured between today and 2030.

European hydrogen demand would total 1885 TWh by 2050, under a scenario in which Europe achieves net zero by 2050, Aurora's modelling shows. This is up from just 300 TWh today.

■ The World Bank Group has announced the creation of the Hydrogen for Development Partnership (H4D), a new global initiative to boost the deployment of low-carbon hydrogen in developing countries. The main activities of the H4D partnership, to be hosted in the Energy Sector Management Assistance Program (ES-MAP) of the World Bank, will include: convening international cooperation to increase the knowledge base in low-carbon hydrogen technologies for developing countries; and fostering collaboration with private sector partners for clean hydrogen projects.



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Mexico plans low-carbon additions as US offers support

■ Solar costs expected to fall ■ US support for nuclear expanded

Janet Wood

Mexico has announced plans to add 30 GW of new wind, solar, geothermal, and hydroelectricity capacity by 2030, as part of a new ambition to raise its greenhouse gas emissions reduction target from 22 per cent to 35 per cent over the next eight years.

The new commitments were announced at the recent COP27 meeting by Foreign Secretary Marcelo Ebrard and US Special Presidential Envoy for Climate John Kerry.

According to the announcement, "the United States intends to work

closely with Mexico to achieve these ambitious goals, including through US efforts to mobilise financial support and joint efforts to catalyse and incentivise investments into new Mexican renewable energy deployment and transmission".

Mexico outlined a preliminary investment plan of up to \$48 billion towards the new renewable energy goal.

The plans will be boosted by recent reductions in levelised cost of electricity (LCOE) for solar PV in the region. LCOE for the technology in Latin America is projected to slide to \$14 per MWh by 2050, according to a new research report from WoodMac titled

'Latin America levelised cost of electricity'. Mexico's solar market will boast the lowest LCOE among all countries included in WoodMac's outlook, followed by Chile.

"Expected solar cost reductions are significant, with average capital investment falling by 55 per cent from 2022 to 2050. This is mainly led by technology improvements, such as bifacial modules becoming the norm across the region in the mid-term," said Leila Garcia da Fonseca, Research Manager, Latin America Power & Renewables at Wood Mackenzie.

Meanwhile, the US and Mexico and have seen their first bilateral agreement

for peaceful nuclear cooperation between the two countries enter into force, the US State Department said.

The agreement was signed in 2018 but Mexico's Senate did not give its approval to the deal until March 2023. It paves the way for the peaceful transfer of US nuclear material, equipment and information in compliance with non-proliferation requirements. "This agreement will further strengthen the US-Mexico relationship and deepen our energy security cooperation," US State Department spokesman Ned Price said.

Mexico's state-owned electric utility CFE operates two 775 MW reactors at

the Laguna Verde site which provide around 4 per cent of the country's power. In August the company received approval to operate unit 2 until 2055, following an earlier permit granted for unit 1 to operate until 2050. The plant would otherwise have closed by 2030. The country's Energy Secretary, Rocio Nahle, called nuclear power "clean, safe, steady and cost-effective". There have long been discussions about adding more nuclear units and a recent low-carbon power projection doubled generation from nuclear power, but there has been no government action towards building a new plant.



Canada's Infrastructure Bank has announced plans to provide funding of \$1 billion to Ontario Power Generation (OPG) for the utility's first small modular reactor (SMR).

The 300 MW unit will be located next to the existing 3500 MW Darlington nuclear plant.

It is set to start producing energy in 2028 but Chief Executive Ken Hartwick said it was just the start: "I think as we move forward on the first reactor, that first SMR, we'll design the site to probably build four at the site, but will only start the second one when we know we are successful on the first one."

The reactors are designed by GE

Hitachi Nuclear Energy, an alliance between General Electric Co and Japan's Hitachi Ltd.

About 15 per cent of Canada's electricity comes from nuclear power, according to the World Nuclear Association. Ontario is facing a power shortage and is also seeking to extend the life of the Pickering nuclear station, first by a year to 2026 and potentially by a further 30 years. It is also procuring more natural gas generation and electricity storage capacity, and rolling out energy efficiency programmes.

Electricity demand is rapidly accelerating due to growth in manufacturing and electric vehicles.

Guyana bets on gas fired generation and new pipeline

The government of Guyana has recently approved construction of a 300 MW natural gas combined cycle thermal power plant, which it says will help cut the country's electricity bill in half.

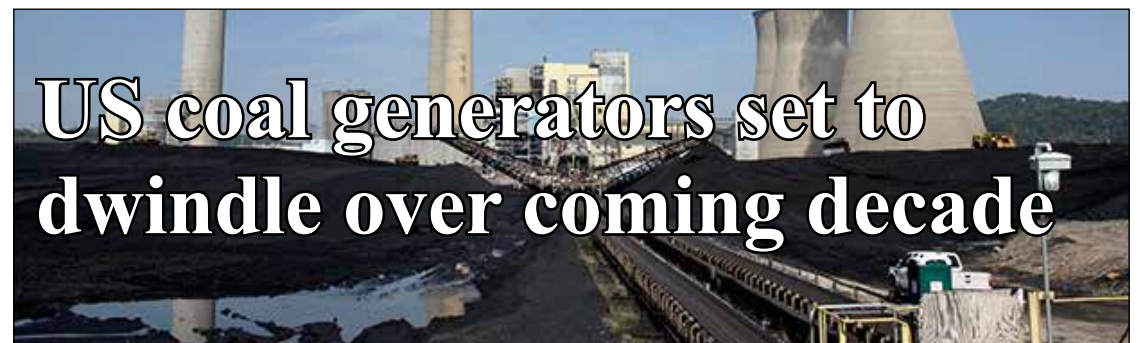
The power plant will be government-owned and will be sited in Wales, West Demerara. Guyana President Irfaan Ali said CH4/Lindsayca will be in charge of manufacturing and building the turbine, which is expected to be installed by December 2024. It will be built under a construction and engineering procurement contract.

Power China came second in the competition to execute the project and

Ali also said that Power China could be involved if negotiations do not result in a contract with Lindsayca.

Ali said that the projected generation costs, taking into account the payment for an associated pipeline to be built by Exxon and completed by the end of 2024, as well as operation and maintenance and the capital cost recovered, will total less than 5 cents/kWh. That is half of what is currently charged in the country he said.

"This is a significant move for Guyana moving forward," Ali said, because it will improve energy security, and help industry to expand.



■ Development funding goes towards storage ■ Network companies combine to chase new opportunities

Janet Wood

The US coal sector is set to dwindle as the country relies on more renewables, increased storage and an expanded grid to share resources.

Competition from natural gas and renewables was said to be behind plans to retire 23 per cent of more than 200 GW of coal fired capacity currently operating in the USA, with closures running at over 9 GW each year.

Older, less efficient units face higher operating and maintenance costs and some must comply with regulations limiting the discharge of wastewater by 2028, which would require additional capital investment.

Michigan, Texas, Indiana, and Tennessee have the most coal fired generating capacity announced to retire through 2029, accounting for a combined 42 per cent.

In contrast, the US Department of Energy (DoE) recently launched a \$350 million funding opportunity for

developing long-duration energy storage demonstration projects.

The DOE wants to cover half the funding requirements for up to 11 projects demonstrating storage technologies that can provide electricity for 10 to 24 hours or more. "Advancing energy storage technologies is key to making energy generated from clean renewable resources—like wind and solar—available for 24/7 use, and is critical to achieving a decarbonised power grid and reaching President Biden's ambitious climate goals," said US Secretary of Energy Jennifer M. Granholm.

Meanwhile utility PPL Corporation and Belgium's Elia Group have signed an agreement to develop and propose transmission solutions to integrate future offshore wind capacity to the onshore grid in New England.

The companies signed a memorandum of understanding to develop, build and operate transmission assets. "Both PPL and Elia Group are at the forefront of grid innovation. We intend

to leverage our shared vision and deep expertise to propose solutions that advance decarbonisation goals, enhance energy security and drive value for consumers," said Vincent Sorgi, President and Chief Executive of PPL Corporation. "PPL is a reliable and robust player in the US energy sector. Our values and ambitions in terms of driving the energy transition are well matched," said Chris Peeters, Chief Executive of Elia Group.

PLL and Elia Group plan to respond to a joint Request for Information from Massachusetts, Connecticut, Rhode Island, Maine and New Hampshire, that are seeking input from interested stakeholders relating to the transmission system changes and upgrades needed to integrate renewable energy resources into their grids.

Recent studies, including Massachusetts' 'Energy Pathways to Deep Decarbonization' report, which is cited in the RFI, assume that up to 30 GW of New England offshore wind capacity will be deployed by 2050.

Offshore wind suffering early stumbles

The Biden administration's aim to grow the offshore wind sector to 30 GW by 2030 has hit early barriers, with the industry recently saying that permitting is too slow, leases are too expensive and equipment is in short supply, while inflation is rising.

"If significant delays continue to occur and projects that are already underway are delayed, it will be more difficult to meet the 30 by 30 target," said Molly Morris, head of the offshore

wind division of Equinor. Environmental reviews "could end up being a very complicated bottleneck," said Morris.

Seabed leases offshore of New York state produced bids higher than in offshore oil and gas sales but companies such as Equinor and Denmark's Orsted pulled out of the bidding process as prices rose. "I don't think it's healthy to have these high lease prices," said Mark Mitchell, Senior Vice President

of project construction at US utility Dominion.

The government is working with the companies, as it seeks to develop the sector. Amanda Lefton, Director of the US Bureau of Ocean Energy Management, said: "We have advanced our processes considerably and continue to do so... We are certainly going to reach this administration's goals of 30 GW of offshore wind by 2030. We are also prepared to go much further."



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Indonesia's coal retirement plan takes shape

- Cirebon 1 refinanced to close 10-15 years early
- Just Energy Transition Partnership to help power sector emissions peak by 2030

Syed Ali

Indonesia's plan to reduce its dependence on coal fired generation is taking shape as the country signed significant deals to finance its transition to clean energy.

In November the Indonesian government, the Asian Development Bank (ADB) and a private power firm said they are teaming up to refinance and prematurely retire a coal fired power plant, the first such project under a groundbreaking carbon emissions reduction programme.

The 660 MW Cirebon 1 power plant in West Java will be refinanced in a \$250-300 million deal on condition that it be taken out of service 10 to 15 years before the end of its 40-50-year useful life under a memorandum of understanding (MOU), ADB officials said.

The Manila-based multilateral lender and Indonesia's Finance Minister Sri Mulyani Indrawati announced the MOU with independent power producer Cirebon Electric Power in Bali on the sidelines of the G20 Leaders summit.

The agreement is the first under the ADB's Energy Transition Mechanism (ETM), an initiative to blend private investment funds, public finance and philanthropic donations to buy up or refinance coal power plants in Southeast Asia to retire them early as the region shifts to renewable energy sources.

The ETM project, first announced last year, was developed by ADB with input from private sector firms including Prudential (PRU.L), Citi (C.N) and Black Rock (BLK.N) to eliminate decades of future carbon emissions by altering the economics of coal plant operations.

"The problem of legacy coal fired power in Southeast Asia qualifies as one of the single biggest problems for the energy transition, if not the world," ADB regional Vice President Ahmed M. Saeed, told *Reuters*.

"With this announcement, we're taking the first steps in what was an ambitious project and making it real," he added.

The deal marks a shift of the initial ETM concept of an "acquire and retire" model to a "refinance and accelerate retirement" model, Saeed said, adding that Cirebon, whose shareholders include Japan's Marubeni Corp and Korean Midland Electric Power Co, was motivated to take an active role in the transition rather than simply offload the plant.

"It became clear that it's a simpler structure to leave the existing owner in place," Saeed said. "And so we could deliver economic value through fi-

nancing as opposed to a change in equity ownership."

The coal plant deal was announced alongside a broader country platform for energy transition in Indonesia, which depends on coal for 60 per cent of its power. Sri Mulyani told the event that the government had identified plants generating 15 GW of electricity that could be retired early.

The deal was quickly followed by an announcement that the US, Japan and other countries will form a long-term energy transition partnership with Indonesia that aims to mobilise \$20 billion in public and private financing to help the Southeast Asian country achieve its climate targets.

The Just Energy Transition Partnership is expected to help coal-reliant Indonesia's total power sector emissions peak by 2030, earlier than previously projected, and establish a goal for it to reach net zero emissions in the

sector by 2050, bringing forward the target by 10 years.

The \$20 billion will be financed from the public sector – the Group of Seven members (G7) and Norway and Denmark – and the private sector, using a mix of grants, concessional loans, private investments and other means over a three-to-five-year period.

The G7 members are Britain, Canada, France, Germany, Italy, Japan and the United States, plus the European Union.

According to a new report by research company BloombergNEF (BNEF), accelerated deployment of renewables within this decade combined with post-2030 deployments of nuclear and carbon capture and storage can enable Indonesia to achieve net zero emissions by 2050. It said the global net zero transition could represent a \$3.5 trillion investment opportunity for the country.

Philippines has big plans for wind

The Philippines Department of Energy (DOE) is set to enhance the policies and guidelines governing offshore wind developments with over \$157 billion worth of such projects in the country's pipeline.

Energy Secretary Raphael Lotilla said the agency is undertaking the review to ensure the efficient and optimal development of offshore wind projects.

"The department is engaged in a review of the policies and guidelines of offshore wind projects. And this includes the existing policies framework and guidelines governing the administration of wind energy service contracts for offshore wind development," he said.

Lotilla said the refinements to the

existing policies, framework, and guidelines governing the administration of wind energy service contracts cover the technical, financial, operational, and administrative risks and challenges of offshore wind project development.

However, Lotilla added that existing offshore wind service contractors are still bound to comply with their obligations under their contracts. He said they would therefore have to continue to work on their existing commitments based on their approved work programmes.

The announcement came as Norwegian renewables company Scatec said it has lined up five onshore and offshore wind power projects with a combined capacity of 2.4 GW.

Singapore betting on hydrogen

Singapore says it aims to achieve carbon neutrality by 2050, giving a firm date for the first time, and will look at using hydrogen as a major power source.

The Southeast Asian nation targets for carbon emissions to peak in 2030 at 60 million tonnes, a reduction of five million tonnes from the previous goal, Deputy Prime Minister Lawrence Wong said.

Singapore also has plans to look at developing low carbon hydrogen as a major power supply in the long term.

"If technology continues to advance, we foresee that hydrogen can supply up to half of our power needs by 2050, alongside domestic renewable energy sources and electricity imports," Wong said.

Singapore's recently published plan to grow its hydrogen industry, as part of its target to achieve net zero emissions by 2050, sets out five ways to explore and grow opportunities for hydrogen.

Under the plan, the country will experiment with commercial ready

hydrogen technologies; conduct research and development to push forward hydrogen technologies; form international collaborations for low-carbon hydrogen supply chains; develop hydrogen related infrastructure for import, storage and for power generation; and support workforce training.

Energy expert William Stroll of Pinsent Masons MPillay, the Singapore joint law venture between MPillay and Pinsent Masons, said: "Governments around the world are exploring how hydrogen may be utilised to achieve a low carbon economy. With its limited land space other renewable energy technologies are not as viable in Singapore as they are in other countries, and so hydrogen presents a real opportunity for Singapore to meet its COP26 target for reaching net zero by 2050."

In late October Singapore's energy regulator said it will be introducing new emissions standards for new and repowered fossil fuel-fired power generation units in 2023.



India 'will need coal until 2040 and beyond'

Coal will play an important role in India until at least 2040, according to the nation's coal minister.

Addressing a parliamentary committee, the Minister in charge of coal, Pralhad Joshi, said the fuel was an affordable source of energy and demand for it had yet to peak in India.

"Thus no transition away from coal is happening in the foreseeable future in India," Joshi said, adding it would have a big role until 2040 and beyond.

The announcement came as calls for countries to switch to cleaner forms of fuel intensified at the UN's COP27 climate change summit in Egypt last month.

As heatwaves boost air conditioning use and drive up power demand, the government said in a statement coal accounts for more than 51 per cent of India's primary energy requirement

and around 73 per cent of electricity generation.

Months of declining fuel inventories at power plants culminated in the worst power crisis in more than six years in April, disrupting industrial activity and driving India to accelerate coal mining.

Although there are no plans to reduce coal use any time soon, the country is still pursuing an ambitious plan to massively increase its renewables generating capacity.

Last month the Ministry of New and Renewable Energy (MNRE) released a draft tender document for 4 GW of offshore wind leasing off the coast of the southern state of Tamil Nadu.

The draft document proposes to lease out seabed areas for 4 GW equivalent offshore wind project capacity across five sub-blocks off the coast of Tamil Nadu in the Gulf of Mannar during the

2022/23 financial year, which runs through March 2023. The leasing will be through international competitive bidding in the form of a single-stage, two-envelope bidding procedure.

The potential of the sub-blocks is estimated at between 3.9 GW, which is their collective tentative minimum potential, and 5.2 GW.

The move follows a 300 MW floating solar tender recently launched by India's Rewa Ultra Mega Solar Ltd (RUMSL), a joint venture of the Solar Energy Corporation of India (SECI) and Madhya Pradesh Urja Vikas Nigam, which has attracted huge interest, with subscriptions reaching 1000 MW.

India had 57 GW of cumulative installed solar capacity at the end of June. Data from Mercom India shows that less than 200 MW comes from floating photovoltaic parks.

UK support for customers and nuclear contrasts with renewables windfall tax

■ Sizewell C receives grant funding ■ Renewables subject to windfall tax

Janet Wood

The UK redoubled its commitment to more new nuclear power recently when Chancellor Jeremy Hunt confirmed he would back the proposed Sizewell C nuclear power plant with an initial £700 million investment. The UK government will initially be co-owner of the nuclear project with EDF until it reaches Final Investment Decision, when other investors will be invited to take a stake in the project.

The funding was pledged by Boris Johnson this summer. Confirming it,

Hunt said: "Our £700 million investment is the first state backing for a nuclear project in over 30 years and represents the biggest step in our journey to energy independence."

The announcement came alongside an autumn energy package intended to support consumers affected by skyrocketing bills. Industry body EnergyUK called the measures, which also included direct support for households, "a step in the right direction to support households and improve energy efficiency".

The recently announced measures

also included funding to improve the energy efficiency of the UK's housing stock, something the industry has been pressing for since previous schemes ended – although it will not take effect until 2024. EnergyUK said: "While we welcome the ambition to reduce the UK's final energy consumption from buildings and industry by 15 per cent by 2030, it is disappointing that there is no immediate support to invest before next winter. Every pound spent on energy efficiency measures will reduce subsequent energy expenditure and gas

reliance year on year, versus the sunk cost of direct financial support."

The government had threatened a 'windfall tax' on non-fossil energy generators and others who had benefited from the high electricity wholesale price. It softened the initial proposal slightly, but renewable electricity generators face a 45 per cent tax from January next year until March 2028 if prices rise above £70/MWh. The windfall tax for the oil and gas sector will be set at a lower rate of 25-35 per cent.

The proposed Electricity Generator Levy also faced pushback from

EnergyUK, which said it "will effectively penalise much needed low-carbon generation over polluting fossil fuel extraction". Other countries have imposed a windfall tax for six months but "in stark contrast" the UK mechanism would last six years, making the UK a much less attractive destination for investment, EnergyUK said.

RenewableUK agreed with that assessment, warning that the windfall tax "could severely deter investment in much-needed new renewable energy projects". Renewables generated 40 per cent of the UK's electricity last year.

Poland and Romania make decisions on new nuclear

Westinghouse will build Poland's first nuclear power plant, beating rival bids from France's EDF and South Korea's KHNP, said Prime Minister Mateusz Morawiecki. The plant near Choczewo will be operational in 2033. Poland plans three nuclear plants with three reactors each, with an overall maximum power output of 15 GW, which would account for about 30 per cent of energy consumption.

For this first project, Poland said it opted for US technology because "it is the most advanced and safest" technology. "In the decision, we have indicated our partner and it is the American Westinghouse," Morawiecki said. The details of the financial package for the \$20 billion investment have not yet been decided.

Poland's ZE PAK (private energy company) and PGE (state-owned public power company) will also work with KHNP to appraise the feasibility of an APR-1400 project in Patnow, central Poland.

Meanwhile the USA's Washington-based Export-Import Bank will provide \$3 billion for the construction of two new nuclear reactors in Romania. It will cover "about one-third of the amount necessary for the construction of two reactors" at Cernavoda, said Romanian Prime Minister Nicolae Ciuca. However Swedish nuclear plant owner Uniper has said that no more nuclear plants are being considered beyond a fourth one being built. Barsebäck Kraft boss Åsa Carlson had expressed hopes for a further new plant.

Nordics set to become green powerhouse

The Nordic region is set to play a growing role as a green powerhouse for Europe, according to an analysis by Rystad Energy.

Rystad says Denmark, Sweden and Finland will increase their combined utility-scale solar and onshore wind capacity to 74 GW by 2030 from 32 GW in 2022, with onshore wind accounting for the bigger part of the total (61 GW). In addition they will add 14.8 GW of offshore wind by that date and control 18 per cent of Europe's electrolyser capacity in almost 40 green hydrogen projects scheduled to come online by 2030.

"The Nordics at present produce more

than 90 per cent of their power (including nuclear) via renewables and are significant electricity exporters to the rest of Europe. That trend will intensify as geography, technology and managerial experience in the region will see renewable investment and generation increase. This will be welcome news to heavy industries in the region as Europe seeks to cut emissions," commented Francesca Bjornflaten, senior analyst, renewables at Rystad Energy.

Norway and Iceland were not included in the analysis as they already generate most of their electricity from hydropower.



Europe 'must invest to shift to LNG instead of Russian gas'

■ New terminals will help cut prices from 2024
■ US suppliers need long term contracts to invest

Janet Wood

Europe has to pivot to liquefied natural gas (LNG) if it wants to wean itself off Russian gas, according to a new report from S&P Global Ratings. It said that switching from Russian pipelines to LNG has both opportunities and high risks for utilities.

For the next three years, Europe will need around 150 billion cubic metres (bcm) of LNG annually – nearly 65 per cent more than the 90 bcm it purchased in 2021. Acquiring this will be tough considering the stiff competition, especially from China.

S&P expects supply will be at its tightest in 2023/24 because gas demand in Asia Pacific is expected to rebound at a time when liquefaction capacity additions remain low. But further gas shortages or an extremely cold winter could push prices higher,

threatening utilities' earnings and liquidity, it said. S&P said diverse gas sources and joint procurement could help avoid bottlenecks.

Meanwhile, a new study published by McKinsey said North America could become a key gas supplier for Europe. The report, 'How North American natural gas could help alleviate the energy crisis', also says gas exports from North America to Europe could help reduce the use of coal globally.

McKinsey warns that limited LNG supplies in the near term could drive countries in Europe and Asia back to using coal and lignite in power generation. But it said "Europe's new focus on LNG infrastructure... opens the door wide for North American LNG exports to increase in the next 3-5 years".

It said that will require infrastructure

investment in the US and Canada such as new strategic natural gas pipelines. To justify that capital expense, buyers in Europe would need to commit to offtake agreements for 20 years or longer, whereas they prefer five-year contracts.

Dumitru Dediu, Partner at McKinsey, commented: "North American gas resources have a lot of potential to address the energy crisis of today, by improving affordability and energy security. Our analysis shows that gas infrastructure development and long-term offtake agreements are fundamental, or there will be higher prices for gas and LNG, which may have spill-over effects for power, fertiliser, and other essential commodities."

The EU has been planning to introduce measures to cap gas prices but its proposals have not yet found favour with market participants.

France loses one of four floating wind demonstrators

Shell, China General Nuclear Power Group (CGN) and France's Caisse des dépôts et consignations (CDC) have cancelled a project to build a demonstrator floating wind farm.

The €300 million Groix & Belle-Ile project, off the coast of Brittany, was expected to have an installed capacity of 28.5 MW.

Shell joined the project when it acquired Eolfi, a French renewable energies developer specialising in floating

offshore wind projects, in 2019.

But Shell said the wind farm had faced "technical, commercial and financial challenges". It said in a statement: "The economic conditions linked to the project have been significantly modified, calling into question, for all the partners of the consortium, the economic viability of the project."

The wind farm would have comprised three Vestas 9.5 MW turbines and floating foundations from Naval

Energies, which was acquired by Saipem in June last year after its parent company Naval Group announced it was exiting the offshore wind sector.

It was one of four demonstrator floating wind projects approved for development by the French government and cleared by the EC for state aid in 2019. It was the only one of the four on the Atlantic coast. The other three – Golf du Lion, Eolmed and Provence Grand Large – are in the Mediterranean Sea.



South Africa will need \$500 billion to reach net zero

Shift away from coal requires significant international support and private sector involvement. **Nadia Weekes** reports

South Africa will require at least half a trillion US dollars to achieve carbon neutrality by 2050, according to the World Bank. Financing the energy transition could cost South Africa 4.4 per cent of its GDP every year up to 2050, a recent report found. Given the government's limited fiscal capacity, the domestic private sector and external financing will be required, it said.

As the continent's most industrialised economy, South Africa accounts for 1.2 per cent of global greenhouse gas emissions, with the coal-dominated energy sector responsible for nearly half of them. The country's carbon intensity was 3.2 times higher than the global average in 2019.

At last year's COP26 climate summit in Glasgow, Scotland, South Africa secured R152.15 billion (\$8.5 billion) in loans and grants from rich nations to finance the transition to cleaner energy sources.

"The power sector... will need to transform radically by moving away from coal toward renewables," the bank said, projecting that solar and wind will provide about 85 per cent of the country's energy by 2050. "This shift should start immediately to address the ailing generation capacity," the report added.

The World Bank estimates that at least 300,000 jobs in high-emitting sectors will be lost, but that between two

and three times as many jobs could be created in renewables, green manufacturing and non-coal mining sectors.

On the eve of the recent COP27 summit in Sharm-El-Sheikh, Egypt, South Africa's government said the bulk of the \$8.5 billion climate finance deal would be spent to bolster its energy supply. Nearly 90 per cent of the funds will be used to decommission coal fired power plants while developing renewable energy generation, strengthening the transmission grid and modernising the electricity distribution system. The rest will go toward the development of green hydrogen and electric vehicle industries.

The so-called Just Energy Transition

Partnership – which saw the US, UK, EU, Germany and France pledge funds for South Africa at COP26 – is expected to serve as a prototype for similar deals with coal-dependent, developing nations such as Vietnam, Indonesia and India.

Presenting the plan, President Cyril Ramaphosa said it reflected South Africa's determination to diversify its energy mix and ensure that its transition to a low-carbon economy underpinned efforts to tackle inequality, poverty and unemployment.

Ramaphosa warned that the package was "not sufficient to meet the scale of our ambition", however. The South African government has also criticised

the structure of the finance package, saying it relies too heavily on loans that will add to the country's debt burden.

Commenting on its €300 million (\$312 million) loan, Christiane Laibach of Germany's KfW development bank said that it was "absolutely essential" for South Africa to move away from coal fired power generation to achieve its climate targets, and that it was necessary "to re-establish the security of supply and make the process socially affordable".

South Africa aims to significantly lower its greenhouse gas emissions by 2030 by increasing the share of renewable energies in its energy mix from 11 per cent to 38 per cent.

World Bank approves repurposing of Komati coal fired power plant

The World Bank has approved South Africa's request for a \$497 million project to decommission and repurpose the Komati coal fired power plant using renewables and batteries.

The Komati Project aims to help mitigate climate change, enhance energy security and support economic opportunities in the Komati area. World Bank Group President David Malpass said this demonstration project would serve as a reference on how to transition fossil fuel assets for future projects in South Africa and around the world.

State utility Eskom's 15 coal fired power plants, with an average age of 41 years, provide 38.7 GW of the country's 52.5 GW installed capacity.

"This project is critical to our understanding of the sustainability of decommissioning, repurposing and mitigating the socio-economic impacts for workers and communities before we scale-up the move of the power sector into a low-carbon path," said South Africa Minister of Public Enterprises, Pravin Gordhan.

Under its 2019 Integrated Resource Plan, South Africa aims to retire some 12 GW of its old and inefficient coal fired power plant fleet by 2030, while adding 18 GW of private sector-led renewables.

Komati, which had been operational since 1961, was fully decommissioned on 31 October, when its last generating unit was taken offline.

The plan is to convert the power

plants into a renewable energy hub with 150 MW of solar and 70 MW of wind power, alongside 150 MW of storage batteries. The coal plant workers will transfer to other Eskom facilities or be upskilled and deployed to the renewable energy facilities.

The Komati Just Energy Transition Project is financed jointly through a \$439.5 million World Bank loan, a \$47.5 million concessional loan from the Canadian Clean Energy and Forest Climate Facility (CEEFCF) and a \$10 million grant from the Energy Sector Management Assistance Program (ESMAP).

During COP27, the European Investment Bank (EIB) and Development Bank of Southern Africa (DBSA) launched a €400 million renewable energy investment initiative to boost private sector solar and wind investment across South Africa.

The Embedded Generation Investment Programme (EGIP) is expected to deliver 1.2 GW of green energy capacity and avoid 3.6 million tonnes of CO₂ emissions while creating hundreds of jobs across the country during construction and operation.

The financing will be available for solar photovoltaic and onshore wind energy projects – and potentially also energy efficiency projects – promoted by the private sector in South Africa.

The EIB facility complements the Just Energy Transition Partnership, which focuses on support to the public sector.

Ethiopia starts electricity exports to Kenya

- Mega-dam to supply electricity under 25-year deal
- \$500 million transmission line can deliver 2 GW

Nadia Weekes

Ethiopia has begun exporting electricity to Kenya under a 25-year deal between the two East African neighbours. The move comes after Ethiopia announced earlier this year it had started generating power from its controversial mega-dam project on the Nile.

Ethiopian Electric Power (EEP) said the \$500 million transmission line between the two countries has a capacity to deliver the electricity generated from 2 GW of capacity, and generate

revenues of up to \$100 million a year. "It's a pivotal project geared towards transforming the multifaceted Ethiopian-Kenyan diplomatic relations," said Ethiopia's ambassador to Kenya Bacha Debele.

Daniel Kiptoo, Director General of Kenya's Energy Petroleum and Regulatory Authority (EPRA), said initial imports will be 150 MW, rising to 300 MW in the next three years. He said the cost of importing from Ethiopia was lower than Kenya's average generation cost.

Ethiopia first began generating power from the Grand Ethiopian Renaissance Dam on the Blue Nile in February 2022, with a second turbine starting in August. The \$4.2 billion project is expected to have a capacity in excess of 5 GW, more than doubling Ethiopia's current installed capacity.

Ethiopia is already selling electricity to Sudan and Djibouti and has signed memorandums of understanding with South Sudan, Tanzania and the breakaway Somali region of Somaliland.



UAE-US partnership to invest \$100 billion in clean energy projects

The UAE and the US have signed a strategic partnership to invest \$100 billion to install 100 GW of clean energy capacity globally by 2035.

The Partnership for Accelerating Clean Energy [PACE] aims to enable climate action while enhancing global energy security and affordability. It will promote practical initiatives and promising technologies that can accelerate the energy transition.

With a focus on elevating global climate action and ensuring a just transition, PACE aims to unlock joint investment and opportunities in emerging economies. As part of the initiative, the two nations will seek to provide technical, project management and funding assistance for commercially and environmentally sustainable energy projects in third countries.

The partnership aims to assemble

and stimulate private and public sector funding and support across four priority areas. These are: clean energy innovation, financing, deployment and supply chains; carbon and methane management; advanced reactors, including Small Modular Reactors (SMRs); and industrial and transport decarbonisation.

The UAE has invested more than \$50 billion over the past ten years in

clean energy technologies and solutions, building three of the world's largest solar projects.

The country is also involved in an ambitious nuclear energy programme. When all its three reactors are online, the Barakah Nuclear Power Plant will supply up to 25 per cent of the country's electricity needs.

Other notable UAE projects include the 5 GW Mohammed bin Rashid Al

Maktoum Solar Park and the region's first industrial-scale carbon capture, utilisation and storage (CCUS) facility, which captures 800,000 tons of CO₂, with plans to expand six-fold by 2030.

The UAE is supporting clean energy projects worldwide, including in 31 small island states in the Caribbean and the Pacific Ocean. It will host the COP28 climate conference in November 2023 in Dubai.

Nuclear activities of Steam Power sold as GE focuses on gas and renewables

- GE Vernova positioning for “longer term growth”
- Power business predicts low single-digit revenue growth for 2022

Junior Isles

GE has signed a binding agreement to sell GE Steam Power’s nuclear activities to French state-owned power company Électricité de France (EDF) as part of a plan to focus on its gas turbine and renewable energy businesses.

GE Steam Power’s business activities include the production of conventional island equipment for the new nuclear power facilities including Arabelle steam turbines and maintenance and upgrade services for the

existing nuclear power plants located in the Americas, as well as overseas locations. The transaction also includes steam turbine technology for future nuclear plants, such as the European pressurised reactors (EPR2) and small modular reactors (SMR).

This acquisition will enable EDF Group to strengthen the technologies and skills around the conventional island, which are essential for the maintenance of the existing nuclear fleet and future projects.

The binding agreement between the

two companies builds on the process, which first began in February this year. It is still subject to customary closing conditions including regulatory approvals and is expected to take place in the second half of 2023.

Following the sale, GE said in a statement: “This acquisition will enable EDF Group to strengthen the technologies and skills around the conventional island which are essential for the maintenance of the existing nuclear fleet and future projects.”

The announcement follows the

release of GE’s third quarter 2022 results, where the company said it is “building broad-based momentum with solid revenue and free cash flow results, as well as services growth in all businesses”.

GE Chairman & CEO and GE Aerospace CEO Larry Culp, said: “Within GE Vernova, Power remains on track to grow this year and we are taking significant actions to reset Renewable Energy. External catalysts, like recent US legislation and the energy crisis in Europe, are increasing investment in

new decarbonisation technologies, helping position GE Vernova for longer-term growth.”

Looking to the fourth quarter, GE continues to expect significant sequential and year-over-year growth in equipment and services. This sets Power up to deliver its 2022 outlook of low single-digit revenue growth and margin expansion.

“Overall, the business remains on track for growth in earnings and cash generation in 2022 and 2023,” Culp added.

European wind turbine manufacturers continue to face strong headwinds

The latest performance figures released by Europe’s biggest wind turbine manufacturers have highlighted the difficult conditions facing operators in the wind power sector.

In an “extremely challenging macro-economic and geopolitical context”, shaped also by Europe’s commitment to safeguard energy independence and an increase in global commitments to curb climate change, Siemens Gamesa ended what it called “a particularly complex fiscal year 2022”.

Although the turbine maker recorded a net profit of €286 million in the fourth quarter of the Fiscal Year 2022, – the first time it has ended a quarter in the black since the first quarter of Fiscal Year 2021 (October-December 2020) – it has been a difficult year.

The company’s performance during the fiscal year reflected market imbalances caused by persisting supply chain disruptions, heightened by geopolitical tensions and additional waves of Covid-19, as well as upward pressure on the price of inputs and shipping. There were also internal challenges. These challenges included the industrialisation of the Siemens Gamesa 5.X onshore platform, where progress was slower than planned, and additional costs related to failures and repairs of components in legacy onshore platforms.

All these factors affected the manufacturing, execution and delivery of projects in progress, said the company. Based on new assumptions about market, production and project-execution conditions, the backlog of projects for delivery in future years needed to be

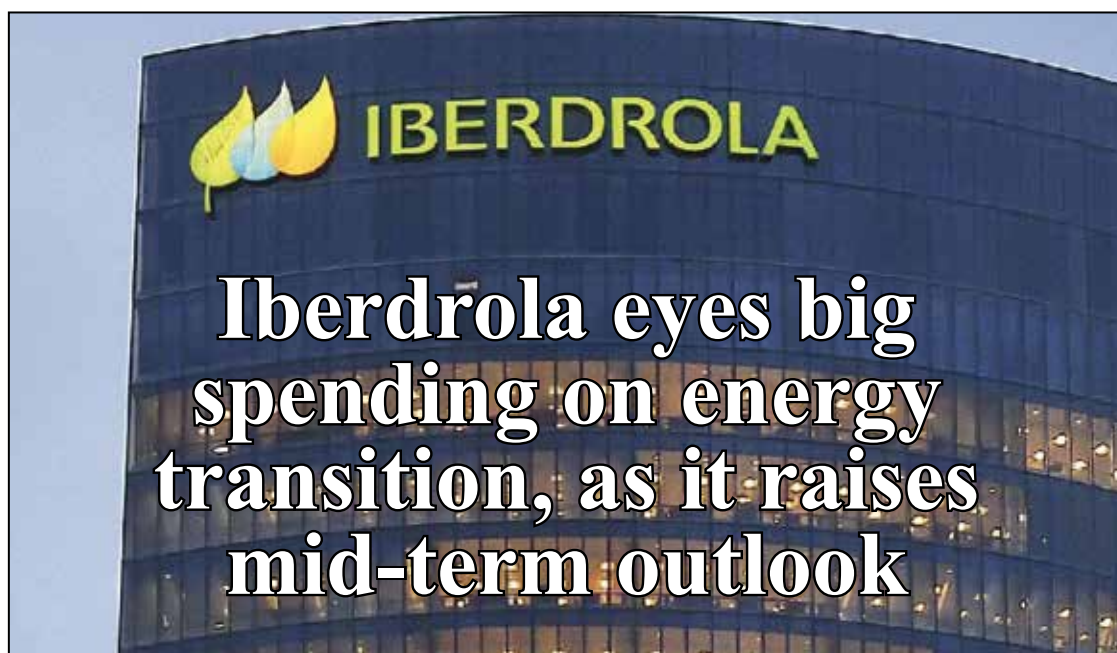
re-assessed, it said.

Revenue from October 2021 to September 2022 amounted to €9814 million (-4 per cent year-over-year). The company closed the fiscal year with a net loss of €940 million (vs. -€627 million in FY21). The numbers come as a result of supply instability and delays in project execution, the challenges around the ramp-up of the Siemens Gamesa 5.X platform, reduced manufacturing activity, and component failures and repairs in legacy onshore platforms. This impact was partially offset by the successful sale of renewable development assets in southern Europe.

It was a similar story for Vestas Wind Systems, as the Danish wind turbine giant cut its full-year earnings guidance. Full-year revenue for 2022 is forecast to range between €14.5 billion and €15.5 billion, as compared to the previously expected €14.5-16 billion.

Its third quarter results revealed underlying losses (EBIT) were worse than forecast at €127 million, compared to an average analyst forecast of €40 million, on revenues of €3.9 billion, down 29 per cent on a year ago and around 14 per cent below consensus forecasts.

Vestas Group President & CEO Henrik Andersen said: “In the third quarter, our profitability improved along the lines of our expectations but remained heavily impacted by cost inflation and supply chain disruption, which resulted in an EBIT margin of minus 3.2 per cent and an adjustment of our guidance.”



Spanish electric utility Iberdrola says it will invest €47 billion in the energy transition during the period from 2023 to 2025, and has raised its outlook for the fiscal 2025.

Notably, the energy company says it will allocate €27 billion to networks and €17 billion to renewables. Noting that transmission networks will account for almost six out of every ten euros invested between now and 2025, it said networks are the backbone of the integration of new renewable capacity and will enable the implementation of new solutions and distributed services.

Ignacio Galán, Iberdrola Executive Chairman, commented: “The record global investment plans we have set out will help us to bring more self-sufficiency and resilience against

potential energy shocks in the countries where we operate, by reducing their dependency on oil and gas and by continuing their path to net zero.”

The investment in renewables will see Iberdrola reach a renewables capacity of 52 GW.

The bulk, i.e. 46 per cent, of the investment in renewables will be focused on offshore wind in France, Germany, the United Kingdom and the US. Onshore wind will account for 25 per cent of the investment, solar photovoltaic for 24 per cent, hydroelectric for 2 per cent and batteries 3 per cent.

With these investments, the company will increase its installed renewable capacity by 12 100 MW during the 2023-2025 period – 3100 MW onshore wind, 6300 MW photovoltaic, 1800 MW offshore, 700 MW of batteries and

200 MW of hydropower. The group has already secured 50 per cent of the new capacity and around 95 per cent of production will be contracted by 2025.

Iberdrola also reaffirmed the outlook for 2030. Driven by growth in all markets and the acceleration of electrification, it will make investments of €65-€75 billion in 2026-30 to exceed 100 GW of installed capacity, while investing €65 billion in network assets.

Presenting figures during its Capital Markets Day last month, the company said it expects to achieve a net profit of between €5.2 and €5.4 billion at the end of the 2025 period.

At the end of October the Spanish utility reported a net profit of €3.1 billion for the nine months through September, up by 29 per cent year-over-year.

Hitachi Energy and Equinor agree to accelerate energy transition

Hitachi Energy has signed a strategic collaboration agreement with Equinor to collaborate on electrification, renewable power generation and low-carbon initiatives worldwide.

Initial areas of focus for the collaboration include developing standardised base designs to be applied for high-voltage direct current (DC) and alternating current (AC) transmission systems to connect offshore wind farms and Equinor production facilities to

mainland power grids.

“We are delighted to deepen our long-standing relationship with one of the world’s leading energy companies and to help Equinor achieve its ambition of becoming net zero by mid-century,” said Niklas Persson, Managing Director of Hitachi Energy’s Grid Integration business. “Together we make a strong team that will support the society to reach the goal of the Paris Agreement and create a sustainable energy

future for all.”

Geir Tunesvik, Executive Vice President for Projects, Drilling and Procurement at Equinor, added: “Hitachi Energy has been a reliable supplier to Equinor for many years. This strategic collaboration agreement is a signal of joint ambitions to increase our competitiveness in the ongoing energy transition.

“Standardisation of technical solutions will be a key to succeed, and we

look forward to improving together with Hitachi Energy.”

The scope of the agreement covers the complete spectrum of Hitachi Energy’s portfolio of power grid technologies and solutions.

It includes IdentiQ, Hitachi Energy’s digital twin for high-voltage direct current (HVDC) and power quality solutions, which provides significant benefits throughout the assets’ plan, build, operate and maintain life cycle; Grid-

eXpand modular and prefabricated offshore and onshore grid connections that make it faster, simpler and more efficient to connect facilities to the grid; OceaniQ solutions such as transformers and high-voltage products that can operate flawlessly on land, offshore and below the sea surface; and grid automation solutions that keep onshore and offshore electrical assets operating reliably, safely and securely.

10 | Tenders, Bids & Contracts

Americas

Vestas secures 300 MW order in USA

Vestas has won a 300 MW order from Apec Clean Energy to supply 50 V162-6.2 MW wind turbines operating in 6.0 MW mode for the Goose Creek Wind project in Illinois, USA. The order includes supply, delivery, and commissioning of the turbines, as well as a 10-year Active Output Management 5000 service agreement.

Turbine delivery is scheduled to begin in Q3 2023 with commissioning scheduled for Q4 2023.

Mark Goodwin, President and CEO of Apex Clean Energy, said: "Goose Creek Wind will positively impact domestic energy security while delivering substantial economic benefits, including long-term positions and hundreds of construction jobs, as well as significant tax revenue and landowner payments on Piatt County, Illinois."

The project will support nearly 400 construction jobs, eight long-term positions, and approximately \$200 million in tax revenue and landowner payments in Illinois.

Voith Hydro awarded US Army dam contract

The US Army Corps of Engineers (USACE) awarded Voith Hydro a \$50 million contract to modernise the turbines and generators at the Norfolk Dam in Baxter County, Arkansas. The work is expected to begin soon and projected to last through 2028.

Originally completed in 1944, the Norfolk Dam powerhouse has two generating units, each of 31.3 MW capacity. After modernisation, each unit will have a capacity of 46.5 MW. In addition, the water quality below the dam will be improved due to Voith Hydro's dissolved oxygen enhancement technology.

Stanley Kocon, President and CEO of Voith Hydro, said: "Voith Hydro's US-based workforce is excited to give new life to an iconic dam in the heart of the Ozarks. We thank the Army Corps of Engineers for the contract award, which recognises Voith Hydro's unparalleled technology and know-how in both hydropower modernisation and environmental performance."

Ramboll foundations for Atlantic Shores

Atlantic Shores Offshore Wind Project 1, a wholly owned subsidiary of Atlantic Shores Offshore Wind, a 50:50 partnership between Shell New Energies US and EDF-RE Offshore Development, announced it has selected Ramboll as the design and structural engineering firm for the turbine foundations on its 1.5 GW offshore wind project.

The project is located 10-20 miles off the coast of Atlantic City, New Jersey, USA. Atlantic Shores will also be developing a 10 MW green hydrogen plant to make use of power from the offshore wind farm.

Asia-Pacific

Cable T&T order for Taiwan wind farm

James Fisher Renewables (JF Renewables) is working with Ho Lung Power Engineering (HLPE) to provide planning, reporting, engineering support/technical review and skilled labour for cable termination and testing (T&T) of Ørsted's Greater Changhua wind farm in the Taiwan Strait.

Offshore operations include T&T consultancy and service on 66 kV

inter-array cables. Additional work scope includes fibre-optic installation support and electrical testing pre- and post-installation.

This comes at a pivotal growth moment for Taiwan as it ramps up to meet its target of 20.5 GW of offshore capacity by 2035 against the backdrop of project delays due to Covid challenges.

Green hydrogen plant for Pakistan

Oracle Power has appointed Thyssenkrupp Uhde to lead a technical and commercial feasibility study for the green hydrogen and ammonia project, being developed by the company's joint venture company, Oracle Energy. The final report is due in H1 2023. The project is located in the province of Sindh in southern Pakistan.

The plan is for a 400 MW capacity green hydrogen production facility generating 55 000 t/y of green hydrogen. The facility will use 700 MW solar power and 500 MW wind power. The hydrogen will then be converted to green ammonia.

The detailed techno-economic modelling study will be performed providing cost estimates for plant opex and capex, processes and plant layout, project execution schedule, technology information and carbon intensity of the hydrogen value chain.

Vestas wins 21 MW wind order in Taiwan

Vestas has won an order for five V117-4.2 MW wind turbines from wpd for two projects in Taiwan.

Deliveries are scheduled to start in Q3 2023, with commissioning in Q4 2023. The order includes a long-term Active Output Management 4000 service agreement.

DNV is owner's engineer for Chujin offshore wind

Elenergy has announced that it has appointed DNV as owner's engineer for the 1.5 GW fixed-bottom Chujin offshore wind project in South Korea. The wind farm, featuring 100 wind turbines, will come up in three stages including 500 MW Phase I and 1GW Phases II & III.

The scope of work specified in the contract includes conducting the pre-front end engineering design and supervising contractors in the final design, procurement, construction, commissioning and operations phases to reduce risks and prepare optimal solutions for the building stages of the project.

The project is backed by Namsung Shipping with completion expected in 2027, according to a press release from DNV.

Europe

EnBW transitioning to H₂-capable turbines

EnBW is transitioning the district heating power plant in Stuttgart-Münster, Germany from coal to natural gas. All systems will be constructed such that natural gas can be replaced by hydrogen as quickly and as completely as possible. Siemens Energy will supply two SGT-800 gas turbines capable of achieving these twin transitions.

The two turbines will each have a 62 MW capacity and a downstream waste heat recovery system. They will replace three coal fired boilers. Diana van den Bergh, engineer with EnBW, said: "Pipelines, control systems, and boiler technology also have to be converted to hydrogen

use as quickly and easily as possible when green hydrogen is available."

Siemens Energy said that the new turbines will be able to process up to a 75 per cent hydrogen admixture from the time they are shipped in 2025, and the overall package will be capable of burning 100 per cent hydrogen.

Once all approvals have been obtained, work on the new systems could begin in Q1 2023.

Siemens Gamesa and OX2 to develop Riberget project

Siemens Gamesa and OX2 are jointly developing the 70 MW Riberget wind project in Sweden, located in the municipality of Ljusdal. Siemens Gamesa has a 35-year service agreement to cover all maintenance services for the wind farm once installation is complete.

Siemens Gamesa will supply 11 of its SG 6.6-170 wind turbines, with a hub height of 115 m. The platform features one of the largest rotors available for onshore applications.

The project is due to be commissioned in late 2024.

In early October, Siemens Gamesa introduced an additional member to its 5.X platform, the SG 7.0-170, which offers a rated capacity of up to 7 MW.

EIB signs loan agreement with Terna

The European Investment Bank (EIB) has signed a loan contract with Italian power grid operator Terna, extending €500 million to the cost of constructing a 1 GW submarine link connecting Sicily, Sardinia, and the Italian peninsula.

The loan is the first tranche of the €1.9 billion financing approved by the EIB to support construction of the Tyrrhenian link, a 970 km, 1000 MW DC double submarine cable linking the islands and the mainland peninsula.

Terna plans to invest €3.7 billion for the whole project. It will use the first tranche to build the "east section" link to connect Campania in the peninsula to Sicily, the EU bank said. The west section will extend the connection to Sardinia.

The first east section cable will be operational at the end of 2025, while the entire Tyrrhenian link will be fully functional in 2028.

World's first SF₆-free 420 kV GIS for Germany

Hitachi Energy will provide the world's first SF₆-free 420 kV gas-insulated switchgear (GIS) technology, along with a modular prefabricated grid connection at a key node at TenneT's power grid in Germany.

The project is for a major grid connection upgrade, which will extend the operating life of existing power assets. Hitachi Energy will supply its EconiQ 420 kV GIS.

Hitachi Energy will contribute its skills to strengthen the grid connection at the 220 MW Erzhausen pumped storage power plant near Hanover. This project uses Building Information Modelling, a consolidated and collaborative digital working method that allows decision-based 3D modelling and improves facility management via a digital twin for the life cycle of the power asset. The entire project will be completed in 2026.

In this project, Hitachi Energy will install three bays of its EconiQ 420 kV GIS to enable the transmission of large amounts of electricity over long distances while eliminating significant volumes of SF₆.

Prysmian wins French offshore wind projects

Prysmian has won a contract from Réseau de Transport d'Electricité (RTE) to provide power grid asset management services for Saint-Nazaire, Fécamp, and Calvados offshore wind farms off the Normandy coast of France.

Prysmian will provide inspection, maintenance, and repair services for the submarine export cable links connecting the three offshore wind farms to the mainland using Prysmian cables.

The contract will cover the three HVAC 220 kV three-core submarine cables with XLPE insulation and single-wire armouring of the Fécamp (2×18 km offshore), Calvados (2×16 km offshore) and Saint-Nazaire (2×34 km offshore) wind farms.

The agreement will last 15 years and is in effect immediately at the completed link of Saint-Nazaire, which will then be extended to the other two links as soon as they are fully operational.

International

DEWA awards consultancy for UAE solar

The Dubai Electricity and Water Authority (DEWA) has selected an Ernst & Young-led consortium to provide consultancy services for the 900 MW sixth phase of the 5 GW Mohammed bin Rashid Al Maktoum Solar Park in the UAE.

Under the terms of the contract, the consultants will be responsible for reviewing existing laws and regulations in the UAE, preparing tender documents, developing a financial model, managing the tender submission, commercial negotiation, and concluding a PPA and financial closure with the developer. The sixth phase is expected to be operational in stages between 2025 and 2027.

MAN to supply gensets for Namibian grid

MAN Energy Solutions will supply three MAN 18V51/60DF dual-fuel engines with alternators and auxiliary equipment as part of an expansion of the Anixas power station in Walvis Bay, Namibia. For this purpose, a new power station will be built directly next to the existing facility, expanding the current generation capacity of 22.5 MW by an additional 50 MW. The power station will be operated by state-owned utility, Namibia Power Corporation (NamPower).

The project is a joint venture between FK Namibia – represented by FK Generators and Equipment (International) – and the two Namibian firms, PHIM and August Twenty Six Construction.

Once commissioned, the MAN 51/60DF engines will initially run on liquid fuel. As soon as an appropriate gas infrastructure becomes available regionally, the dual-fuel engines will switch to operation on low-emission natural gas.

Sungrow inverters for South African solar project

Sola Group of South Africa has awarded a contract to Sungrow Power Supply of China for the supply of inverters for a 256 MW solar PV project.

Under the terms of the deal, Sungrow will supply its 1+X modular inverter. The solar farm is expected to generate 540 GWh annually. The power plant is scheduled to be operational by 2023.



Hydrogen

Japanese companies move ahead with ammonia transport project

Japan relies almost entirely on imports of natural gas and coal to meet its energy needs. But its desire to cut carbon emissions is pushing it to test innovative methods to meet its huge energy demand and contribute to the battle against global warming. Many advances are being made in alternatives and renewables, but is an ammonia/coal mix one of them?

Gary Lakes

Japan's JERA, the country's largest power generation company, has signed a memorandum of understanding with shipping companies Nippon Yusen Kabushiki (NYK) and Mitsui OSK Lines (MOL) regarding the transportation of 'fuel ammonia' to JERA's Hekinan Thermal Power Plant for a project proposing to mix ammonia with coal. The project, which has provoked questions about the environmental safety and cost of an ammonia/coal mix, is set to come into operation by the end of the decade or early 2030s.

The three companies will together examine how large-scale ammonia carriers might be developed and safely transported. The transport vessels are to be designed to carry the ammonia to Japan's domestic thermal power plants and deliver the fuel to receiving stations. The group will look at "building a fuel ammonia transportation and receiving system, as well as installing and operating propulsion engines that use

ammonia as ship fuel", a statement released by JERA said. The partners are also to work with related parties to foster a set of rules for the reception of fuel ammonia, the statement added.

JERA intends to start the commercial operation of large-volume co-firing – a 20 per cent mix of fuel ammonia with coal – at its Hekinan Thermal Unit 4 by the end of the 2020s. The project is part of JERA's green fuels production and promotion scheme under the JERA Zero CO₂ Emission 2050 programme, which is designed to cut emissions at its domestic and overseas facilities.

The programme led to the signing of a deal in August this year between JERA, Singapore's Jurong Port, and Mitsubishi Heavy Industries Asia Pacific on the production of ammonia. The group plans to set up a direct 100 per cent ammonia combustion power plant on Jurong Island, where Singapore's chemical and energy industries are based. JERA said in its statement that a 60 MW class gas turbine combined cycle power plant fuelled by

100 per cent ammonia is planned for the location that will produce carbon-neutral electricity and stimulate ammonia demand.

However, a study carried out by Bloomberg New Energy Finance (BNEF) examining Japanese utility companies' plans to retrofit their existing coal fired power plants to enable co-firing of coal with ammonia might not be a good idea. Japan is keen to reduce its carbon dioxide emissions by 46 per cent by 2030 from 2013 levels and hit net zero by 2050, but according to the BNEF analysis of the proposal, it appears that ammonia and coal might not mix well.

The plan could be an attempt by JERA and other companies with coal-fired generation facilities to save their coal fired plants in the face of what will in future be growing pressure to close them as usage and development of renewables expands. The cost of phasing out these plants or converting them to a no-emissions fuel could be ruining for the coal sector of the energy industry. Coal provides Japan

with some 30 per cent of the electricity it requires drawn from 49 GW worth of coal fired capacity.

Japanese utilities are reported to have invested heavily in retrofitting for ammonia, and have received hundreds of millions of dollars in support from the government, but it could prove to be an uneconomic pursuit.

According to the BNEF analysis: "The CO₂ emissions from a coal power plant burning ammonia at a co-firing ratio of below 50 per cent will still emit as much CO₂ as a natural gas fuelled combined cycle gas turbine. Coal power plants co-firing ammonia may also emit more nitrous oxide, a greenhouse gas with global warming potential 273 times larger than that of CO₂ for a 100-year timescale. Additionally, handling ammonia requires more care than coal due to its volatility and toxicity."

Furthermore, co-firing ammonia and coal may prove to be an expensive route for Japan to take. According to the report: "The levelised cost of electricity (LCOE) for a typical Japanese

coal plant retrofitted for ammonia co-firing at 50 per cent or higher energy content is significantly higher than zero-emission sources such as offshore wind. Ammonia co-firing is unlikely to become an economically viable path for Japan to reduce power sector emissions."

The report calculates that the LCOE using a 50 per cent clean ammonia co-firing ratio could be \$136/MWh in 2030, while using 100 per cent clean ammonia could be \$168/MWh in 2050.

"These values are costlier than the LCOE of renewable alternatives such as offshore wind, onshore wind or solar with co-located batteries. Clean ammonia is better suited for decarbonisation of applications such as fertiliser production than power," the BNEF study said.

The words 'ammonia' and 'hydrogen' generate considerable attention in the energy sectors, but it may turn out that they are not miracle molecules and may not fit all applications in economic and environmental ways that are best met with other renewables.

Gas

Qatar, China sign 27-year LNG contract as market tightens

Qatar has plenty of renewable energy potential, but its main resource is natural gas. The country's latest contract to supply LNG to China and its North Field expansion projects are testament to the fact that Doha plans to be in the gas business well into the future.

Gary Lakes

Qatar and China last month signed an agreement destined to go down in LNG history. It is the first time that a supplier, that being state-owned Qatar Energy, and China's Sinopec, another state-owned entity, negotiated a long-term contract covering 27 years. The length of the Supply and Purchase Agreement (SPA) will bring LNG to China up to 2053, three years after the date that most of the world has targeted for net zero in accordance with the Paris Climate Accord.

Media reports put the value of the contract at \$60 billion for the delivery of 4 million tons annually of Qatari LNG beginning in 2026 when the North Field East (NFE) expansion project is due to start producing LNG. The LNG will be delivered to Sinopec's regasification terminals in China via a fleet of new tankers.

This latest deal follows a 10-year contract signed in 2021 between Qatar

Energy and Guangdong Energy Group Natural Gas Company for 2 million tons annually, and China is reported to be busy pursuing other long-term contracts with Qatar and in a global market that is becoming increasingly tight as LNG consumers vie for what LNG might be floating about on the spot market.

Case in point: Japan, which until Chinese demand soared, was the world's largest LNG importer, said in late November that long-term contracted LNG is "sold out" until 2026, a situation that if true sets the scene for fierce competition in the spot market among LNG importers not only for this winter but probably the next and possibly the one after that. For its part, Japan is reported to have successfully lined up sufficient supply for this winter, and taken special measures to provide financing if Japanese companies are forced to turn to the spot market, where prices have become exorbitant.

The thing about long-term contracts is that a buyer can count on a steady supply at an expected price, while suppliers know that their product is already sold.

Saad Sherida Al-Kaabi, who is Qatar's Minister of State for Energy Affairs and the President and CEO of Qatar Energy said the SPA will "further solidify the excellent bilateral relations" between China and Qatar and "help meet China's growing energy needs".

Qatar has been the world's largest exporter of LNG, despite being challenged for that position first by Australia and now from the US. China, meanwhile, has claimed to be the largest importer of LNG during 2021 and will overtake Japan in imports this year or next, but the country's battle with Covid-19 has had a drastic impact on energy demand and continues to do so. However, energy demand is expected to continue to grow once China manages to get the virus under control.

Al-Kaabi mentioned that the SPA with Sinopec was the first committing gas/LNG from the NFE expansion project, which began in 2020 with the intention to expand Qatar's LNG production from 77 million tons/year to 110 million tons/year by 2026. The North Field South (NFS) expansion project will boost Qatar's production capacity to 126 million tons/year by 2027.

Qatar Energy has signed partnership agreements with eight international oil companies for the two projects that include the involvement of Exxon-Mobil, Shell, TotalEnergies, Eni and ConocoPhillips.

Qatar Energy has also lined up construction contracts and long-term charters agreements for 60 LNG carriers to support the NFE and NFS projects. The number of tankers linked to the projects is expected to reach around 100 over time.

Qatar has had talks with potential European customers, but no long-

term deals have been reached, as the Europeans have not abandoned their plans to move resolutely towards renewable energy systems even though for now, they themselves are lining up LNG deliveries.

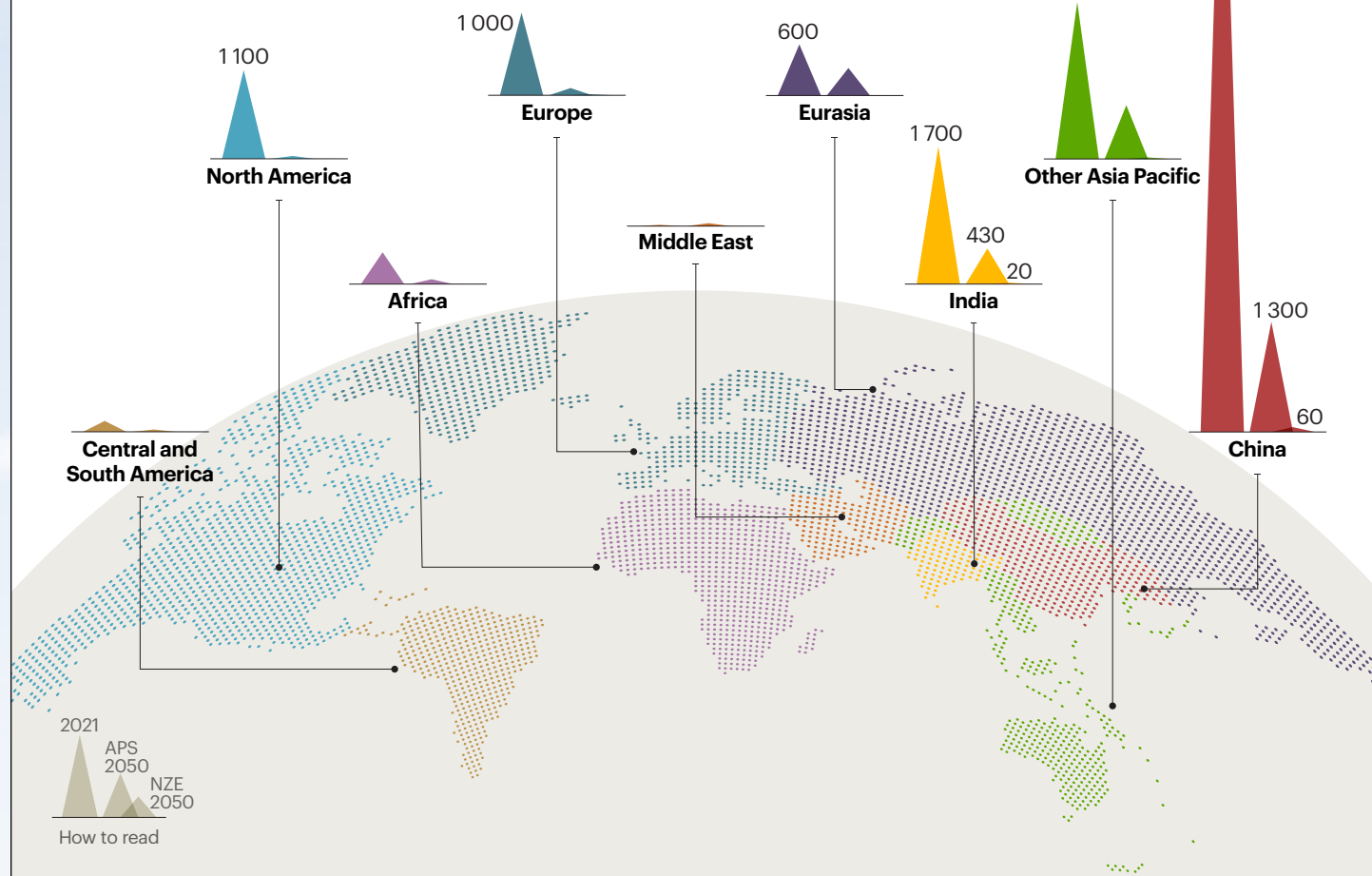
American LNG companies are expanding production capacity and currently shipping large volumes to Europe, which has had to a scramble for gas supplies since western sanctions against Russia for invading Ukraine have led to Russia cutting off pipeline supplies to Europe.

The Ukraine war calls much speculation into play when considering the gas market. The war's outcome will likely determine Russia's future role as a gas supplier and whether western economies will ever revert to Russia for energy supplies or push ahead with their renewable targets. Asian buyers would now like to see more Russian LNG available, but will Moscow hold onto its status as new LNG projects come on-stream later this decade?

Coal in net zero transitions

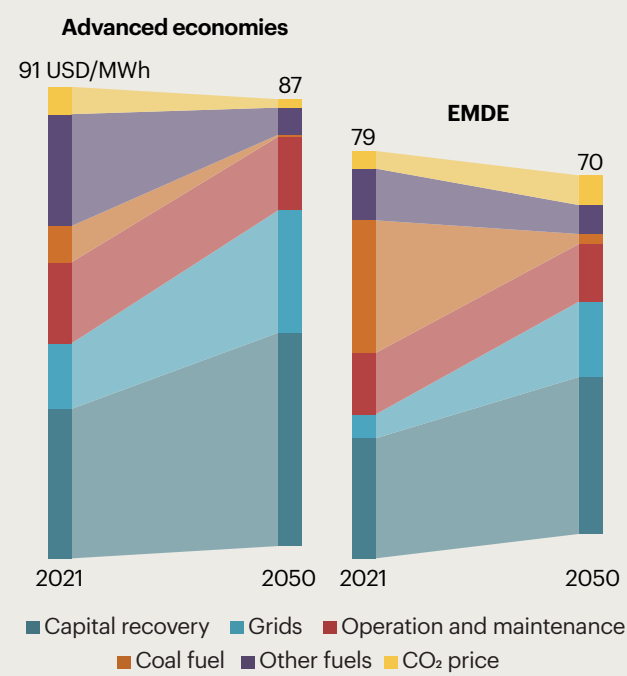
Coal emissions by region in 2021 and 2050

Coal emissions are highly concentrated in emerging market and developing economies (EMDE), but need to fall substantially by 2050 to meet climate goals.

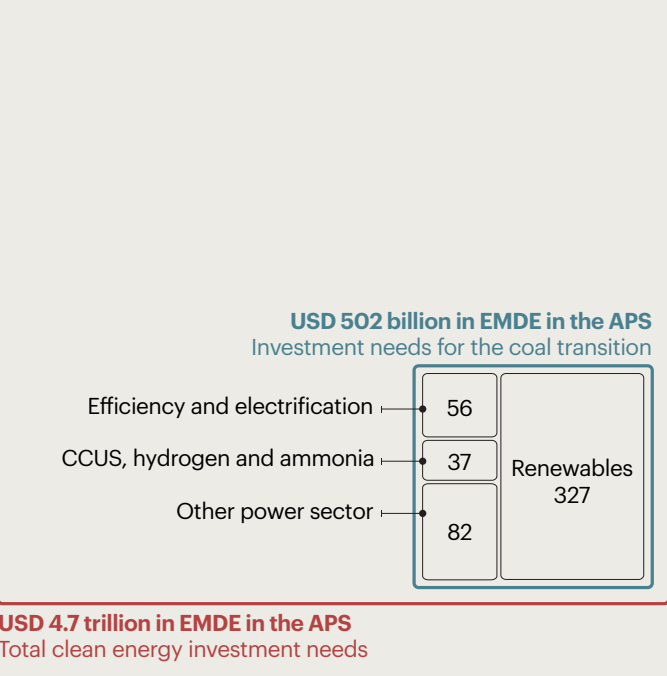


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The coal transition does not raise electricity supply costs



How much does the coal transition cost to 2030?



Notes: EMDE = emerging market and developing economies. APS = Announced Pledges Scenario

Cementing the case for waste heat recovery

Decarbonising the hard-to-abate industrial sector is crucial in the fight against climate change. Luckily, there are many different use cases for turning unused heat into clean, affordable and reliable electricity – modules can be installed wherever waste heat is generated. Orcan Energy's **Dr Andreas Sichert** says waste heat recovery modules offer a key solution to achieving climate neutrality, while saving on energy costs.

Growing population, increasing urbanisation and industrialisation are three factors driving growth in the construction and cement industries. Forecasts expect the cement industry to grow at a compound annual growth rate of 3.4 per cent until 2030.

Cement plants are the backbone of economic activity and prosperity and an integral part of our everyday lives – it is the second-most consumed product worldwide after potable water. While a crucial part of our lives, its environmental impact has become an even bigger issue. The cement industry alone is responsible for about a quarter of all industries' CO₂ emissions, according to McKinsey.

With governments and industries aiming to reach full carbon neutrality, the cement industry needs to adapt and reinvent itself. To keep on track with a net zero emissions by 2050 scenario, cement production needs to decline by 3 per cent annually until 2030. Some players have started to act, but overall, the industry is nowhere near achieving this target. CO₂ intensity derived from cement production has increased by about 1.5 per cent annually between 2015 and 2021, according to an International Energy Agency (IEA) report.

In addition, governments are increasingly requiring environmental impact assessments prior to committing funding for projects. And ESG

investments are booming: they are expected to account for a third of global Assets Under Management by 2025, exceeding \$53 billion, says Bloomberg Intelligence. This means that funding is more likely to go to companies able to demonstrate tangible sustainability credits.

Currently, the silver-bullet roadmap towards cement decarbonisation does not exist and the eventual route remains uncertain. Cement players need to identify a clear roadmap toward decarbonisation by assessing digital and technological advancements to invest in and rethinking their products, portfolios and construction methodologies. Strategising and investing now will provide forward-thinking players with an opportunity to become the industry front-runners.

Key strategies to drastically reduce carbon emissions in cement production involve improving energy efficiency, switching to low-carbon fuels, promoting material efficiency, and advancing innovative zero-emissions production routes. While the latter two will impact direct emissions reduction most, according to the IEA, they require deploying technologies that are not yet available. Even if they eventually manage to be deployed at scale, building low-emission cement production capacity with carbon capture utilisation and storage (CCUS) equipment poses the risk of making the average metric tonne of cement about 45 per cent more expensive by 2050.

Electrical efficiency can be improved by changing preheater designs on the kilns and by improving grinding. In addition, unused and restored lands near cement sites can be used for renewable energy generation. However, the challenges that come with betting on renewable energy sources are two-fold. First, renewable energy is fluctuant, and cement plants need constant reliable electricity production. Secondly, they require a vast amount of land. Few plants have the ability to produce their own renewable energy on-site.

While a transition towards a grid powered by renewable energy is inevitable, another solution can be implemented by cement players today: waste heat recovery (WHR). By integrating WHR facilities in plants, manufacturers can increase electrical efficiency and alleviate emissions.

Waste heat is the largest unused energy resource in the world. WHR has been commercially deployed in many sectors – such as marine, steel, geothermal, power generation and also cement – but remains an untapped resource for many players. Tapping currently wasted energy could, for example, satisfy the bulk of UK households' electricity demand (109 000 GWh in 2021).

Given the gigantic waste heat potential in the cement industry worldwide, corresponding waste heat solutions could generate a total of 82 000 GWh of electricity worldwide. At the same time, WHR in the cement industry could save 36 million tons of CO₂ – a double advantage.

Cement players can choose between two routes to integrate WHR facilities in their plants. They can: a) opt for large tailor-made WHR plants dependent on high temperatures, integrated heat sources and high conversion efficiency; or b) go for a more modular approach that allows them to tap into individual low, medium or high-temperature sources flexibly. The first option comes with a lower conversion efficiency and requires an unchanged heat source over many years, while the second allows flexible modification of the plant. These novel modular WHR solutions fulfil all the required criteria for a successful and prosperous cement industry: flexible, fast, low capex, and impactful. In short: a no-regret option.

Just like there is no silver bullet solution to decarbonising the cement industry, opting for modular WHR solutions over large ones will depend on what producers value. The most common approach to WHR is through expensive steam turbines that are complex to plan, require a manned operation, and prevent any flexibility in operation. Even the classic organic rankine cycle (ORC) plant gives only little operational flexibility, plus requires long delivery time and complex planning. To exploit the higher power output of these rather sophisticated installations, a stable plant operation without setup changes such as CCUS integration is required.

We believe that most cement players urgently need autonomous, flexible and easy-to-use solutions. Orcan Energy's modular approach with plug-and-play solutions is tailored to answer those individual needs. The technology is highly flexible regarding the waste heat source: the modules can be installed wherever waste heat is generated, for example in engines or in industrial processes. The novel ORC modules are smaller than conventional solutions and allow re-installation in different places. In times of uncertainty and rapid changes, this solution allows great flexibility.

From a technical point of view, the novel ORC modules work similarly to a steam power plant: organic liquids are evaporated at a lower temperature than water. In this way, waste heat can be used even at comparatively low temperatures starting at under 100°C. The modules allow clean electricity to be generated from waste heat at a very low price. The

electricity can be fed into the grid or consumed immediately, improving energy reliability and flexibility.

The benefits of these plug-and-play modules have already been demonstrated at several sites. Pioneered by the Miebach family and its cement company Wittenkind, cement giant Cemex also decided to take this no-regret step. Orcan Energy supplied Cemex, which runs Germany's largest cement plant, with six modules. While producing 2 million tons of cement on-site yearly, the modules generate savings on the existing cooler and convert previously unused waste heat from production into a total of up to 8150 MWh of electricity per year. At the same time, they reduce the plant's CO₂ emissions by around 3500 tons annually. This example shows WHR solutions can have a real impact.

Waste heat recovery is not limited to the cement industry; it can also produce clean electricity wherever waste heat is generated. Having made headway into the decarbonisation of the cement industry Orcan Energy's is also focusing on the oil and gas sector. Being responsible for 42 per cent of all global emissions, directly and indirectly (according to McKinsey), decarbonising this industry is incredibly important. Fortunately, the industry has great potential for heat-to-power solutions. Just this year, Orcan Energy implemented its novel geothermal solution in the US, paving the way for more projects utilising waste heat around the globe.

There is a wide range of use cases for heat-to-power in oil and gas: upstream, midstream and downstream. Upstream, energy conversion technology can leverage further geothermal and waste heat potential of existing oil and gas sites. The heat-to-power modules can, for instance, be installed at generators or compressors in the field or tap geothermal potential of existing wells. Midstream, we can utilise waste heat at gas-compressor stations. And downstream, we tap another huge energy potential as there is an "invisible wind park" hiding under every refinery.

Decarbonising industries like cement and oil and gas is a task requiring fast and urgent action. It can only be achieved with solutions that can deliver benefits now without blocking any future investments. With a simple solution, businesses and entire industries can lower their energy costs significantly, relying on stable prices in unstable times. Waste heat recovery makes a real impact on global emissions – now and even more so in the future.

Dr Andreas Sichert is co-founder and CEO of Orcan Energy AG.

Dr. Sichert: Waste heat recovery in the cement industry could save 36 million tons of CO₂



China and India: the net zero game changers

The importance of China and India to the world's net zero emissions ambition cannot be understated, as was evident at two major global diplomatic events held in mid-November. The size of their populations, rising share of global GDP, energy markets, and emissions, mean their action on climate change has a significance that reaches far beyond their borders. **Joseph Jacobelli** explains.

In light of Russia's invasion of Ukraine and the resulting European and global energy crisis, it was no surprise that energy and the transition toward a global green and sustainable future featured prominently at both the UN COP27 climate change conference and the G20 Leaders Summit.

China and India featured in a major way at both summits. With their huge population, rising share of global GDP and carbon emissions, what these countries do in terms of climate action has a huge impact on the rest of the world. Importantly, each of the giant nations renewed their pledges to achieve net zero emissions (NZE). Yet the two countries have adopted dissimilar paths and are transforming their respective energy systems at different speeds. Although China is ahead of India, India does have the capacity and resources to accelerate the transition over the next few years.

Both China's President Xi Jinping and India's Prime Minister Narendra Modi attended the G20 in Bali, Indonesia. Notably, the meeting put China and the US back on climate action talking terms and placed China back in the spotlight as a key (or "the" key) climate action participant. Also, there seemingly is a prospect that India may accelerate its decarbonisation path with Prime Minister Modi saying that "India is committed" to clean energy and environment and stressing

that half of its electricity will be generated from renewable sources by 2030.

Meanwhile, at COP27 in Sharm El-Sheikh, Egypt, hopes on climate action were high but realistic expectations were low – only senior representatives from the two countries were present.

China and India's differing paths in terms of the level and speed of their energy transition can be explained by several factors. One reason is the level of development of their power systems. Another is their reliance on thermal coal. The two have similar population sizes but China has a larger GDP, almost six times greater. The nation accelerated its electric power capacity expansion in the past three decades or so. It now consumes about five times as much as India. Yet, both continue to be highly reliant on fossil fuel generation.

The brown to green ratio in China is 66:34 and that of India is 78:22. China's coal power has a share of 63 per cent of total output, versus 74 per cent for India. China's coal power share has most certainly peaked and will be declining from the current level as it continues to massively expand its conventional renewable energy sources, namely solar energy as well as onshore and offshore wind power. This will confirm its status as today's global clean energy leader in terms of output and equipment manufacturing

capacity. The share of coal power in India, however, is likely to still rise for some time unless major curbs are urgently adopted.

The two nations officially have NZE objectives that lag behind many of their peers. China's NZE goal is "by/before" 2060 based on current policies. However, it is most likely to reach its objective well before 2060. Probably in the early 2050s. India is targeting 2070 though there is scope for an earlier date.

Some of the global narrative is that China's decarbonisation plans are weak or unclear. This may not be completely accurate. The nation aims at creating new decarbonisation parameters or "base" for the whole economy by 2025. It will introduce, for example, more green guidelines for key industries, including improving their energy efficiency. Energy consumption per unit of GDP in 2025 will fall 13.5 per cent versus 2020. This includes cutting CO₂ emissions per unit of GDP 18 per cent. It will also raise the share of non-fossil energy consumption to 20 per cent by 2025 and to 25 per cent by 2030, with wind and power installed capacity reaching 1200 GW.

Its ambitions could be somewhat thwarted in the short term by its net zero Covid policies and slower economic growth. However, capacity additions and policy trends remain positive. In the first nine months through September 2022, electric power sector generation capacity rose 25.1 per cent to Yuan392.6 billion (about \$55 billion). Almost 87 per cent of the total expenditure was towards non-fossil fuel generation according to the China Electric Power Council. Policy-wise, the central government's strong climate action motivation witnessed in the 2010s do not seem to have changed. As President Xi entered his third term in power, he actually reiterated the nation's green and low-carbon development goals, including peak CO₂ emissions within the next five years.

Unlike China, India's decarbonisation plans have indeed been weak and lack some clarity. While climate action policy and related regulations are slowly but surely improving, such as the recent release of its decarbonisation strategy, policy and regulatory execution have been inconsistent. Arguably, the country is at a different stage of development versus China. This is both a challenge and an opportunity. It must increase a gigantic amount of installed capacity in the

coming decades – five times the amount to reach China's level today. But if it adds more clean energy than fossil fuel baseload plants, it can easily beat its 2070 NZE aim. And maybe even bring the date forward.

India issued its Long-Term Low Emission Development Strategy (LT-LEDS) in mid-November – the last of the five largest economies in the world to do so. Its environment minister proudly told *Reuters* that the release of the strategy was "an important milestone", and that "once again India has demonstrated that it walks the talk on climate change". The initiatives the strategy highlights are not vastly different from those China is implementing. India wants to add clean energy generation, upgrade technologies (including those for carbon capture, use and storage or CCUS), push for a domestically driven electric vehicles sector and cut household energy consumption. The major variation from China is that it still wants to add a significant amount of fossil fuel-based generation.

Over the next few decades China and India will continue to be the key players in global decarbonisation, the main forwards to use a soccer analogy.

China will continue to lead in terms of clean energy output, adding clean technologies such as energy storage, and further develop electric systems-related digital technologies and solutions to optimise the clean energy sources. It will continue to drive clean energy asset investments and research and development as it has done for the past decade or so.

India has enormous scope to upsize its decarbonisation strategy. It also has the capability and the capacity to follow China's path. It does need, however, to greatly expand climate finance resources.

Importantly, collaboration and co-operation between China and India on decarbonisation would be hugely beneficial to both, and the world, given their bulk manufacturing and technological capacity and know-how. Unfortunately, they must first be able to break through their existing political or diplomatic barriers.

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China and India 2021 power generation by fuel (TWh).

Source: Author using data from the 'bp Statistical Review of World Energy June 2022'

	Oil	Natural Gas	Coal	Nuclear	Hydro	Renewables	Other	Total
China	12.2	272.6	5,339.1	407.5	1,300.0	1,152.5	50.2	8,534.3
	0.1%	3.2%	62.6%	4.8%	15.2%	13.5%	0.6%	100.0%
India	2.3	64.2	1,271.1	43.9	160.3	171.9	1.1	1,714.8
	0.1%	3.7%	74.1%	2.6%	9.3%	10.0%	0.1%	100.0%

CHINA VS INDIA

- Output 8,534 TWh vs 1,715 TWh
- Coal power 63% of total vs 74%
- Fossil fuels 66% of total vs 78%
- Clean energy 34% vs 22%
- Clean energy ex-nuclear power 29% vs 19%

Evolving energy storage for time-shifting

As the energy crisis rumbles on, electricity is set to become a precious commodity. Operators need to find ways to reduce their dependence on traditional sources of energy such as natural gas and fossil fuels. Saft's **Michael Lippert** explains how battery energy storage systems can help them to achieve this by avoiding curtailments of wind and solar farms to maximise the integration of renewables.

Looking back 10 years, there was no need to use a battery system for time-shifting. The relatively small scale of solar and wind farms meant that their energy could generally be absorbed by the grid. Meanwhile, the relatively high cost of battery capacity per kilowatt-hour meant that energy storage was not economically viable for arbitrage. This is where energy is stored at times of peak production when its price is low and sold several hours later when demand and price have picked up.

However, we now need this level of storage – and energy storage systems (ESS) can provide it. Today's market is evolving. Whereas energy storage used to be dominated by high-power applications such as frequency regulation or wind/solar smoothing, it is now feasible to use batteries in more energy-oriented, longer-duration applications that enable operators to integrate more renewable energy onto the grid.

In practical terms, this uses ESS in "energy-shifting", which is also known as time-shifting. Although renewable energy sources such as solar and wind power cannot be turned on or off, they can be curtailed. A wind turbine might produce a high volume of energy, but if congestion on the grid means that it

is not able to handle all this power at once, the grid operator will not accept it.

Therefore, energy storage has the role of absorbing renewable energy when it exceeds either the demand or the grid's transmission capacity. And as we are currently seeing a steady growth of renewable power capacity, we are also seeing a growth in curtailment. Not only is this energy lost to the operator of the wind or solar farm, it is also lost to the community. In addition, when demand is high, alternative sources must be used as a substitute at relatively high economic and environmental costs.

Another important consideration is the flexibility and capacity that are essential for power grids. Flexibility enables operators to overcome variability in supply and demand. This is becoming more important with the growing penetration of renewable sources that are variable and non-dispatchable.

Secondly, investing in grid capacity enables them to cope with peak demand and guarantee security of supply, even in extreme cases. For example, they need capacity to meet high demand on the coldest winter evenings or to overcome a sudden outage of a major generation plant. Having sufficient capacity tends to overcome the lower predictability of renewable generators.

Typically, fast-reacting generation plants, such as simple cycle or combined cycle gas turbines (CCGT), are used to provide both flexibility and capacity reserves. However, the drive towards net zero by 2050 and the energy crisis have shown that we need alternatives.

Batteries have the capability to capture precious zero-carbon electricity that could otherwise be lost to curtailment, and to provide flexibility and capacity resources that have until now relied on fossil fuel-powered generators.

Today's battery energy storage is increasingly competitive and can deliver peak power at a similar cost to gas peaking generation plant. We have already seen US operators award tenders to energy storage rather than gas peaking. It is a venture that is becoming more profitable in Europe in light of current prices on the energy market.

The question asked by investors is whether the situation will last and whether electricity prices will still be as expensive in the next five years. It is likely that energy and other resources will continue to be

scarce. As a result, policymakers and industry leaders will view electricity as a valuable commodity and its storage will provide a commercial advantage.

Looking at the economic side of energy storage itself, the overall cost of lithium-ion (Li-ion) battery systems has significantly reduced over the past decade. However, recent increases in raw material costs have caused a 15 per cent price increase over the last year. The good news is that the underlying reason for this is a short-term reduction in capacity for processing battery materials. Therefore, the outlook is for continuation of the long-term reduction in ESS costs driven by a well-known learning curve of cost reduction as a function of cumulated volume produced.

As with any other area of technology, there have been technological advances in ESS and particularly in digitalisation, energy density and scale.

Digitalisation provides enhanced management and control of ESS in real-time. This improves availability, reduces downtime and cuts maintenance requirements. Operators can manage ESS more efficiently with modern digital platforms by automating key functions. In addition, an interface with the cloud provides remote monitoring of key performance indicators (KPIs) and control over the battery's operating parameters.

In practice, this enables the operator to measure the ESS provider against contractual performance targets. A contract might specify a minimum available energy storage capacity of X megawatt-hours (MWh) with availability of 98 per cent or more. A digital platform like Saft's I-Sight will monitor performance of the system in real-time. If performance drops below 98 per cent availability or below X MWh, the platform will alert the operator, as well as Saft. As a result, they can take corrective action immediately.

Digital monitoring and control also pre-empt major issues before they can develop. Before the advent of such systems, operators were not able to access real-time performance data. Therefore, they could not easily observe performance trends and might not be able to spot issues early to take remedial action.

Moreover, as the cost per kWh has dropped, the overall size of systems has grown. A 5 MW system was considered big only a few years ago, but today we are starting to see

gigawatt-scale systems.

This creates a challenge for the physical size of systems. It is conceivable that we will see the development of ESS of 50, 60 or even 100 MW. This will require greater energy density. Packing more storage capacity into the same space will require less civil engineering, less cabling and less installation time.

Anticipating this, Saft has increased the energy capacity per container from 2.3 MWh to 2.9 MWh by improving the system design and using higher-capacity modules. Other aspects of system design also help to control system costs. For example, factory installation of heating, ventilation and air conditioning (HVAC) and safety features ensure that containers arrive on site ready to plug and play.

Large-scale ESS also requires more sophisticated controllers. It is important for an electrical power conversion system (PCS) to oversee multiple containers as a single entity but this is complex. Without adequate control in place, the system might experience a drift between the real and perceived state-of-charge (SOC). This may affect system capacity and performance – and to overcome it, it's important to use a system that can handle real-time data from many battery strings in multiple containers. This enables systems to scale up to hundreds of megawatts.

Another factor that influences energy density is the safety gap between containers. This can be minimised with good mechanical design and choice of electrochemistry.

In the US, more than 30 per cent of solar farms have an ESS under a solar-plus storage model, which has been driven by tax incentives. The new Inflation Reduction Act (IRA) is likely to increase the trend for ESS and for time-shifting.

In contrast, the European ESS market has traditionally focused on grid services, such as primary and secondary frequency regulation, with storage durations of up to an hour.

This is creating an opportunity in Europe. As there is greater penetration of renewables on the grid, it's likely that we will see deployment of large-scale ESS to give operators the ability to time-shift renewable energy for consumption during peak time. This will make the most of precious energy as we continue to adapt to the energy transition.

Lippert: "It's likely that we will see deployment of large-scale ESS to give operators the ability to time-shift renewable energy for consumption during peak time"





Junior Isles

A game of two halves

The recently concluded COP27 climate change meeting in Egypt really was a mixed bag. While there were some significant agreements, overall the final outcome left much to be desired. In some ways, you could say it was a game of two halves.

For much of the two-week summit held in Sharm El-Sheik, there was little to write home about. COP27 was meant to be an “action” summit that implemented agreements made last year. Yet expectations that it would achieve anything new were low. That proved to be the case in terms of reaching an agreement on how to accelerate much-needed cuts in carbon emissions.

Tuvalu’s Finance Minister Seve Paeniu, said it was “regrettable” not to have an agreement about emissions peaking in 2025 to prevent a rise in temperatures beyond 1.5°C.

More than 80 countries had, reportedly, supported a proposal to phase-down the use of all fossil fuels but in the end there was no movement on the weakened Glasgow COP26 pledge to phase-down polluting coal power and phase-out inefficient fossil fuel subsidies. Moves to phase-down fossil fuel use were largely blocked by a group of countries with a vested interest in the production of oil and gas – the most vocal among them being Saudi Arabia.

COP26 President Alok Sharma said he was “incredibly disappointed” that countries were unable to go further. “Emissions peaking before 2025, as the science tells us is necessary. Not in this text,” he said. “Clear follow-through on the phase down of coal. Not in this text.”

Negotiations on coal use remained locked even as the International Energy Agency (IEA) released a special report on what it would take to cut

global coal emissions rapidly enough to meet international climate goals while supporting energy security and economic growth.

According to the report, if nothing is done, emissions from existing coal assets would, by themselves, tip the world over the 1.5°C limit. IEA Executive Director Dr. Fatih Birol said a major unresolved problem is how to deal with the “massive amount of existing coal assets” worldwide.

“Coal is both the single biggest source of CO₂ emissions from energy and the single biggest source of electricity generation worldwide, which highlights the harm it is doing to our climate and the huge challenge of replacing it rapidly while ensuring energy security,” Dr Birol said. “Our new report sets out the feasible options open to governments to overcome this critical challenge affordably and fairly.”

The report notes that moving more quickly to significantly reduce carbon dioxide emissions from coal would require “massive financing for clean energy alternatives to coal and to ensure secure, affordable and fair transitions, especially in emerging and developing economies”.

Replacing coal in electricity generation would cost \$6 trillion and “will not be easy”, as it will require a “rapid financial mobilisation” to close old plants and implement alternative energies, said the IEA. Much of that money will be needed to bring renewables (90 per cent) and nuclear (8 per cent) on line.

During COP27, a coalition of countries led by the US and Japan promised to deliver \$20 billion in public and private finance to help Indonesia shut coal power plants and bring forward its peak emissions date by seven years to 2030. The money, pledged under the Just Energy Transition Partnership

(JETP), was hailed by the IEA and others as one of the concrete successes of the summit and came off the back of a roadmap set out by the IEA last year that would enable Indonesia to achieve net zero by 2050.

“This JETP programme will help Indonesia, a country that relies heavily on coal, to move away from coal to a cleaner energy future in a just and secure way. It’s a real testament to international cooperation,” said Dr. Birol.

The Indonesian deal follows a similar \$8.5 billion package for South Africa, and arrangements with India and Vietnam have been mooted.

“Next year we hope we can work with India, and after with Brazil, to provide some insights to help them to reach their climate commitments,” said Dr. Birol.

The IEA stresses that the entire coal sector must shift to net zero emissions by 2050 in order to “give the world an even chance” of limiting global warming to the critical threshold of 1.5°C.

While COP27 kept in place the COP26 pledge to accelerate the phase-down of polluting coal power and invest in renewable energy, there was a sharp U-turn on the language around fossil fuels in an effort to reach a compromise between opposing camps.

On one side, the Arab group of nations and Russia resisted wording that emphasised the need for renewable power. Saudi Arabia pushed for the UN agreement to allow for carbon capture and storage technology, which would limit emissions and enable continued oil and gas production. At the other end of the field, a growing number of countries, including the US and Australia, said they would support a commitment to phase-down all fossil fuels.

The text now includes a reference to “low emission and renewable energy”. This could cover anything from wind and solar farms to nuclear reactors, and coal fired power stations fitted with carbon capture and storage. Notably, it is also seen by some as a significant loophole that could allow for the development of further gas resources, as gas produces less emissions than coal.

“The world will not thank us when they hear only excuses tomorrow,” said European Commission Executive Vice-President and EU green chief Frans Timmermans. “This is the make or break decade but what we have in front of us is not enough of a step forward.” And in fairness, such general disappointment is not misplaced.

As the summit drew to a close Brian O’Callaghan, Lead Researcher and Project Manager, Oxford Economic Recovery Project, said: “If COP were a football rivalry, it would be amongst the most lopsided; Fossil Fuel Interests: 27, Humankind: 0.”

“We are now at 27 years of COPs. There have been successes, but mostly, it’s been 27 years of obstructionism, delay, and greenwashing. The world is already moving faster than the COP processes – we need to double down on that trend.”

But despite the disappointments, the summit ended on what was seen as a “historic moment”.

Financial support for helping developing countries address climate issues and those affected by climate change has long been a contentious issue at these talks and was expected to be a central factor in the field of play. Money has long been available to cut carbon or help countries adapt to rising temperatures – but until now there was nothing for those who had lost everything.

“For someone who has seen his home disappear in the floods in Pakistan, a solar panel or a sea wall isn’t much use,” said Harjeet Singh from the Climate Action Network.

The devastating floods in Pakistan this summer, which killed about 1700 people with estimated damages of \$40 billion, set a powerful backdrop to the summit.

As the talks went into extra-time, countries agreed a new funding arrangement on “loss and damage” – a pooled fund that will see rich nations pay poorer countries for the damage and economic losses caused by climate change.

It is seen as the most important climate advance since the Paris Agreement at COP 2015.

Pakistan’s Climate Minister Sherry Rehman, who negotiated for the bloc of developing countries plus China, was very happy with the agreement. She told journalists: “I am confident we have turned a corner in how we work together to achieve climate goals.”

Minister Molwyn Joseph, Antigua and Barbuda Environment and chair of the Alliance of Small Island States, said the deal was a “win for the entire world” and “restored global faith in this critical process dedicated to ensuring no one is left behind”.

Certainly agreeing on such a fund restores faith in mankind’s capacity for empathy and essential justness. The deal has at least gone some way to levelling the scoreline but time is running out and there is still a long way to go.

Cartoon: jemsoar.com

