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Special Project Supplement

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In a move that will expand and accelerate the growth of its strategic bioenergy business, BP has agreed to acquire Archaea Energy Inc., in the US. The deal came just ahead of Q3 results, which were expected to show another quarter of extraordinary profits *Page 9*

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Growth in carbon emissions slows as power sector embraces renewables

Global carbon emissions are set to show minimal growth this year due to the ongoing deployment of renewables in the power sector, but more still needs to be done. **Junior Isles**

Global carbon dioxide (CO_2) emissions in 2022 are set to grow by only a fraction of last year's big increase due to a strong expansion of renewables in the power sector, according to several recent industry reports.

In a press note released just ahead of its 'World Energy Outlook 2022' publication, the International Energy Agency (IEA) said that despite concerns about the effects of the current energy crisis, global CO_2 emissions from fossil fuel combustion are expected to grow by just under 1 per cent this year, as a strong expansion of renewables and electric vehicles prevent a much sharper rise.

New IEA analysis of latest data from around the world shows that these CO_2 emissions are on course to increase by close to 300 million tonnes in 2022 to 33.8 billion tonnes – a far smaller rise than their jump of nearly 2 billion tonnes in 2021 caused by the economic recovery after the pandemic.

Even though the energy crisis sparked by Russia's invasion of Ukraine has propped up global coal demand in 2022 by making natural gas far more expensive, the relatively small increase in coal emissions has been considerably outweighed by the expansion of renewables, said the IEA. Notably, it says the European Union's CO_2 emissions are on course to decline this year despite an increase in coal emissions.

"The global energy crisis triggered by Russia's invasion of Ukraine has prompted a scramble by many countries to use other energy sources to replace the natural gas supplies that Russia has withheld from the market. The encouraging news is that solar and wind are filling much of the gap, with the uptick in coal appearing to be relatively small and temporary," said IEA Executive Director Fatih Birol. "This means that CO_2 emissions are growing far less quickly this year than some people feared – and that policy actions by governments are driving real structural changes in the energy economy."

Energy think-tank Ember found that renewables met all of the rise in global electricity demand in the first half of 2022, preventing any growth in coal and gas generation.

Global electricity demand was found to have grown by 389 TWh in the first half of 2022. Renewables – wind, solar and hydro – increased by 416 TWh, slightly exceeding the rise in electricity demand.

The rise in wind and solar generation met over three-quarters of the demand growth in the first half of 2022, while hydro met the remainder, preventing a

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COP27 Presidency urges developed world to implement commitments

Egypt's COP27 Presidency has spelled out the importance that the developed world keep its climate pledges to avoid a "crisis of trust" in the COP process whilst holding out hope for progress at COP27 in Sharm El Sheikh starting on November 7th.

Speaking to 60 ministers from around the world at the pre-COP27 meeting in Kinshasa, Democratic Republic of Congo, H.E. Sameh Shoukry, Egyptian Minister of Foreign Affairs and COP27 President-Designate, said: "We have not yet delivered on the $100 billion pledge, which in itself is more a symbol of trust and reassurance than a remedy to actual climate needs."

Commenting on the current levels of support to protect people's lives and livelihoods in the developing world he highlighted that "mitigation finance is receiving more attention than adaptation" and that "instruments of finance are still mostly non-concessional loans rather than concessional loans and grants which account for only six per cent of climate finance.

"We must find a way to address this challenge. Without appropriate and fair finance serving as a catalyst, we will all continue to struggle in delivering impactful climate action," he said.

Setting out his vision in a press webinar at the end of September, Shoukry said: "We must accelerate climate action on all fronts including mitigation, adaptation and finance in addition to adopting more ambitious mitigation measures to keep the 1.5°C within reach. There can be no room for delay in the fulfilment of climate pledges or backtracking on hard-earned gains in the global fight against climate change. We must work together for implementation."

The urgent need to act now was highlighted in the recently published UN Environment Programme (UNEP) 'Emissions Gap Report 2022'.

The report finds that, despite a decision by all countries at the 2021 climate summit in Glasgow, UK (COP26) to strengthen Nationally Determined Contributions (NDCs) and some updates from nations, progress has been "woefully inadequate". NDCs submitted this year take only 0.5 Gt of CO_2 equivalent, less than 1 per cent, off projected global emissions in 2030.

This lack of progress "leaves the world hurtling" towards a temperature rise far above the Paris Agreement goal of well below 2°C, preferably 1.5°C, it said.

Unconditional NDCs are estimated to give a 66 per cent chance of limiting global warming to about 2.6°C over the century. For conditional NDCs, those that are dependent on external support, this figure is reduced to 2.4°C. Current policies alone would lead to a 2.8°C hike, highlighting the temperature implications of the gap between promises and action.

"In the best-case scenario, full implementation of unconditional NDCs and additional net zero emissions commitments point to only a 1.8°C increase, so there is hope. However, this scenario is not currently credible based on the discrepancy between current emissions, short-term NDC targets and long-term net zero targets," the report stated.

To meet the Paris Agreement goals, UNEP says the world needs to reduce greenhouse gases by unprecedented levels over the next eight years.

Unconditional and conditional NDCs are estimated to reduce global emissions in 2030 by 5 and 10 per cent, respectively, compared with emissions based on policies currently in place. To get on a least-cost pathway to holding global warming to 1.5°C, emissions must fall by as much as 45 per cent over those envisaged under current policies by 2030. For the 2°C target, a 30 per cent cut is needed.

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possible 4 per cent increase in fossil generation and avoiding $40 billion in fuel costs and 230 Mt CO_2 in emissions.

Consequently, global CO_2 power sector emissions were unchanged in the first half of 2022 compared to the same period last year, despite the rise in electricity demand.

The report analysed electricity data from 75 countries representing 90 per cent of global electricity demand. It compares the first six months of 2022 to the same period in 2021 to show how the electricity transition has progressed.

But despite the halt in fossil generation in the first half of 2022, coal and gas generation increased in July and August. This leaves open the possibility that power sector CO_2 emissions in 2022 may yet rise, following last year's all-time high.

Wiatros-Motyka: unsure if fossil fuelled power has peaked

"We can't be sure if we've reached peak coal and gas in the power sector," said Malgorzata Wiatros-Motyka, senior analyst at Ember. "The first step to ending the grip of expensive and polluting fossil fuels is to build enough clean power to meet the world's growing appetite for electricity."

In its 'Energy Transition Outlook' published last month, DNV warned that while greening of electricity production remains the driving force of the transition, emissions are not on track to meet climate change targets. It forecasts that the planet is on course to warm by 2.2°C by 2100, stressing that global CO_2 emissions reduction of 8 per cent every year is needed to reach net zero by 2050.

Alongside the 'best estimate' forecast for the energy transition the Outlook this year also includes the Pathway to Net Zero, which is DNV's most feasible route to achieving net zero emissions by 2050 and limiting global warming to 1.5°C.

It says reaching net zero globally in 2050 will require certain regions and sectors to go to net zero much faster. OECD regions must be net zero by 2043 and net negative thereafter; with carbon capture and removal enabling negative emissions. China needs to reduce emissions to zero by 2050 rather than the current goal of 2060. Some sectors like electricity production will need to reach net zero before 2050, while other sectors like cement and aviation will still have remaining emissions.

"According to our Pathway to Net Zero, no new oil and gas will be needed after 2024 in high income countries and after 2028 in middle- and low-income countries. Investments in renewables and grid need to scale much faster; renewables investment needs to triple and grid investment must grow by more than 50 per cent over the next 10 years," stated the report.

Europe prepares for winter energy crunch

- Consumption to be cut 5 per cent, renewable generators taxed
- Germany agrees temporary generation measures, as others eye power barges

Junior Isles

Europe is preparing for what could be a difficult winter with preparations to secure energy supplies and curb high electricity prices exacerbated by Russia's invasion of Ukraine.

At the end of September EU member states agreed to: reduce electricity demand by 5 per cent during peak hours; establish a "solidarity" levy on fossil fuel intermediaries, such as oil companies; and redistribute to the most vulnerable the extraordinary profits of 'infra-marginal' technologies – i.e. those with the cheapest operating costs, including wind, solar and nuclear power plants – that sell electricity above €180/MWh.

The EU Commission also presented its proposal for an "autumn package" in the gas sector. The package is intended to include temporary measures against the high gas prices and for greater gas supply security. In early October the Commission told EU countries that they must make even deeper cuts to gas demand to get through winter at the same time as outlining several measures to slash the price of gas.

Germany's Federal Minister Robert Habeck commented: " With the emergency measures jointly decided by the Energy Council, we have agreed on good and effective instruments to curb the rise in electricity prices.

"To do this, we siphon off random profits from the electricity market and also put a solidarity tax on energy producers, such as companies in the oil, natural gas, coal and refinery sectors. It is only fair because some of companies earn a lot of money in the crisis and it is right to use this income for a solidarity contribution used for the common good."

He added: "It is, and will remain, just as important to save energy. We are in a serious situation and winter is yet to come. That is why the binding energy saving targets are necessary."

Habeck went on to explain: "Of course we also have to curb the high wholesale gas prices. We support the proposal of the European Commission and are committed to using our European strength wisely and lowering the gas price across Europe through joint purchasing strategies."

The EU agreement came as the European Commission approved a €450 million temporary German measure under EU State aid rules, to enable five lignite fired power stations to be on stand-by and ready to be activated in the event of gas shortages.

Germany also warned, however, that Russia's war in Ukraine must not lead to a "worldwide renaissance" for coal.

Germany also decreed that all three of the country's remaining nuclear power plants will continue operating till mid-April 2023, as the country battles to avert an energy crunch this winter.

Elsewhere, Switzerland said it is well prepared for the winter crunch thanks to its hydropower reserves, support for the electricity sector, a national energy-savings campaign and efforts by the government and gas sector to secure additional gas storage capacities abroad.

Meanwhile, Türkiye's Karpowership, one of the world's largest operators of floating power plants, said it is in talks with four European countries for the supply of floating power barges with a combined capacity of 2 GW.

The barges, which can generate electricity from liquefied natural gas (LNG) or liquid fuels, can be connected to a country's electricity grid in about 30 days. The most powerful of the barges is said to be 500 MW.

Global demand for low carbon hydrogen to surge

Global demand for low carbon hydrogen is expected to increase from less than 1 Mt to 200 Mt by 2050, according to global research and consultancy group Wood Mackenzie. The group also forecasts that capital costs for hydrogen production technologies will fall significantly in the next 5-10 years.

The EU's REPowerEU plan, which has set an ambitious low carbon hydrogen production target of 10 Mt, with an additional 10 Mt of imports by 2030, and the US with its Inflation Reduction Act (IRA), which introduces a production tax credit (PTC) for clean hydrogen, will support the industry's broader commitment to achieving net zero targets by 2030 and 2050 and drive growth of hydrogen production, the research said.

The findings came as the European Commission approved state aid worth €5.2 billion for a second wave of hydrogen-related 'Important Projects of Common European Interest (IPCEI)', helping to reduce dependence on natural gas and accelerate the hydrogen economy.

The IPCEI wave, called Hy2Use, supports projects in two main areas. First, it supports hydrogen-related infrastructure, namely large-scale electrolysers – totalling 3.5 GW for an annual output of 340 000 tons of hydrogen – and infrastructure for the production, storage, and transport of renewable and low-carbon hydrogen. Second, it supports innovative technologies for the integration of hydrogen into industrial processes, in sectors such as steel, cement and glass.

Hy2Use was prepared and notified by 13 European Member States: Austria, Belgium, Denmark, Finland, France, Greece, Italy, Netherlands, Poland, Portugal, Slovakia, Spain and Sweden. It also includes two Norwegian projects. These countries will provide up to €5.2 billion in public funding, which is expected to unlock an additional €7 billion in private investment, for the development of 35 schemes across Europe.

Hydrogen Europe said it "welcomed this decision and the fact it aligns" with the objectives of key EU policy initiatives such as the European Green Deal, the EU Hydrogen Strategy and the REPowerEU Plan.

It stated: "The large-scale roll-out of impactful hydrogen schemes will lay the path for future projects to be developed faster and at lower costs. Hydrogen Europe underlines the importance of IPCEIs in the roll-out of the hydrogen economy and encourages Member States to notify subsequent IPCEI waves under preparation as soon as possible."

A recent report by the International Energy Agency (IEA) said that momentum continues to build behind low-emissions hydrogen amid the global energy crisis, with electrolyser manufacturing expected to grow strongly and pilot projects proliferating in new applications such as steel and transport. It said, however, that these areas remain a small part of the overall hydrogen landscape, highlighting the need for greater policy support.

According to the IEA, the encouraging developments in hydrogen technologies that can support the clean energy transition include an expected six-fold increase by 2025 in global manufacturing capacity of electrolysers, which are needed to produce low-emissions hydrogen from renewable electricity.

Low-emissions hydrogen production worldwide in 2021 was less than 1 million tonnes – with practically all of it coming from plants using fossil fuels with carbon capture, utilisation and storage – according to the latest edition of the IEA's annual 'Global Hydrogen Review'.

Meanwhile, overall hydrogen demand worldwide reached 94 million tonnes in 2021, exceeding the previous annual high of 91 million tonnes reached in 2019. Almost all of the increase last year was met by hydrogen produced from fossil fuels without carbon capture. And while demand for new applications of hydrogen jumped by 60 per cent in 2021, the growth was from such a low base that it rose to just 40 000 tons, the report finds.

Nord Stream blasts redraw the global gas trading map

Several underwater blasts in late September that hit both stems of the Nord Stream gas pipeline linking Russia and Germany, emitting record levels of methane for the oil and gas sector, have redrawn the global gas trading map, according to climate data company Kayrros.

According to Kayrros, the damage inflicted on the pipeline may "durably redraw" the global gas trading map by structurally reducing Russia's gas export capacity to the west.

"One of the less commented upon effects of the Nord Stream blasts will be to make the recent European thirst for US LNG more permanent," said the company.

European imports of US LNG surged in early 2022, spurred by tight European gas balances and reduced Russian shipments, and have since remained elevated as Russia has steadily deepened its export cuts, culminating with the full Nord Stream closure since late August.

With Russia's gas export capacity to Europe having been badly hit, US gas exporters can expect Europe to remain "a US gas magnet" for a lot longer said Karryos.

Russia's continued curtailment of natural gas flows to Europe has pushed international prices to painful new highs, disrupted trade flows and led to acute fuel shortages in some emerging and developing economies, with the market tightness expected to continue well into 2023, according to the International Energy Agency's latest quarterly 'Gas Market Report'.

"Natural gas markets worldwide have been tightening since 2021, and global gas consumption is expected to decline by 0.8 per cent in 2022 as result of a record 10 per cent contraction in Europe and unchanged demand in the Asia Pacific region," said the report.

It added: "Global gas consumption is forecast to grow by only 0.4 per cent next year, but the outlook is subject to a high level of uncertainty, particularly in terms of Russia's future actions and the economic impacts of sustained high energy prices."

Canada's provinces release power plans

■ Nova Scotia plans offshore wind park of 5 GW by 2030 ■ Ontario acts to bolster falling margin

Janet Wood

The province of Nova Scotia is set to hold Canada's first offshore wind auction. Canada has been a focus for development in other parts of the marine energy sector (tidal and wave energy) over the past several years, but it previously had a moratorium on offshore wind. Now Newfoundland and Labrador are also both investigating the potential for marine energy with the federal government.

Nova Scotia recently decided to offer leases for 5 GW of offshore wind energy by 2030, starting in 2025.

"Setting this target sends a clear signal to the world that Nova Scotia is open for business and becoming an international leader in offshore wind and green hydrogen development," said Nova Scotia Premier Tim Houston. "We are taking every opportunity to develop our renewable energy market, not only to fight global climate change, but also to create green jobs here in Nova Scotia."

The province believes the offshore wind will be used to support green hydrogen production and it is working on a hydrogen delivery strategy. Recently Canada's Prime Minister Justin Trudeau and German Chancellor Olaf Scholz signed a Joint Declaration of Intent to establish the Canada-Germany Hydrogen Alliance, an agreement to enable Canada to export green hydrogen to Germany by 2025.

Offshore wind projects will be administered by Canada-Nova Scotia Offshore Petroleum Board, the current offshore petroleum regulator whose mandate will be expanded and name changed to the Canada-Nova Scotia Offshore Energy Board.

Canada has an offshore wind technical potential of 9321 GW, with 7282 GW in floating wind and 2039 GW from fixed wind.

Meanwhile, Ontario province has announced plans for at least 1.5 GW of energy storage as part of a larger procurement aimed at addressing the growing demand for energy. It is part of a plan to add 4 GW in total, with 2.5 GW of new electricity generation of which up to 1.5 GW will come from natural gas.

The capacity will be contracted through a competitive tender process run by the Independent Electricity System Operator (IESO). "Energy system reliability and affordability is essential so that Ontario mines can continue to competitively produce the critical minerals we need for battery manufacturing and other technologies that support the transition to a clean economy," said George Pirie, Minister of Mines.

The province has produced excess power for over a decade and supply is expected to meet demand until at least 2025. New capacity will be required from 2026.

Companies join to develop wind in Gulf of Mexico

Three companies have recently signed a Memorandum of Understanding (MoU) over the evaluation and development of offshore wind in the Gulf of Mexico.

Entergy Louisiana, Entergy New Orleans, and Diamond Offshore Wind have joined forces and the MoU provides a legal framework for them to work toward developing offshore wind demonstration projects in Louisiana state waters.

The partners will focus first on grid interconnection to determine the optimal size and locations of future developments.

The MoU follows the Louisiana Climate Action Plan, published earlier this year by Louisiana Governor John Bel Edwards. In order for the state to reach net zero greenhouse gas emissions by 2050 the Plan includes an offshore wind power generation goal of 5 GW by 2035. It also follows a Biden administration call for offshore wind sites, in response to which the Bureau of Ocean Energy Management sought input on two areas in the Gulf of Mexico.

"Louisiana has a tremendous opportunity to develop an offshore wind industry that services the entire country, and through this project, we hope to accelerate its development, create jobs, provide a renewable source of power to Louisiana customers, and help Louisiana meet its climate goals," said Chris Wissemann, Chief Executive of Diamond Offshore Wind.

US opens first west coast offshore wind auction

December will see the first offshore wind energy lease sale take place for areas offshore of the US west coast, off central and northern California, the US Bureau of Ocean Energy Management (BOEM) recently announced. Five lease areas totalling 373 268 acres will be made available. Estimates put their total potential at more than 4.5 GW.

The sale aims to support floating offshore wind. The US Department of the Interior has a deployment goal of 15 GW of floating offshore wind by 2035.

"I am proud of the teams at the Interior Department that are moving forward at the pace and scale required to help achieve the President's goals to make offshore wind energy, including floating offshore wind energy, a reality for the United States," said Interior Secretary Deb Haaland.

On the east coast BOEM has already held 10 competitive lease sales and issued 27 active leases. The sites are offshore of a large area stretching from Massachusetts to North Carolina. "Today's announcement represents years of close coordination and engagement with the state of California, Tribes, ocean users, local communities, and all interested parties, to move us closer towards achieving the administration's vision to fight climate change and realising California's clean energy future, while creating a domestic supply chain and good-paying union jobs," said BOEM Director Amanda Lefton.

Georgia set to tap new nuclear generation

Georgia Power recently announced that it has begun loading nuclear fuel into the Vogtle 3 nuclear unit near Waynesboro, Georgia. The load kicks-off a process that will see startup and commercial operation of the first new nuclear unit to be built in the US in more than three decades.

Southern Nuclear will operate the new unit on behalf of the co-owners, Georgia Power, Oglethorpe Power, MEAG Power and Dalton Utilities. Nuclear technicians and operators from Westinghouse and Southern Nuclear will transfer 157 fuel assemblies to the new reactor core.

Startup testing will demonstrate the integrated operation of the primary coolant system and steam supply system at design temperature and pressure with fuel inside the reactor. Operators will also bring the plant from cold shutdown to initial criticality, synchronise the unit to the electric grid and systematically raise power to 100 per cent. Vogtle Unit 3 is projected to enter service in the first quarter of 2023.

"The Vogtle 3 and 4 nuclear units represent a critical, long-term investment in our state's energy future, and the milestone of loading fuel for Unit 3 demonstrates the steady and evident progress at the nuclear expansion site," said Chris Womack, Chairman, President and Chief Executive of Georgia Power.

Brazil maintains investment in renewables

■ Solar PV installed at rate of 1 GW per month
■ Investors vie for wind/hydrogen options

Janet Wood

Brazil has awarded renewable power supply contracts to projects with a combined capacity of around 558 MW to be installed by 2027, the Power Trading Chamber (CCEE) has announced.

The contracts represent close to $570 million in future investments, and wind, solar, hydro energy from waste and biomass. The agreements are for 15 years for wind and solar and 20 years for other sources.

The solar contract will add 200 GW to the booming sector, which surpassed 20 GW of installed capacity in October and was being installed at a rate of 1GW per month in the last quarter, local solar association Absolar announced. Brazil's installed solar capacity has risen 44.4 per cent since the beginning of the year when it was at 13.8 GW. Overall, solar power represents 9.6 per cent of the country's total power mix. Absolar said that solar installations have brought in investments of $19.8 billion and created more than 600 000 local jobs since 2012.

Meanwhile Brazil's investment in hydrogen production continues to expand with two new major agreements.

AES Brasil Energia has signed a pre-contract with Pecém Industry and Port Complex to proceed with feasibility studies for a 2 GW green hydrogen production facility in Ceara state. The proposed facility will produce 800 kt of green ammonia per year

Neoenergia has signed a memorandum of understanding (MoU) with Prumo, the conglomerate responsible for the construction of the Port of Açu and it has added State of Rio Grande do Sul to Pernambuco, Ceará and Rio Grande do Norte in a suite of MoUs for the development of green hydrogen plants and offshore wind power generation.

Offshore of Porto do Açu has among the best wind conditions for offshore wind farms, with major global players interested in installing projects on its coast. In addition it has capacity to host major industrial energy users.

Neoenergia's Executive Director of Renewables, Laura Porto, said that the company "is focused on developing a portfolio of renewable wind and photovoltaic projects", in addition to team building and strategic alliances for the development of offshore wind generation and green hydrogen pilot projects.

Meanwhile Galp has said that it will invest $5 billion in Brazil over the next 10 to 15 years.

It claims a 5.4 GW pipeline of wind and solar projects, including in the 'solar belt' of nine states with the highest solar irradiation. "Galp's strength is the strength of its portfolio of assets, of which the crown jewel is Brazil. Our goal is to be increasingly present in renewables," said Andy Brown, Chief Executive Bloomberg.

Australia drives clean energy developments

■ First investments in 'Rewiring the Nation' plan ■ Up to $2.8 billion of energy investment from major US corporations

Syed Ali

The Australian government has signed several key agreements that will accelerate the development of its clean energy sector.

In mid-October the federal government announced the first investments of its Rewiring the Nation plan, which will drive renewable energy development in Victoria and Tasmania.

Australia's federal government and Victoria signed an agreement to jointly fund Victorian offshore wind projects, renewable energy zones (REZs) and the Victoria-New South Wales Interconnector (VNI West) KerangLink.

The agreement includes A$1.5 billion ($948 million) of concessional financing for REZ projects in the state, including offshore wind, a A$750 million concessional loan to support VNI West's completion by 2028 and plans to coordinate regulatory processes to aid the development of the offshore wind industry in Victoria. The VNI-West KerangLink is expected to unlock 4 GW of new power generation.

"Rewiring the Nation has always been about jobs in new energy industries, delivering cleaner, cheaper and more secure energy, and bringing down emissions – today it begins doing just that," said Labour Prime Minister Anthony Albanese.

The Albanese government said that key transmission projects stalled under the former federal government at a time when the country's electricity system is changing rapidly.

In addition, the Australian government, Victoria and Tasmania will equally fund a 20 per cent equity investment in the Marinus Link interconnector between Tasmania and Victoria.

Under a letter of intent between the federal government and Tasmania, the remaining 80 per cent of the project costs will be funded by a concessional loan from Rewiring the Nation, through the Clean Energy Finance Corporation.

The partnership also includes up to A$1 billion of low-cost debt for Tasmania's Battery of the Nation projects, as well as low-cost debt to link Cressy, Burnie, Sheffield, Staverton and Hampshire in Tasmania, known as the North West Transmission Developments (NWTD), to enable Tasmania and the mainland to take advantage of the wind energy resources in North-West Tasmania.

The news follows an announcement in September that Australia expects to receive up to $2.8 billion of clean energy infrastructure investment from major US corporations.

Australia's Climate Change and Energy Minister Chris Bowen signed a Letter of Intent with his US counterpart Special Climate Envoy John Kerry and a group of nine US conglomerates, seeking to support the clean energy transition. The pact makes Australia a member of the Clean Energy Demand Initiative (CEDI), a global platform that connects countries with corporations seeking to rapidly deploy clean energy to offset electricity demand in their sectors.

Australia's participation in the CEDI is seen to showcase the government's active engagement on regional energy security.

"Australia's policy actions – including large-scale generation credits, corporate power purchase agreements (PPAs), and renewable retail contracts – may serve as a model for other countries working to expand corporate procurement of renewable energy," the US Department of State said.

Australia has made some significant announcements in renewables development in recent weeks.

In early October the Australian Renewable Energy Agency (ARENA) said it is providing funding to support Alinta Energy Ltd in the early-stage development of a 1 GW offshore wind project that could power the Portland Aluminium Smelter.

Meanwhile the state of Queensland said it will be the host of a green energy hub that will produce green ammonia for export to South Korea.

The project is being proposed by the Han-Ho Hydrogen consortium, made up of Korea Zinc and its Australian unit Ark Energy, and Korean firms Hanwha Impact and SK Gas.

The project will focus on the development of Ark Energy's new Collinsville Green Energy Hub project located southwest of Bowen, Queensland which, once complete, will potentially be able to generate up to 3 GW of renewable electricity. By 2032, the hub is expected to export over 1 Mt of green ammonia, a byproduct of green hydrogen production, from Australia to South Korea each year.

Philippines urged to lift foreign equity limit in renewable energy sector

The Department of Energy (DOE) has said foreign ownership restrictions that hamper the flow of investments in the renewable energy sector may now be relaxed following a legal opinion provided by the Department of Justice (DOJ).

There is currently a 40 per cent equity limit for foreign investors, who have been asking the government to lift the foreign ownership limit in renewable energy projects to attract more investments into the sector. The DOE is now looking to amend this rule following the legal opinion.

"The good news is there is strong interest from foreign investors to enter and invest in renewable energy projects here in the Philippines, provided that we are able to increase the equity or ownership for foreigners," Energy Secretary, Raphael Lotilla said.

To further entice foreign investors, Lotilla said the government must ensure the availability of adequate transmission lines to bring the renewable energy from where it is plentiful to areas where it is needed.

"We are listening to the needs of the investors because we don't want renewable energy projects to be built and then, as what happened in Negros, they cannot be used at all. It is wasted because there are no transmission lines to transmit the power out of Negros Island," Lotilla said.

China's energy transition needs shifts in resources and technologies

To reach net zero emissions by 2060, a World Bank report estimates China needs between $14-17 trillion in additional investments for green infrastructure and technology in the power and transport sectors alone.

China's current decarbonisation plan would need to decouple economic growth and emissions at a faster pace and at a lower income level than in advanced economies, the bank warned, as it made the "significant investments in a massive green infrastructure and technology scale-up".

The International Finance Corporations's Regional Vice President for Asia and the Pacific, Ruth Horowitz, said: "Given the immense price tag, public investments won't be sufficient to meet these needs, so China needs policy and regulatory reforms to spur the private sector and fully tap the potential for investment and innovation."

China could also leverage some advantages, said the World Bank, such as its position at the forefront of advancing low carbon technologies.

The World Bank Group's 'Country Climate and Development Report' (CCDR) for China contains a comprehensive set of economy-wide and sector level policy recommendations, including for the energy, industry, building, agriculture, transport and other sectors.

These include accelerating the power sector transition by increasing solar and wind power generation capacity by 2030 to 1700 GW from the current target of 1200 GW, and enhancing the integration of renewables by investing in energy storage.

It also recommends expanding the current Emissions Trading System in the power sector to other high-carbon sectors such as steel, iron, and cement, and gradually transitioning to absolute emissions caps.

Malaysia sets out national energy policy

Malaysia has published its national energy policy (NEP) 2022-2040, setting out details of the government's priorities for the energy sector over the next 20 years.

The policy is aimed at streamlining various existing policies, creating a long-term vision coordinated across various stakeholders, and providing updated direction for the country's energy sector.

Speaking in its *Out-Law News* publication, climate change expert John Yeap of Pinsent Masons, commented: "With Malaysia's commitment to net zero emissions, the increasing focus on decarbonising the generation sector across southeast Asia is to be expected. Delivering on the ambitions of the plan will, however, require the support of both public and private sector stakeholders in enabling not just a just transition away from fossil intensive generation but also in championing regulatory progress on commercialising economically marginal technologies."

The NEP has a series of new targets to help Malaysia become low carbon by 2040. These include increasing the total installed capacity of renewable energy from 7.6 GW in 2018 to 18.4 GW in 2040 and the overall percentage of renewable energy in the total primary energy supply from 7.2 per cent to 17 per cent. The policy also targets reducing the percentage of coal in installed capacity from 31.4 per cent to 18.6 per cent.

By 2040, the NEP aims to reach an energy mix of 4 per cent bioenergy, 4 per cent solar, 9 per cent hydropower, 27 per cent oil products, 39 per cent natural gas and 17 per cent coal compared to 2018 numbers of 1 per cent bioenergy, 0 per cent solar, 6 per cent hydropower, 30 per cent oil products, 41 per cent natural gas and 22 per cent coal.

Natural gas looks set to remain an important part of the country's electricity mix with the recent announcement of plans for a new gas fired combined cycle power (CCGT) plant in Kapar, Selangor.

Last month state-owned electricity utility Tenaga Nasional Berhad (TNB), through its wholly owned subsidiary, TNB Power Generation Sdn (TPGSB) received a Letter of Intent (LoI) from the Ministry of Energy and Natural Resources for the new 2100 MW project, which would be developed on land located to the north of the existing Sultan Salahuddin Abdul Aziz power station.

The project is aligned with TNB's Net Zero Emissions Aspiration by 2050 which also forms part of TPGSB's initiative in supporting the government's Low Carbon Aspiration 2040 under the NEP.

Countries eye ammonia in decarbonisation drive

Singapore and Japan are both looking at the use of ammonia as a green fuel for power generation.

Keppel New Energy, a wholly-owned subsidiary of Keppel Infrastructure, recently said it will explore the use of 100 per cent ammonia as a fuel for gas fired generation alongside Mitsubishi Heavy Industries (MHI) and global independent energy expert, DNV.

Under the memorandum of understanding (MoU), Keppel New Energy will study the feasibility of an ammonia-fuelled power plant, whilst MHI will develop an ammonia-fired gas turbine that produces carbon-neutral power. DNV will bring its quality assurance and risk management expertise to the project.

Through the MoU, Keppel, MHI, and DNV aim to draw-up robust assessment guidelines to ensure the safety and sustainability of ammonia as a clean fuel, while maintaining high efficiency and low NOx emissions for use in a gas turbine system for power generation.

Meanwhile, Japanese utilities are exploring the case for retrofitting their existing coal power plants to enable co-firing ammonia to reduce CO_2 emissions. However, ammonia-coal co-firing is unlikely to be economically viable for Japan to reduce power sector emissions, according to a new report published by research firm BloombergNEF (BNEF).

BNEF estimates the levelised cost of electricity (LCOE) for a retrofitted coal power plant in Japan using a 50 per cent clean ammonia co-firing ratio would be at least $136/MWh in 2030 By 2050, the LCOE of a retrofitted plant running 100 per cent on clean ammonia is expected to be at least $168/MWh.

This is more expensive than the LCOE of renewable alternatives such as offshore wind, onshore wind or solar with co-located batteries.

BNEF says ammonia co-firing would therefore require a significant rise in Japan's carbon tax to be economically viable. Its analysis shows that at least $300 per ton of CO_2 would be needed to make the technology economically viable at a 20 per cent blend rate in 2030. By 2050, the carbon price needed to make 100 per cent ammonia-fuelled retrofitted coal plants economically viable could be reduced to around $159/t of CO_2. These values are far higher than Japan's current "tax for climate change mitigation", which is set at below $3/t of CO_2.

■ Mitsubishi Heavy Industries Ltd. has said it will develop a next-generation nuclear reactor with Kansai Electric Power Co. and three other major Japanese utilities in what could be the first project in the government's recent policy shift to push nuclear energy.

Offshore wind ambition continues to expand

■ Floating wind jumps from MW to GW scale ■ UK leads but there is concern over windfall tax

Janet Wood

Europe represents over half of the pipeline of floating wind farms, according to new figures from RenewableUK, and a third of European capacity under development is in UK waters. By the end of 2030, floating wind capacity could reach 31 GW in Europe and 41 GW globally, said the renewable energy trade association.

The lobby group's 'EnergyPulse Insights' report says nine projects have been fully commissioned, in seven countries, totalling 121 MW. But the pipeline is 1000 times larger: 96 MW is under construction and 288 MW is consented or in the pre-construction phase, but 31 GW is in planning or has a lease agreement and 153 GW is in early development.

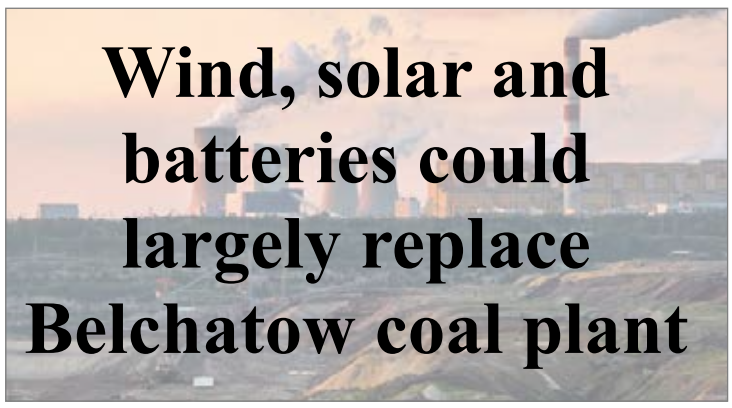
Of that total, 107 GW (58 per cent) of floating capacity is being developed in Europe and 33.3 GW is in the UK. The UK pipeline has increased from 29 projects to 51, which are being developed in the North Sea (Scottish and English waters), Celtic Sea and the North Atlantic Ocean, including 29 GW in Scottish waters.

RenewableUK Chief Executive Dan McGrail said: "The growth of floating offshore wind is surging ahead at a phenomenal rate year-on-year around the world… In the years ahead, as we build projects further out to sea where wind speeds are even stronger, floating wind will play a central role in proving cheap, clean electricity for British homes as well as boosting our energy security. It also offers a significant opportunity to build up a whole new industry in the UK."

Meanwhile the ambition on fixed offshore wind farms continues to rise. SSE Renewables and Equinor have said they are investigating a fourth phase at Dogger Bank, where three 1.2 GW phases are under construction. Dogger Bank D would add a further 1.2 GW.

However, the UK industry has expressed concern that renewable energy projects will see changes in their price support regimes, after they were suspected of profiting from record high electricity prices.

McGrail said a potential 100 per cent windfall tax on renewables would be more onerous than the 25 per cent tax on excess oil and gas profits, and risks skewing investment towards fossil fuels. He said: "This decade we need to attract £175 billion of investment in secure, domestic wind power and we can already see the investor turmoil that the EU's proposed price cap is causing in the European market… To limit the negative impacts, it is essential that a cap is set at a level that doesn't make the UK less attractive to investors than the EU, is technology neutral and has a clear sunset clause in place."



Wind, solar and batteries could largely replace Belchatow coal plant

Poland's Belchatow power station – at over 5 GW Europe's largest coal fired power plant – could be replaced with renewables and batteries or lower-carbon thermal capacity, according to a new report from BloombergNEF (BNEF).

Only five coal plants in the world are larger than the lignite ('brown coal') plant. But BNEF found that land in the region could house 11 GW of wind and solar, which would go 80 per cent of the way towards replacing Belchatow. Alternatively, 6 GW of wind and solar could be paired with a gas, biomass or waste-to-energy plant.

BNEF's analysis found that such a transition would lower overall power system costs in the Lodz region of Poland, where the power plant is located, while maintaining critical energy security.

The local lignite resources that fuel Belchatow are likely to run out latest by 2036, forcing the plant to shut, BNEF said, and a successful transition could serve as an example for coal regions around the world.

Michael R. Bloomberg, UN Secretary-General's Special Envoy on Climate Ambition and Solutions and founder of Bloomberg LP and Bloomberg Philanthropies, said: "This new report shows a promising path to replacing Europe's biggest coal fired power plant with alternative and resilient clean energy sources – and it can serve as an example for coal regions in Europe and globally that are looking to reap the health and economic benefits of clean energy."

Iberian Peninsula to expand links with neighbours

Spain and Portugal have ditched plans for a gas pipeline to France across the Pyrenees (the so-called MidCat pipeline) in favour of building a "green energy corridor" to transport hydrogen and renewable gases from the Iberian Peninsula to the rest of Europe.

The new proposal is for a maritime pipeline between Barcelona and Marseille (dubbed BarMar). A second gas pipe would link Portugal and Zamora, Spain.

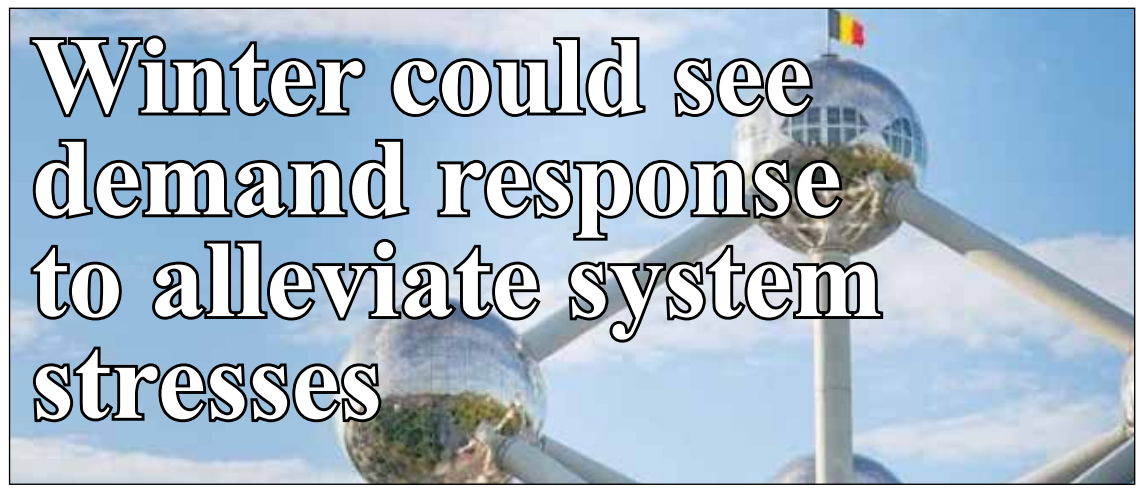
Both pipes would be intended to carry mainly hydrogen, but they would also be "technically adapted to transport other renewable gases, as well as a limited proportion of natural gas as a temporary and transitional source of energy", according to a joint statement released following a meeting between Spanish Prime Minister Pedro Sanchez, Portuguese Prime Minister Antonio Costa and French President Emmanuel Macron.

Macron said: "This is an important moment for European solidarity."

Sánchez hailed it as a project that would "unite the Iberian peninsula with France and therefore the European energy market", while Costa said the plan allowed the countries "to overcome a historic blockage".

Spain and France have also announced plans for a new power interconnection through the Bay of Biscay, while Spain and Germany have signed a commitment to improve interconnection between the Iberian Peninsula and the rest of Europe.

The countries warned of the "utmost importance" of having this infrastructure in place by 2025 to achieve a "robust" energy market, accelerate the energy transition and improve the autonomy of the EU-27.



Winter could see demand response to alleviate system stresses

■ First project to launch in Belgium
■ GB products aimed at households and fleet operators

Janet Wood

European homes and businesses will be helped to switch their usage away from peak times this winter, reducing costs and alleviating strain on the grid.

In Belgium, electricity supplier platform Kraken has been licensed by energy solutions provider Noven to control heat pumps, solar panels, EV chargers and smart meters to automatically reduce consumption and ensure customers avoid the costly peak charges.

This is the first test of such a programme in Belgium but it follows UK flexibility trials that saw over 100 000 consumers willingly reduce usage in return for savings.

Pieter-Jan Degroote, Project Manager at Noven, commented: "It's through boundary pushing technology projects like these that we will be able to reduce our reliance on dirty gas. It will not only allow Europe to move away from high wholesale energy prices, but it will also help promote greener energy solutions."

Kraken's flexibility division is currently contracted to control over 3800 MW across 10 000 green energy assets. The platform is targeting management of 25 000 devices and 6000 MW of energy capacity by 2023.

Meanwhile, two UK suppliers are offering payments to customers who shift load out of peak times. Octopus Energy has followed up a trial in partnership with system operator NGESO last year with a commercial product this winter, while Ovo Energy is recruiting limited numbers for a trial. A third scheme will reward companies who have electric vehicle fleets if they turn down charging during peak hours. The trial will run from November to March.

Gary Highton, Head of Energy Services at Fuuse, said: "By enabling our customers to turn down their EV charging during peak demand via the Fuuse platform, we can not only ensure businesses generate revenue from the scheme but facilitate their social responsibilities at a time of unprecedented crisis."

The new flexibility products are supported by NGESO, which warned in its regular 'Winter Outlook' of a low supply/demand margin. He raised the prospect of rolling power cuts at peak times if a cold winter and lack of gas coincides with low wind generation.

Jess Ralston, Senior Analyst at the UK's Energy and Climate Intelligence Unit (ECIU) said: "Bringing more market dynamics into the electricity system makes sense and will help to bring bills down not only for those households taking advantage and switching their energy use to off-peak times, but will reduce the need for the most expensive gas plants to come online in the first place, cutting the nation's overall electricity bill."

Revived nuclear interest finds opposition in Austria

The Austrian government has followed green groups with a legal challenge to the EU's plan to label nuclear power generation, as well as some gas-fired plant, as 'sustainable' in a so called 'taxonomy' of power generation. Austrian Environment Minister Leonore Gewessler called the EU Commission's decision, which would tend to direct investment towards those projects deemed sustainable, "greenwash".

Meanwhile, organisations in Finland, Poland, Sweden and the UK have all taken steps towards new nuclear. Canada's Laurentis Energy Partners signed a master services agreement with Poland's Synthos Green Energy to support the development and deployment of small modular reactors (SMRs) in Poland.

Finnish utility Fortum said it would investigate the use of SMRs and other nuclear units. A two-year assessment will "identify the commercial, technological and societal requirements" nuclear and "the assessment focuses on the Finnish and Swedish markets", as Sweden's new government announced plans to build new nuclear reactors.

The UK's Nuclear Decommissioning Authority has agreed to work with the Welsh government on a new nuclear power project at Trawsfynydd, where an existing nuclear station is being decommissioned.

Schwarzheide opens its heart to carbon neutrality

BASF has set its sights on making its Schwarzheide production site one of its first CO_2-neutral locations. The company recently modernised the power plant, replacing an existing gas turbine with a Siemens Energy SGT-800 and also installing a battery system for black-start capabilities. **Junior Isles** hears how carrying out the upgrade was somewhat akin to open-heart surgery.

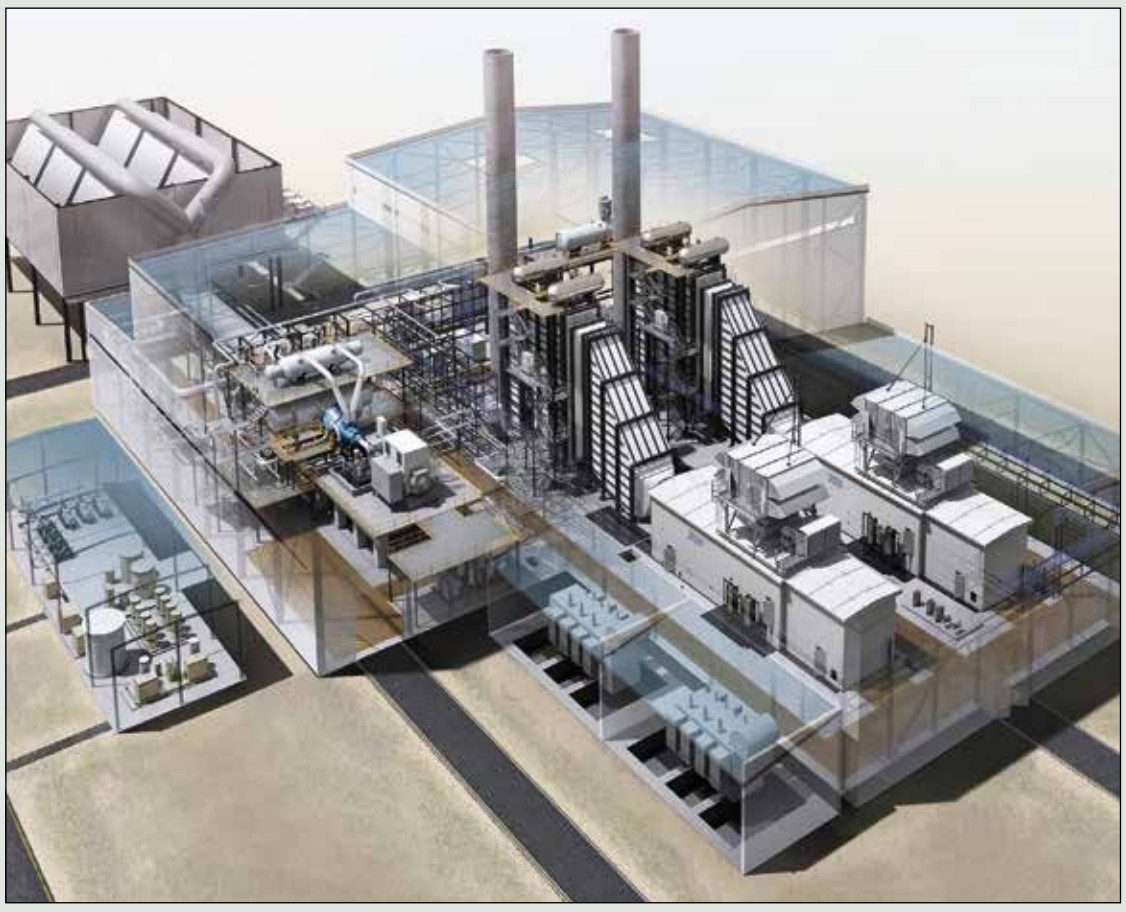
Fuchs: We want to become one of the first BASF CO_2-neutral production sites

As the world's largest chemical producer, BASF has long been taking measures to minimise the impact of its operations on the environment. It is no surprise then that the company has set itself ambitious climate goals, striving to achieve net zero CO_2 emissions by 2050.

In addition, the company wants to reduce its greenhouse gas emissions worldwide by 25 per cent by 2030 compared with 2018. Excluding the effects of the planned growth – which includes the construction of a large Verbund site (a chemical production site with highly interlinked product flows) in South China – this means cutting CO_2 emissions by around a half in the current business by the end of this decade.

In 2021, BASF Group's worldwide carbon emissions amounted to 20.2 million tonnes of CO_2 equivalent. In 1990, this figure was roughly twice as high. The new 2030 emissions goal represents a reduction of approximately 60 per cent compared to 1990 levels, and exceeds the European Union's target of a 55 per cent reduction.

In a move that is significant in achieving those targets, in 2019 the company engaged Siemens Energy to carry out a brownfield exchange project at the combined cycle plant powering its Schwarzheide facility in order to increase power output while cutting emissions.



Artist's cutaway of an SGT-800 plant with batteries

Commenting on the rationale behind the project, Jürgen Fuchs, Head of the Management Board of BASF Schwarzheide GmbH, said: "We must keep our site competitive in order to grow the business and attract investments. We've already achieved a lot here in the last few months and years.

"When it comes to sustainability, we always talk about the triad of the environment, economy and society. Going forward we can use the opportunities provided by the need to change as a driver for our site's growth. We will use eco-efficient technologies such as modernisation; integrate renewable energies and drive forward the circular economy. We want to do this to become one of the first BASF CO_2-neutral production sites."

As a growing location that is installing new production systems and technologies, BASF Schwarzheide will need a very flexible energy supply at the site in the coming years.

Julie DeKeyser, Head of Site Services and Infrastructure at BASF Schwarzheide, explained: "On the one hand, our steam consumption had decreased, but we knew that in the next two or three years we would have an increasing need for electricity. So we wanted to prepare for this by modernising the power plant."

But this would be no regular modernisation. With closing the plant temporarily not an option, Siemens Energy would have to work closely with BASF to carry out the exchange on the live power plant – keeping one power train in operation while carrying out extensive alterations to the other line. It would be sort of an "open heart surgery", as the teams called it.

"Working while the plant is in operation presents certain challenges. Any vibration during assembly might cause our gas turbine to stop mid-operation," said DeKeyser.

Commenting on the project's origins, Bernd Künstler, Key Account Manager at Siemens Energy said: "The contract for the project was signed in 2019. But we were engaged in initial talks in late 2017 when they said they would like to replace one of the turbines at the Schwarzheide plant. We figured out that it was a really difficult task, as it would require a lot of changes. It would have been a lot easier to replace the existing turbine with a successor engine from

that manufacturer but they were still very interested in replacing the turbine despite the huge effort that was needed."

Siemens Energy therefore began developing the project with BASF and found that despite the level of difficulty, the resulting higher output and greater efficiency still made the project worthwhile in terms of the business case. For a company like BASF, operational expenditure (Opex) over the plant's lifetime is as much of a consideration as capital cost.

"Opex was certainly one of the major selection criteria for choosing Siemens Energy turbine," noted Künstler.

The Schwarzheide combined cycle plant has a '2+2' configuration, meaning there are two power trains, each consisting of a gas turbine and steam turbine. The gas turbines were originally GE Frame 6Bs, while the steam turbines are Siemens Energy machines.

Although BASF considered other configurations for the modernisation, the decreasing steam consumption of the chemicals production facility was the main driver in how the modernised plant would be configured. BASF therefore decided the best option was to replace one of the gas turbines to increase power output, while lowering fuel consumption.

Künstler added: "They also worked on the boiler; wherein the exhaust boiler behind the gas turbine was modified along with the plant distributed control system. These tasks were carried out by BASF."

Due to key differences in design, the biggest undertaking in the project was the replacement of the existing gas turbine with a Siemens Energy SGT-800 industrial gas turbine.

The new turbine has a maximum power output of 57 MW, although BASF will operate the unit at 52 MW. This compares to 40 MW from the old machine. The SGT-800 has a gross efficiency of 40.1 per cent, which according to Künstler is currently the best-in-class in the 50-60 MW range. According to Siemens Energy, its design efficiency is up to 10 per cent higher than its nearest competitor.

The single-shaft engine is composed of a 2-bearing rotor with a 15-stage compressor and a 3-stage turbine. First- and second-stage blades and vanes are cooled, third-stage blades and vanes are uncooled, all three turbine disks are cooled. The turbine section is designed as a module to support high maintainability.

The SGT-800's 15-stage axial compressor has a pressure ratio of 21.8 and has five compressor extractions at stages 3, 5, 8, 10 and 15. The machine's compressor casing has a vertical-split plane to provide good access to the compressor components for inspection.

Notably, the engine is cold-end driven – unlike the previously existing turbine, which was hot-end driven – and due to certain conditions, BASF stipulated that the existing turbine generator had to remain intact. This meant substantial changes to the generator to accommodate the SGT-800, which consequently called for a new baseplate for the whole train.

"This wasn't part of Siemens Energy's work, noted Künstler. "But they had to dig out the old massive concrete baseplate, do a forming structure onsite for the new one and lift it in place with a big crane. Doing it this way saved them time, since it allowed other work to be done in parallel."

This was just one of several tricky changes that were needed. Künstler added: "With our machine being a cold-end drive, as opposed to hot-end, the generator had to be moved from one end of the drive train to the other. This resulted in a change in direction of rotation of the generator rotor.

"Another change that was needed, was that the exhaust pipe of the gas turbine also had to be modified as the original machine had a vertical exhaust, while the SGT-800 has an axial exhaust."

As the old generator was from another OEM, manufacturing drawings had to be scanned and understood by the engineering department, said Künstler. "It was an engineering task but they were up for the challenge. The risk is that you have some overview drawings and ideas of what it might look like inside but you don't know the truth until the patient is lying on the table. That was what we discovered when we disassembled the generator."

Once the generator was opened up, engineers were able to perform reverse engineering so that the necessary modifications could be made. According to Siemens Energy, the generator is now in better condition than before and can now be taken to its performance limits.

Following dismantling of the old gas turbine and generator around the end of October/beginning of November 2020, construction of the gas turbine was carried out in the Finspång, Sweden, plant from November 2020 to January 2021. After customer acceptance tests were completed, installation work for the gas turbine was carried out between April and October 2021. This was followed by hot commissioning and first fire in November.

The expansion of the BASF Schwarzheide power plant will see the chemical facility produce more materials for use in batteries for e-mobility. This was one of the drivers behind the decision to install a Siemens Energy SIESTART battery system for black-start of the power plant. The battery system has been designed for an output power of 2.4 MW and an installed battery capacity of 1.7 MWh.

"There is a huge installation currently going on to build a production plant for battery materials at the site," said Künstler. "As they are expanding in this direction, the plant is going to get a perfect reference for an entire battery value chain from end-to-end – battery materials, battery technology and even battery recycling. So it's not just talk, BASF lives it"

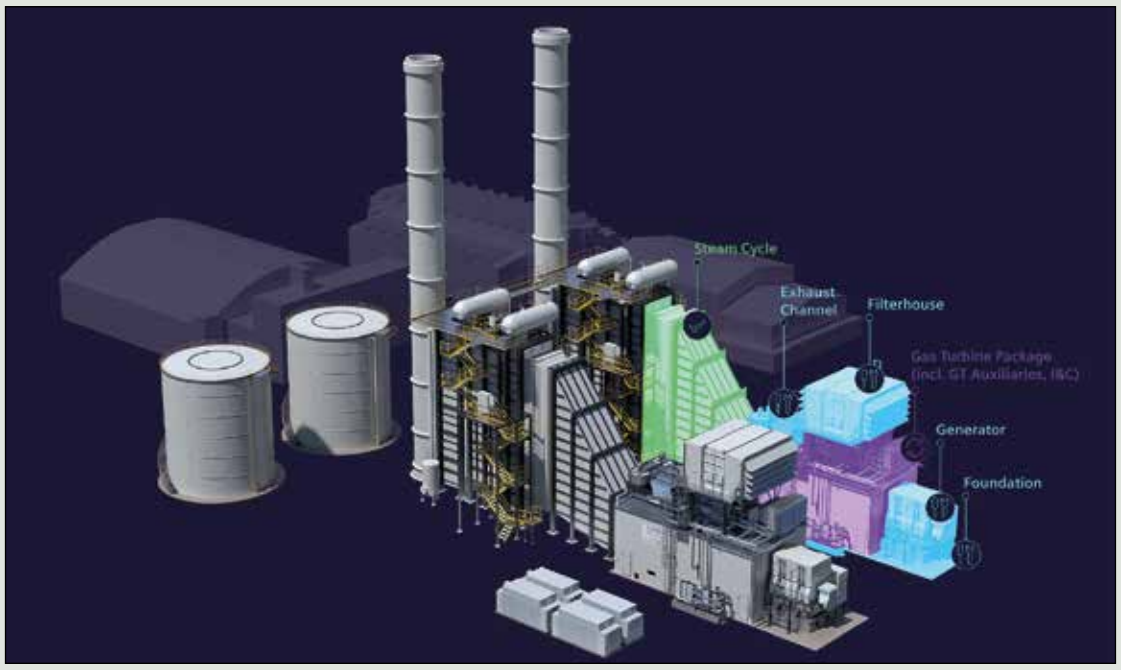
Black-start capability was a requirement for the power plant, and the battery system will be used to perform the duty of what would typically be handled by a diesel generator. As an innovative company, BASF was open to the idea.

"This is not completely new but it's also not standard [practice]; it's a development that BASF saw as innovative. So this is another opportunity for us to demonstrate and prove the technology," said Künstler. "Also CO_2 emissions are a lot lower [than from a diesel genset]."

The SIESTART system is designed to provide the maximum loads of the turbine start motor and of the auxiliary equipment (1.8 MW for the starter motor and 0.4-0.5 MW for auxiliary equipment) to perform at least three sequential black-starts. It is designed to operate for ten years but a capacity extension at the end of its designed lifetime is possible to compensate for the ageing and capacity degradation.

In addition to ticking the environmental box, battery systems have several advantages over diesel engines. According to Siemens Energy, battery storage black-start systems require less maintenance than diesel gensets and are more reliable when needed. A diesel generator requires fuel feed lines; space for fuel storage; it has to be started monthly; and fuel needs to be changed annually if not used.

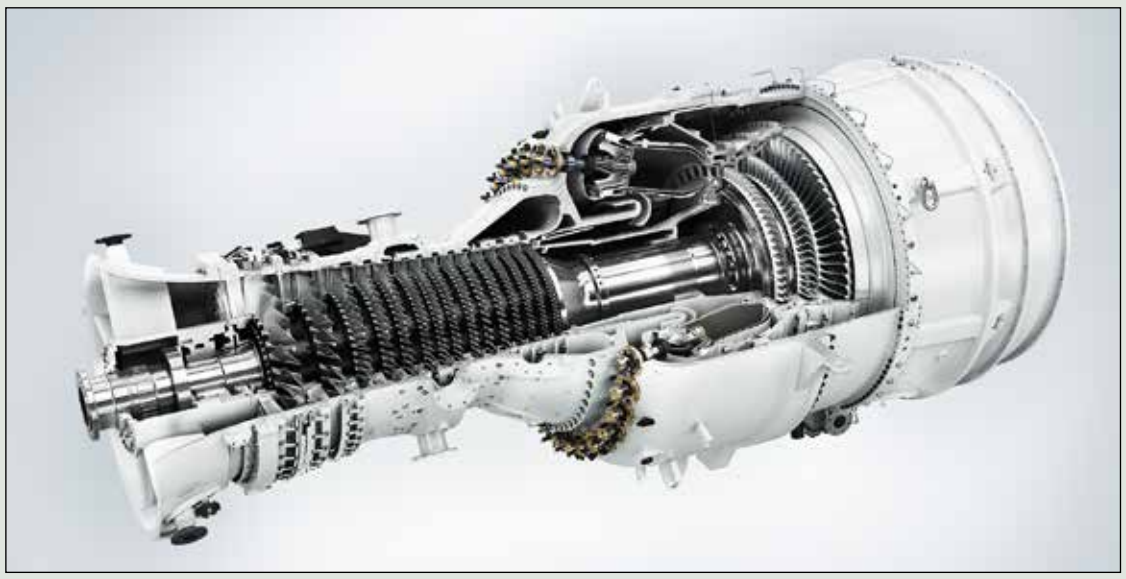
Künstler noted: "Diesel engines often have starting problems when they are needed, so they figured that batteries could be a good option. They also realised that there is the potential to increase their use in the future beyond black-start."



Model of the BASF Schwarzheide plant

Battery energy storage at the BASF plant will provide black-start capability

Künstler: We figured out that it was a really difficult task, as it would require a lot of changes



The SGT-800 has a maximum power output of 57 MW

Batteries are certainly more versatile. Wherein a diesel genset is "bound capital" in terms of fuel, the electricity from a battery storage system can also be used to generate revenue. The battery could in future be used alongside the gas turbine to cover load variations, provide fast frequency control, and potentially gain revenues from participating in the ancillary service markets.

With the SIESTART system, the gas turbine would operate at a specific, optimised output level, i.e. in load following mode. When the required level of plant output is below the output of the gas turbine, the extra output could be used to charge the batteries. When the required level of plant output is above the output of the gas turbine, the batteries would provide the additional output required. This improves the overall efficiency of the power plant and therefore lowers emissions, while improving operational flexibility.

"When thinking about using it in future for ramp-up for load changes, it might get interesting but it depends on the operating value: how often you will need it; how big is the battery capacity, etc.," said Künstler. "Of course the battery [at the site] is too small for this at the moment. But if a battery is already installed and connected to the grid, it's easier to enlarge the system to provide more capacity for this type of operation. So it offers flexibility for the future."

Although modernising a power plant while it is operating is not unheard of, it was the first time that Siemens Energy would carry out such an operation with this kind of turbine and technology.

Künstler said: "Currently we are working on another project with BASF, which will be similar but it's not a gas turbine project. Projects like Schwarzheide are becoming more frequent. In the future we will have to work much more on existing power plants and modify them to meet future needs."

Having successfully handed the gas turbine over for commercial operation earlier this year, Siemens Energy believes the brownfield exchange could become a blueprint and key reference not only for BASF but also for other industrial customers looking at tackling similar issues.

"What we did at Schwarzheide is perfect proof that it's possible to do it like this; and that we can use the turbine in this way," said Künstler. "The project was executed within the timeframe and is running as planned. It's also a perfect reference for the market – for the chemical industry and the power plant industry. There are other engines of the same type as at Schwarzheide that we can exchange successfully."

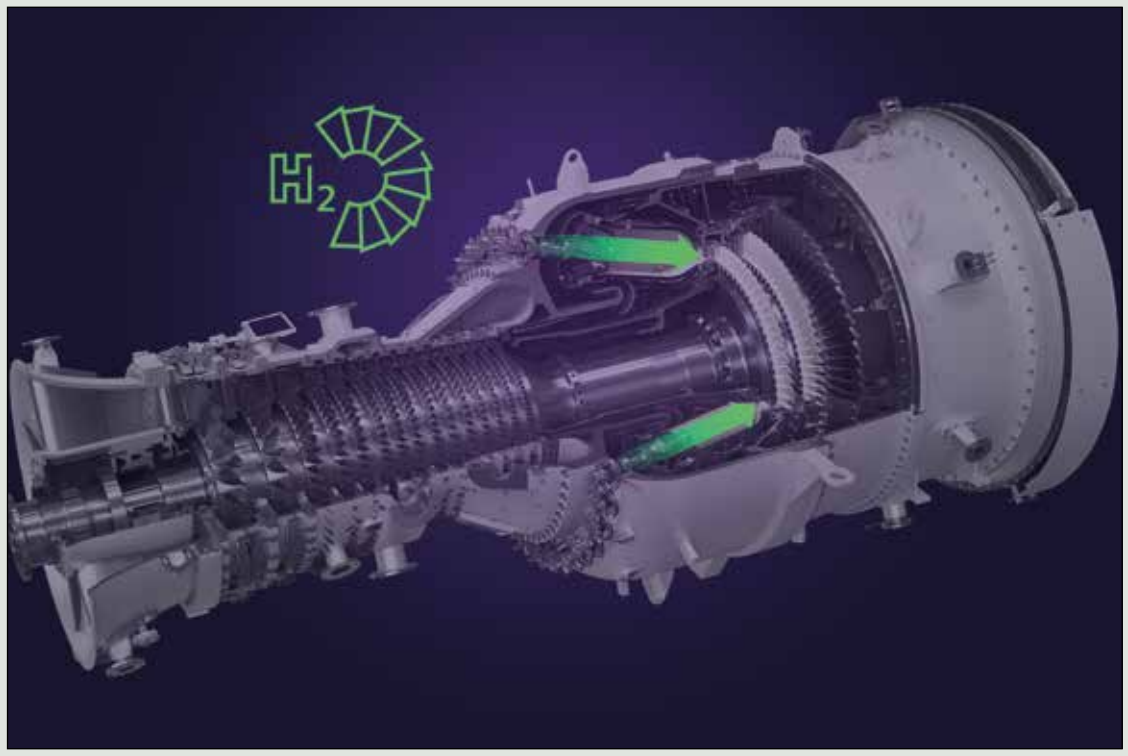
As pressure increases to cut emissions, Siemens Energy anticipates there are plenty of opportunities for adapting its gas turbines to run on hydrogen for a number of years now, and has released a hydrogen blending capability with natural gas in DLE (dry low emissions) mode between 30 and 75 per cent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

This could be a consideration for BASF in the future as it moves towards its net zero goal.

"Although it's currently not foreseen that the turbine will run on hydrogen due to still outstanding availability, we are investing in the technology already so that we are prepared for the future," said Künstler. "But of course BASF were interested in what hydrogen capabilities we have, and it was investigated as an option for future use."

DeKeyser added: "We are very pleased. For this kind of project, you really need a partner that is capable to keep coming up with their own ideas and keep re-thinking things."

Summing up the project, Künstler said: "The collaboration with BASF



Siemens Energy is already looking ahead with a programme to allow its units to run on hydrogen

The SGT-800 package is at the heart of the modernised plant

the SGT-800 at industrial sites.

The SGT-800 operates on natural gas with low emissions. The NO_x emission levels will be 15 ppm for the gas turbine while operating in the range of 60-100 per cent load. This will see nitrogen oxides from the plant reduce by 50 per cent.

Most, notably, however, in line with BASF's drive to cut carbon emissions, the new installation will substantially reduce CO_2. At the operating load at Schwarzheide, power plant efficiency is 4 per cent higher, thus reducing CO_2 by 16 per cent.

And as gas turbine operators look to zero CO_2, Siemens Energy is already looking ahead with a programme to allow its units to run on hydrogen. The company has been working on Schwarzheide was really excellent; it was always a real partnership. The project was challenging but working at an experienced level with the customer was really beneficial – the professionalism we had in exchanging information. It's always a pleasure when technical discussions could be held on a high level due to the knowledge of all related engineers. BASF's Center of Expertise departments are a perfect example – their engineers understand the discussions at a high level.

"There was always open communication even during the challenges, which you get with projects of this size. We always found a good solution; there was always great teamwork and team spirit throughout the execution period."

SCC-800: Performance data for 1x1 combined cycle power plant

	62 MW rating	57 MW rating
Gross plant output (MWe)	89	81.5
Gross plant efficiency (%)	95.6	58.5
Gross plant heat rate (kJ/kWh)	6040	6154
Number of gas turbines	1	1

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Boom expected for carbon capture and battery storage

■ Carbon capture to grow six-fold by 2030 ■ Big uptick for battery energy storage

Nadia Weekes

The global capacity for carbon capture in 2030 is set to increase six-fold from today's level to 279 million tonnes of CO_2 per year, according to research company BloombergNEF's (BNEF). Its latest market outlook forecasts a 44 per cent increase in 2030 capacity compared with last year's outlook.

Carbon capture, utilisation and storage (CCUS) is a technology intended to decarbonise hard-to-abate sectors such as petrochemicals and cement by using gas power plants fitted with capture equipment.

Most of the CO_2 captured today – equal to 43 million tonnes (or 0.1 per cent of global emissions) – is used for enhanced oil recovery. By 2030, it is estimated that as much as 279 million tonnes of CO_2 captured every year, which accounts for 0.6 per cent of today's emissions, will be used by the power sector, for the manufacture of low-carbon hydrogen and ammonia, or to abate emissions from industrial sources.

"A lack of CO_2 transport and storage sites near industrial or power generation point sources could be a major bottleneck to CCS development," said David Lluis Madrid, CCUS analyst at BNEF. "But we are already seeing a big increase in these projects to serve that need."

Much greater growth in CCUS is needed to capture the up to two billion tonnes of CO_2 needed to be on track for net zero and less than 2°C of warming by 2050. Legislators have recognised this and are ramping up their support for the industry. In the US, the Inflation Reduction Act (IRA) increased tax credits for CCUS by 70 per cent, making a viable business case for the technology in energy-intensive industries.

Julia Attwood, Head of sustainable materials at BNEF, said she expected the tax credits to produce a "jump in announcements in 2022, especially in the US as developers there rush to make sure they meet the 2032 deadline for credits".

Meanwhile, another BNEF report forecasts energy storage installations to reach a cumulative 411 GW globally by the end of 2030. That is 15 times the 27 GW/56 GWh of storage that was online at the end of 2021.

BNEF sees an additional 13 per cent of capacity by 2030 than previously estimated, primarily driven by recent policy developments including the IRA and the EU's REPowerEU plan, which sets ambitious targets to reduce reliance on gas from Russia.

The US and China are set to remain the two largest energy storage markets, representing over half of global installations by the end of the decade. Europe, however, is ramping up capacity in the aftermath of the energy crisis. BNEF has more than doubled its estimates for European energy storage deployments from 2025 to 2030.

Supply chain constraints could slow additions. Over the past year inflation, high transport costs and raw material prices have compounded pandemic-related supply chain issues to make battery cells more expensive. Projects are also facing long lead times to finance, develop and commission.

BNEF's forecast suggests that around 61 per cent of the storage built by 2030 will be to provide so-called energy shifting – in other words, advancing or delaying the time of electricity dispatch. Co-located renewables-plus-storage projects, in particular solar-plus-storage, are becoming commonplace globally.

Customer-sited batteries – be they residential, commercial or industrial – are also expected to grow at a steady pace. Germany and Australia are currently the leaders in this space, with sizeable markets in Japan and California too. BNEF forecasts energy storage located in homes and businesses to make up about one-quarter of global storage installations by 2030.

Lithium-ion batteries are expected to continue to dominate the market at least until the 2030s, in large part due to their price competitiveness, established supply chain and significant track record.

World Bank commits $335 million to boost Tanzania grid

The World Bank has approved $335 million of financing to facilitate an additional one million last-mile grid connections in Tanzania, East Africa's second-largest economy.

The new credit financing by International Development Association (IDA) to the Tanzania Rural Electrification Expansion Programme (TREEP) follows a $209 million financing for the same programme approved in May 2016. It is also co-financed by a grant from the Energy Sector Management Assistance Program (ESMAP) with a $6 million contribution.

To meet rapidly growing energy demand, Tanzania is implementing the National Rural Electrification Programme through which it aims to increase the population's electricity access to 50 per cent by 2025 and to at least 75 per cent by 2033.

The funds are expected to add over one million connections including 8500 education facilities and 2500 healthcare facilities, as well as provide renewable energy options and clean cooking solutions to rural households.

Saudi Arabia on track to miss 2023 renewable target

■ Deployment lags behind by 25.8 GW
■ 3.3 GW of new wind and solar announced

Nadia Weekes

Saudi Arabia is most likely to miss its 2023 renewables target by a large margin if it continues with the current rate of development, according to a report by GlobalData.

The Kingdom revised its renewables target to 27.3 GW of renewable energy capacity by 2023 and 58.7 GW by 2030 under its Vision 2030 programme. But with average annual additions of 100 MW per year between 2010 and 2021, Saudi Arabia is on track for a 25.8 GW shortfall to its 2023 target.

"The power sector in Saudi Arabia is facing numerous challenges when it comes to renewable power. Its issues range from low transparency to a lack of skilled human resources, an overarching bureaucracy, a high dependence on desalinated water, and low energy efficiency," according to Attaurrahman Ojindaram Saibasan, power analyst at GlobalData.

Enforcement of contracts is also a concern. Further, the country is a difficult location to start a business, has low levels of international trade, and lacks a robust insolvency resolution system, according to Ojindaram.

The cumulative installed generating capacity for solar PV in Saudi Arabia reached 487.30 MW in 2021. The country has a number of active solar PV plants, about ten in the permitting stage, four under construction and one financed.

Saudi Power Procurement Co. announced in October the launch of three wind energy projects and two solar projects for a total capacity of 3300 MW. The wind energy projects have a total production capacity of 1800 MW, while the two solar energy projects amount to 1500 MW.

In August, under government plans to restructure the electricity sector and introduce financial and organisational reforms, Saudi Arabia's Ministries of Finance and Energy fully nationalised the Saudi Power Procurement Co. after buying up shares in one of the firm's subsidiaries.

As well as new project development, the Saudi Power Procurement Co. is responsible for power purchase and wholesale agreements and energy trading markets.

New renewable energy certificate aims to 'supercharge' distributed power

The D-REC Initiative has pledged to improve access to clean energy and create new investment in developing markets through an internationally recognised market instrument acting as a guarantee of origin for distributed renewable energy.

The new mechanism, known as a Distributed Renewable Energy Certificate (D-REC), claims to provide greater traceability and transparency than existing REC models through a novel technological approach that makes it easier to certify and value distributed renewable generation.

D-REC is a market instrument that allows global businesses to reduce their carbon emissions by funding distributed renewable energy projects in communities with energy poverty. The funds raised through D-RECs can be deployed to create new mini-grid projects or supply revenue to isolated communities already using decentralised solar power, for example.

"This is a complex space and one that we are determined to simplify," said D-REC Initiative's co-lead, Gian Autenrieth. "We want communities in developing nations to reap the benefits of investment in renewable energy projects, to increase the amount of renewable energy available worldwide, and for businesses globally to be incentivised – through certified, trusted instruments – to purchase renewable electricity to meet their ESG goals and power their businesses."

Over 220 major corporations have committed to 100 per cent renewable energy thus far. In 2019, corporates contracted for more than 19 GW of new renewable capacity. The global REC market size was valued at $9.3 billion in 2020 and is projected to reach $103.2 billion by 2030.

Led by South Pole and Powertrust, with support from the Shell Foundation, Good Energies Foundation, the UK's Foreign, Commonwealth and Development Office (FCDO) and the International Finance Corporation (IFC) among others, D-REC is set to become a fully independent not-for-profit entity in 2023.

BP accelerates expansion, as energy majors make extraordinary profits

- BP invests in strategic bioenergy business
- Energy majors see huge Q3 profits

Junior Isles

In a move that will expand and accelerate the growth of its strategic bioenergy business, BP has announced that it has agreed to acquire Archaea Energy Inc., a leading producer of renewable natural gas (RNG) in the US. The deal came just ahead of BP's Q3 results, which were expected to show another quarter of extraordinary profits.

The agreed acquisition, which is subject to regulatory and Archaea shareholder approval, will be for $3.3 billion in cash, as well as around $800 million of net debt.

Bioenergy is one of five strategic transition growth engines that BP intends to grow rapidly through this decade. BP expects investment into its transition growth businesses to reach more than 40 per cent of its total annual capital expenditure by 2025, aiming to grow this to around 50 per cent by 2030.

Based in Houston, Texas, Archaea Energy is a leading RNG producer, operating 50 RNG and landfill gas-to-energy facilities across the US. It has a development pipeline of more than 80 projects that underpin the potential for around five-fold growth in RNG production by 2030.

As a result of the agreed acquisition, BP has doubled to around $2 billion its aim for the contribution to EBITDA from biogas in 2030. BP now aims for more than $10 billion EBITDA to be generated by its transition growth businesses by 2030 – up from previous guidance of $9-10 billion.

The news came two weeks ahead of the BP's Q3 results where the company, like its competitors, was expected to see another quarter of bumper profits driven by high oil and gas prices. On October 27th BP's French rival TotalEnergies posted a sharp jump in third-quarter net profit. The group reported adjusted net income of $9.86 billion, which compared with $4.77 billion for the same period in 2021 and $9.8 billion in the second quarter of this year. US energy giant Exxon Mobil smashed expectations, posting a record-breaking quarterly profit of $19.66 billion. Shell, meanwhile, posted a third-quarter profit of $9.45 billion, slightly below the second-quarter's record high.

The extraordinary profits were likely to intensify calls in Britain and the European Union to impose further windfall taxes on energy companies as governments struggle with soaring gas and power bills.

Shell's departing Chief Executive Officer Ben van Beurden said the energy industry "should be prepared and accept" that it will face higher taxes to help struggling parts of society.

Neil Shah, Director of Research at Edison Group commented: "With Shell on track to surpass its record yearly profit in 2008 of $31 billion, the robust earnings could increase calls in the UK and European Union to levy more windfall taxes on energy companies – particularly as governments grapple with skyrocketing prices."

EIT InnoEnergy and Siemens Energy join forces on clean tech innovations

EIT InnoEnergy, the innovation engine for sustainable energy across Europe, is partnering with Siemens Energy to commercialise and scale clean tech innovations.

The two organisations will look for joint investments and for candidates within the EIT InnoEnergy start-up portfolio to consider for Siemens Energy's 'venture clienting', a programme which scouts, pilots and adopts innovative start-up solutions.

"Bringing together the disruptive thinking and innovations from cleantech start-ups and the global network and large-scale industrialisation capabilities of Siemens Energy will create new value for our customers," said Vinod Philip, Executive Board Member Global Functions at Siemens Energy.

An independent company since 2020, Siemens Energy is focused on driving the energy transition, it has identified three vital focus areas – low or zero emission power generation, energy transport and storage and reduction of CO_2 emissions in industrial processes. Its innovation strategy is directed along strategic fields to develop solutions that will deliver transformational growth and help against climate change.

Siemens Energy Ventures supports this innovation strategy with programmes designed to fast-track sustainable energy innovations to address critical needs of customers and deliver commercial value aligned to the strategic fields.

While its venture building supports innovations from inside the company, the venture clienting programme gives selected external start-ups the opportunity for commercial pilots – with the goal of a roll-out at scale thereafter. On top of that, Siemens Energy Ventures provides strategic investment to early and growth-stage start-ups.

Kendra Rauschenberger, General Partner of Siemens Energy Ventures, commented: "Accelerating the process from idea to impact has been key for us all along. Becoming part of EIT InnoEnergy's ecosystem and engaging with its broad portfolio of clean tech start-ups will help us further in that endeavour."

EIT InnoEnergy, which is supported by the European Institute of Innovation & Technology (EIT), a body of the European Union, has over 560 partners and an equity portfolio of around 300 start-up and scale-up companies.

In addition, EIT InnoEnergy leads three strategic industrial value chains – the European Battery Alliance (EBA), the European Green Hydrogen Acceleration Centre (EGHAC) and the European Solar Initiative (ESI) – all of which aim to decarbonise Europe's industry, create millions of jobs and strengthen its competitive position in the world.

European wind manufacturers under growing pressure

Europe's wind turbine manufacturers are financially struggling and cutting jobs as inflation and the rising cost of key materials, such as steel and copper, continue to drive up the cost of producing turbines.

General Electric Renewables and Siemens Gamesa have both announced recent job cuts, with Jon Lezamiz Cortázar, Global Head of Public affairs at Siemens Gamesa, telling the *Financial Times* that European manufacturers were "all financially struggling".

"Everything is getting much more expensive in an already stretched wind industry supply chain," Lezamiz Cortázar told the *FT*.

At the end of September, the company announced the next steps in its Mistral strategy programme, which would impact 2900 jobs. The programme will see Siemens Gamesa implement a new organisational structure that will become effective on January 1, 2023.

In addition to rising costs, the industry is also grappling with supply chain delays, already strained by the lockdowns during the pandemic and exacerbated since the war in Ukraine. This put companies at risk of having to pay so-called "liquidated damages" to customers, or compensation payments related to project delays, analysts said.

Vestas Wind global head of marketing and public affairs, Morten Dyrholm, said the current situation amounted to "a pretty critical period in time for the supply chain".

Meanwhile GE has said it is laying-off workers in its onshore wind unit as part of a plan to restructure and resize the business. Four sources familiar with the move told *Reuters*, the company had notified employees in North America, Latin America, the Middle-East and Africa about the cuts. It also has plans to cut its onshore wind workforce at a later date in Europe and Asia Pacific. The cuts are expected to affect 20 per cent of the onshore wind unit's workforce in the US.

Ben Backwell, Chief Executive of the Global Wind Energy Council, noted: "Companies are laying people off, at a time when the supply chain should be ramping up."

The Global Wind Energy Council said it was likely to downgrade its forecasts for the amount of new capacity added this year globally from around 101 GW to 94-95 GW. This amounts to almost no growth since last year, with 2021 being a peak year for offshore wind installation.

- Balfour Beatty, the international infrastructure group, announced that it has signed a memorandum of understanding with Aker Solutions, an integrated solutions, products and services provider to the global energy industry, to deliver end-to-end design and construction solutions for the concrete floating and gravity-based foundations for the UK offshore wind industry.

Rolls-Royce strategic partnerships drive clean energy transition

Rolls-Royce has formed strategic alliances aimed at accelerating the transition to clean energy.

In late October the company agreed to build a strategic partnership with Finland-based Neste to accelerate the use of renewable diesel as a lower-emission solution for diesel engines.

The key focus in the collaboration will be on promoting the use of more sustainable fuels in applications based on the existing internal combustion engine technology, accelerating the transition from fossil fuels to renewable fuels, and increasing knowledge sharing on renewable diesel and the benefits it provides to its users.

Under the mtu brand, Rolls-Royce sells high-speed engines and propulsion systems used for ships, power generation, heavy land and rail vehicles, military vehicles, and the oil and gas industry, as well as diesel and gas systems and battery containers for safety-critical applications, continuous power generation, combined heat and power, and microgrids.

The tie-up follows an earlier cooperation agreement signed between the Rolls-Royce business unit Power Systems and Sowitec, a specialist in renewable energy projects.

The two companies have agreed to cooperate with the aim of providing power-to-X projects with a total electrolysis capacity of up to 500 MW by 2028. The plants will use renewable energy sources to generate electrical power that will be used to produce hydrogen with mtu electrolysers.

Sowitec, based in southern Germany, has more than 4.2 GW of solar and wind projects installed in South America, Europe and Asia. The Baden-Württemberg-based company has extensive experience in developing financeable turnkey renewable energy projects, from concept to implementation, including investor sourcing, as well as power-to-X projects.

Americas

H-class gas turbine for Azulão power plant

Eneva, the largest private natural gas operator in Brazil, has ordered an H-class gas turbine from GE. GE will supply a 7HA.02 gas turbine for Eneva's new 350 MW Azulão reserve power plant to help stabilise the grid.

The 7HA.02 gas turbine will power a H65 generator. Brazil gets about 70 per cent of its electricity from renewable energy, and the Azulão plant will support the grid with increasing levels of intermittent power.

Construction of the plant, located near Manaus, will start in late 2022, with commercial operation due to begin by 2026.

Nexans signs order for Empire Wind 1 cables

Nexans has won an order for the export cables for the Empire Wind 1 offshore wind project in the USA, which is being developed by Equinor and BP. The turnkey contract includes the design and manufacture of export cables for the project, and their laying and protection.

Empire Wind 1 will be installed about 20 miles south of Long Island and east of the Rockaways. The export cables will cover 93 miles from the project's offshore substation to landfall at South Brooklyn Marine Terminal.

The cables will be produced at the company's facilities in Charleston, South Carolina and Halden, Norway.

Cummins to build 20 MW Niagara electrolyser

Atura Power has selected Cummins to design and manufacture the electrolyser system for its Niagara Hydrogen Centre in Niagara Falls, Ontario, Canada. This will be Ontario's first 20 MW green hydrogen facility.

Detailed design work and system integration is underway, with plans to bring the Niagara Hydrogen Centre online in early 2024.

Cummins will use its proton exchange membrane (PEM) electrolysis system, to be manufactured at its Mississauga, Ontario facility. The electrolyser would be powered by hydropower. The hydrogen will be transported and blended into the fuel stream at Atura Power's Halton Hills Generating Station.

Alexey Ustinov, Vice President of Electrolysers at Cummins, said: "This project is a great demonstration of the potential of PEM electrolyser technology to decarbonise our power sources. Once completed, this project will be the second 20 MW electrolyser installation for Cummins in Canada."

Power upgrade for Nevada Gold Mines

Wärtsilä will upgrade a captive power plant supplying a Nevada Gold Mines operation in the USA. The upgrade will increase the facility's output on each generating set by approximately 8 per cent, support operational reliability, and ensure its availability during peak periods. It will also avoid de-rating in almost all situations caused by the severe ambient conditions at the plant's high-altitude location in the hot Nevada desert.

The plant operates with 14 Wärtsilä 34SG gas engines. It was originally installed in 2005 with a net output of 115.6 MW. Upon completion of the upgrade, the facility's output will be increased to 128 MW. The upgrade will commence in January 2023 and will be carried out in phases to coincide with the plant's major overhaul schedule.

The upgrade includes installation of Wärtsilä's UNIC engine control system, minimising the risk of outages during the three-month long peak summer season. The upgrade will also increase efficiency and allow less constant operation of the engines.

Asia-Pacific

Masdar selects Goldwind in Uzbekistan

Goldwind announced in September that it was selected by UAE's Masdar to supply a 500 MW wind project in southwestern Uzbekistan. Goldwind will supply 111 units of its GW155-4.5MW turbines for the wind project in the Navoi region.

Construction is scheduled to start in Q3 2022 and to be complete by the end of Q4 2024.

The site will have a substation connecting the wind farm to existing 220 kV overhead transmission lines that run across the site.

Masdar is the sponsor of the 500 MW Zarafshon I wind power project about 7 km east of Zarafshon City in Tamdy, Navoi. Shamol Zarafshon Energy, wholly owned by Masdar, is the special purpose vehicle of Zarafshon I. Masdar expects the 111x 4.5 MW wind farm to be operational for 25 years.

Siemens Gamesa wins Taiwan offshore wind deal

Siemens Gamesa and Hai Long Offshore Wind project signed two agreements in October. These were a Turbine Supply Agreement and a Service and Availability Agreement for three projects with a combined capacity of 1044 MW. The agreements cover the 300 MW Hai Long 2A, the 232 MW Hai Long 2B, and the 512 MW Hai Long 3 projects. This is Siemens Gamesa's largest offshore wind power signing in Taiwan so far.

Siemens Gamesa will deploy 73 SG 14-222 DD offshore wind turbines. The service agreement is for 15 years, with an option to extend it to 20 years.

The wind turbines will be installed 50 km off the coast of Changhua County. Each turbine will have a 14 MW capacity and feature a rotor diameter of 222 m.

Andritz pumped hydro order for Pinnapuram

Greenko Energy, an Indian independent power producer (IPP), has awarded a contract to Andritz for the supply of electro-mechanical equipment for the 1200 MW Pinnapuram pumped hydropower storage plant.

The plant will be located in the Kurnool district of Andhra Pradesh state in India. It will be part of the first integrated renewable energy storage project combining electrical energy production based on photovoltaic solar, wind, and pumped storage. Once commissioned, Pinnapuram will be the largest pumped storage scheme in India. Commissioning of the first units is expected by 2023.

The contract includes design, manufacture, supply, transportation, erection, testing, and commissioning of four 240 MW units, two 120 MW reversible pump units, main inlet valves, and associated auxiliaries.

Suzlon to supply 69 wind turbines to India

The Suzlon Group announced in October that it won an order to develop 144.9 MW of wind power projects for the Aditya Birla Group. Suzlon will install 69 wind turbines, each with a rated capacity of 2.1 MW. The project is located at sites in Gujarat and Madhya Pradesh and is scheduled for commissioning in 2023.

Ashwani Kumar, CEO of Suzlon Group, said: "We are delighted to announce our order with the Aditya Birla Group for their Wind Energy Projects in Gujarat and Madhya Pradesh. Suzlon's expertise in the Indian wind energy market over the last 27 years with products customised to India's varied wind regimes, offer convenience and reliability to customers for setting up wind power projects across India, backed by our service offerings."

Europe

Finland wind power order for Siemens Gamesa

Siemens Gamesa was selected by Energiequelle to supply wind turbines for the Mikonkeidas wind farm in Finland.

The 105 MW wind farm will be located in Kristiinankaupunki and will consist of 16 SG 6.6-170 wind turbines. The wind turbines will be mounted on 145 m towers. Installation is scheduled to be carried out in the first half of 2024. The companies have also signed a 35-year service agreement covering maintenance of the wind turbines.

Landwind Group orders 12 Nordex turbines

The Landwind Group has placed an order for Nordex to supply 12 N163/6.X wind turbines to be delivered to four wind farms in Lower Saxony, Germany. The order also includes a 20-year service agreement for the wind turbines.

The wind farms will be built in the districts of Helmstedt and Wolfenbüttel.

The 6 MW turbines will be built on hybrid towers with a hub height of 164 m. They are scheduled to start operation by winter 2023.

Karsten Brüggemann, Vice President Region Central of the Nordex Group, said: "We are proud to be able once again to work together with the Landwind Group and to once more demonstrate the reliability of our technology. With an installed capacity of 6.8 MW, the N163/6.X currently numbers among our most powerful turbines."

Atkins to design Scottish hydrogen plant

Atkins has won a contract to design the INEOS 500M world-scale low carbon hydrogen plant at Grangemouth, Scotland. The hydrogen plant is expected to be operational by 2030 and will further reduce emissions from the site by 1 million tonnes per year.

Colin Pritchard, INEOS Grangemouth Sustainability Director, said: "The construction of our hydrogen plant is a vital component to delivering our net zero road map at Grangemouth and an enabler for others to reduce their footprints too."

International

Hitachi Energy connects PV plant to Qatari grid

Hitachi Energy has completed the grid connection for Qatar's 800 MW Al Kharsaah solar PV power plant. The plant is located 80 km west of Doha, and consists of 1.8 million solar modules.

The Al Kharsaah plant will avoid 26 million tonnes of CO_2 emissions during its operating life and help Qatar progress towards its goal of reducing greenhouse gas emissions by 25 per cent by 2030.

Niklas Persson, Managing Director of Hitachi Energy's Grid Integration business, said: "We are delighted to have made such a significant contribution to this milestone in Qatar's journey towards an energy system that is more sustainable, flexible, and secure."

Two solar power plants for Australia

GRS, part of the Gransolar Group, along with Ingenia Solar Energy (ISE) and PV Hardware (PVH) has been awarded contracts for two solar power plants in Australia.

The 425 MW Wellington North solar farm will be located in New South Wales, while the 90 MW Wunghnu project will be located in Victoria.

ISE will be responsible for design and engineering of the projects, while PVH will install solar trackers and GRS will be responsible for EPC. Construction has already started, with completion expected by 2024.

LTSA for Africa's longest HVDC link

Hitachi Energy and Société Nationale d'Electricité (SNEL), the national electricity company of the Democratic Republic of Congo, have signed a long-term service agreement (LTSA) to secure power supply in the Inga-Kolwezi HVDC link.

The link supplies up to 1000 MW from the Inga Falls hydropower plant in the west of the country to the Kolwezi mining region on the south. At 1700 km, it is the longest HVDC link in Africa.

As part of the agreement, Hitachi Energy will assess the precise service needs of the converter stations and develop a preventive maintenance programme and supervise its implementation over the next five years. The agreement includes training, knowledge sharing and expertise enhancement of SNEL service personnel.

Enercon and Enerjisa Üretim working in Turkey

Enercon and Enerjisa Üretim, a joint venture of the E.On-Sabanci Holding, will jointly implement the YEKA RES 2 wind power project in Turkey, installing 1000 MW of onshore wind capacity. Enercon will supply the wind energy converter technology and deliver a total of 240 E-138 EP3 E2 WECs within the next four years.

The project is located in regions with the highest wind energy potential in Turkey. Wind farms will be constructed in Çanakkale (250 MW), Balıkesir (250 MW), Aydın (250 MW), and Muğla (250 MW).

Enercon is producing or sourcing all major components for the E-138 EP3 WEC (except the nacelles) from its supply network in the country.

New Zealand awards Vestas 43 MW order

In partnership with Mercury, Vestas has secured a 43 MW order for Kaiwera Downs Wind Farm in New Zealand. The project will feature ten V136-4.2 MW wind turbines in 4.3 MW operating mode which Vestas will supply and install.

Upon completion, Vestas will deliver a 30-year Active Output Management 5000 service and maintenance agreement (AOM5000) to optimise energy production, while providing Mercury with long-term business case certainty for the wind farm. Delivery of Vestas' wind turbines is expected to occur in Q2 2023, with commissioning to commence in Q3 2023.

World Energy Outlook 2022: Launch presentation key slides

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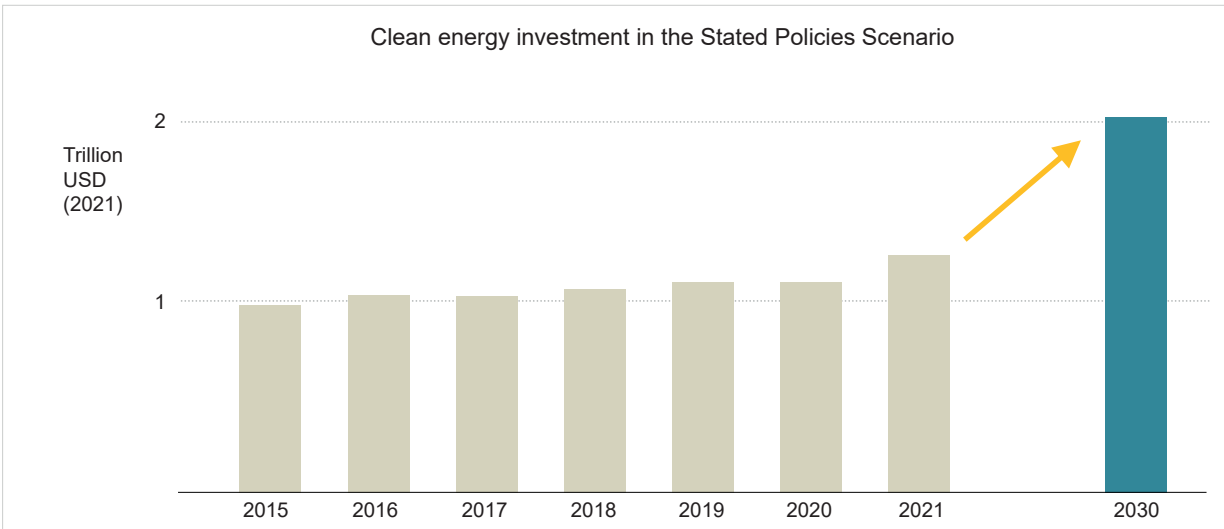
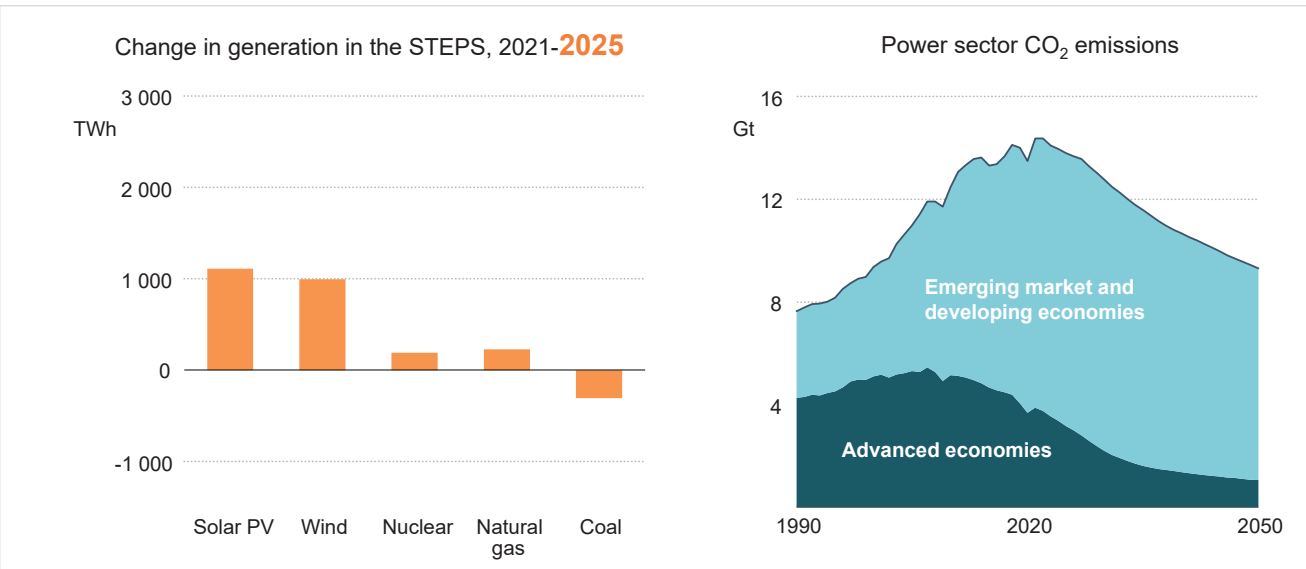
Government responses are fast-tracking the clean energy economy



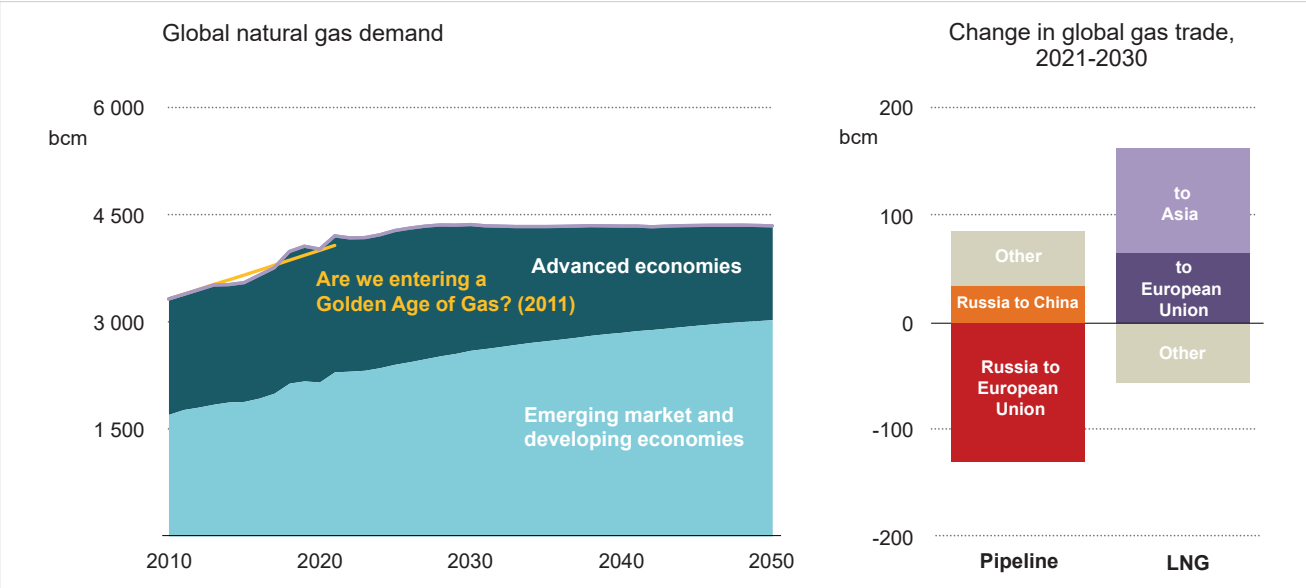
The US Inflation Reduction Act, the EU's Fit for 55 package, Japan's GX, China's new clean energy targets and India's solar revolution propel clean energy investment to new highs, but $4 trillion is needed by 2030 to be on track for 1.5 °C

Electricity is turning the corner



As markets rebalance, the upside for coal is temporary as renewable generation rises by 90% to 2030; the peak in power sector emissions needs to be followed by a much steeper decline to be consistent with global climate goals

The era of natural gas demand growth is coming to an end



Strengthened policies, high near-term prices & energy security concerns bring the "Golden Age of Gas" to a close but LNG remains crucial amid lower pipeline flows to Europe & robust import demand in Asia

Source: IEA World Energy Outlook 2022. Launch presentation, Paris 27, October 2022. All rights reserved.

Hydrogen

US midwestern states form coalition to promote hydrogen hubs

Seven states in the American Midwest, where the economies are based on agriculture, heavy industry such as steel and automotives, and lots of driving, have formed a coalition with the purpose of developing hydrogen production and promoting its use.

Gary Lakes

Seven states in the US Midwest have formed the Midwestern Hydrogen Coalition with the purpose to develop hydrogen production and use it as an alternative to fossil fuels, which dominate the US automotive industry, manufacturing and the agricultural sector. The governors of Minnesota, Wisconsin, Illinois, Indiana, Michigan, Ohio and Kentucky have signed a memorandum of understanding (MOU) in which they agree to work with private companies, universities and non-profit organisations for the creation of a regional market for clean hydrogen and associated products.

The states' actions have been prompted by the 2021 Infrastructure Investment and Jobs Act, which provides billions of dollars in assistance from the US Department of Energy for the establishment of hydrogen hubs. The Act is a key programme in the 'Build Back Better' platform of US President Joe Biden. Funding would include providing assistance to link the clear hydrogen hubs with one another, potential consumers and providers of infrastructure throughout the region. The federal government has taken a number of steps, including providing tax incentives, to encourage the switch to hydrogen.

Governors in the region said their mutual focus on expanding hydrogen production and usage would expand their economies and quicken the transition away from gasoline and diesel. The fuel is envisaged as being used not only for land transport but also for shipping and ferries in the Great Lakes and tributaries.

Very little hydrogen is produced in the US at present, mostly for industrial use. Hydrogen is referred as green when it is produced by electrolysis powered by solar, wind or another renewable energy. Blue hydrogen is produced with power that comes from fossil fuel sources, in which the carbon emitted during extraction and power generation must be accompanied by a carbon capture process. While green hydrogen is the long-term goal of the energy transition, blue hydrogen is acceptable as it is considered cleaner than natural gas.

"We don't have to choose between clean energy and clean air and creating good-paying jobs and a strong economy – we can do both," Tony Evers, the Democratic Governor of Wisconsin, told US daily *Route 50*.

Andy Beshear, the Governor of Kentucky told the daily that his state is well prepared to begin the use of hydrogen. "Kentucky's robust infrastructure, strong chemical and manufacturing base, along with our leadership in the automotive and logistics sectors position us as a natural location for economic development in hydrogen," the Democratic government said.

He pointed out that a Toyota factory in Kentucky plans to begin producing dual fuel cell modules that can be used by heavy commercial trucks. The state also has a large network of pipelines that could transport hydrogen, and three of the interstate highways that run through the state have been designated as federal hydrogen transportation corridors, Beshear said.

The Democratic Governor of Michigan, Gretchen Wittmer, said the Midwest "will continue leading the future of mobility and energy innovation and has enormous potential for transformative hydrogen investments," *Associated Press* reported her as saying.

The Midwestern group will focus on increasing development, markets, supply chains and a work force for clean hydrogen, the group said in a joint statement. The group will use existing infrastructure such as pipelines and storage facilities for distributing and storing ammonia, which consists mostly of hydrogen and is widely used in fertilisers.

JB Pritzker, Governor of Illinois, and another Democrat, said in a statement: "Investing in clean hydrogen is a key component of decarbonising the transportation, manufacturing and agriculture industries. By jumpstarting the hydrogen market in the Midwest, the state of Illinois will add to its robust number of clean energy jobs and bring down the cost of clean energy alternatives for those who reside here."

A number of other regions in the country have taken steps to join together to establish hydrogen hubs. Six states in the northeast have joined together for the purpose, led by New York. Maine, Massachusetts, Connecticut, New Jersey and Rhode Island are working with some 60 other organisations, including universities, utility companies, equipment manufactures and non-profit organisations.

Southern states have taken similar steps, as have some in the far west. The US government is encouraging the creation of a number of major hydrogen centres throughout the country and identified several priorities for hydrogen development, including: the focus on strategic, high-impact hydrogen applications; reducing the cost of clean hydrogen production to $1/kg by 2031; and establishing at least four regional clean hydrogen hubs.

Gas

Erdogan supports Putin's call for Russian gas hub in Turkey

Turkey has not taken a side in the Ukraine war, portraying itself as a mediator in the conflict and maintaining its ties to the West and to Moscow, but new Russian-Turkey plans to create a gas hub in southeast Europe may not be the best way to project a neutral stance.

Gary Lakes

Turkish President Recep Tayyip Erdogan announced last month that he supports a proposal made by Russian President Vladimir Putin for a Russia natural gas hub to be established in Turkey.

Putin made the proposal to Erdogan during a regional summit in Kazakhstan. The proposal includes shipping more Russian gas to Turkey, which relies heavily on supplies from Russian gas monopoly Gazprom, through the existing TurkStream subsea pipelines across the Black Sea. Russia also operates the subsea Blue Stream gas pipeline across the Black Sea.

"Together with Mr. Putin, we have instructed our Energy and Natural Resources Ministry and the relevant institutions on the Russian side to work together," Turkish media reported Erdogan as saying.

Russia's prime gas pipeline route for gas deliveries – Nord Stream 1 & 2, with a combined capacity to ship 110 bcm/year of gas to Germany – is no longer a viable option, even if Europe wanted Russian gas. Nord Stream 2 was refused a license by the German government following the Russian invasion of Ukraine on February 24th this year and Russia later halted gas shipments through Nord Stream 1 citing technical reasons. In October, both pipelines were seriously damaged by explosions and are no longer operational.

Turkish and Russian experts will work together to determine the best location for the hub, Erdogan said. At present this will likely be Thrace, which is the western-most province of Turkey located on the European side of the Bosphorus, where the TurkStream pipeline makes landfall. The province borders Greece and Bulgaria (the countries have recently been linked by the Interconnector-Greece-Bulgaria (IGB) pipeline) and Thrace also serves as a transit route for the Southern Gas Corridor (SGC), which transports gas from Azerbaijan to Italy.

"We have a national distribution centre," Erdogan said, "but, of course, now this will be an international distribution centre." The customers for Russian gas from this hub would be Serbia, traditionally a close ally of Russia, and Hungary.

The idea for a gas hub in Thrace was likely part of a pre-Ukraine war plan for Russian gas distribution in southeast Europe, as the original plan for TurkStream included several strings with one serving Turkey, and as many as three others serving Europe. Two pipelines with a total design capacity of some 31.5 bcm/year have been built, with one pipeline designated to hook up to the Trans-Balkan pipeline system.

Speaking on Russian state TV, Gazprom CEO Alexei Miller in mid-October said talks on the proposal could begin soon, adding that two more pipelines could be constructed under the Black Sea to bring TurkStream capacity up to 63 bcm/year. (This was the original design plan.) Miller said the project design documentation had already been prepared.

However, there is a very strong chance that this will not be necessary.

Since the start of the war, most EU members have been working to curtail or halt outright any imports of Russian hydrocarbons, and once this is accomplished and the war ends, they may never go back to Russian energy supplies. Even with existing infrastructure, a Russian gas hub could likely wind up serving far fewer countries than Gazprom had originally envisaged.

Erdogan has put himself forward as a mediator for the war in Ukraine, although he and Putin have in the past had their differences, especially in Syria. Erdogan, whose country is a member of NATO, is being given some license to see what he can do since he has a foot in both camps. But Erdogan often draws the ire of NATO and EU members.

Over the last couple years, he has made numerous threatening remarks towards NATO and EU member Greece and has purchased anti-aircraft missiles from Russia, risking exclusion for Turkey from some NATO programmes and criticism from US and European politicians. There is also the ongoing Cyprus problem, stemming from Turkey's invasion and continuing occupation of the East Mediterranean island in 1974.

As with the recent Opec+ decision to cut oil production by 2 million b/d, which has resulted in anger from US President Joe Biden towards Saudi Arabia, Erdogan's decision to cooperate with Putin on the gas hub proposal may prompt questions regarding Turkey's supposed efforts to mediate between Moscow and Kiev.

To keep Turkey in the Western camp, Erdogan has supplied Ukraine with combat drones and ammunition, but Ankara continues to import Russia gas and is looking for more at a discount. The country has requested a 25 per cent cut in gas prices from Russia and a deferment in payment until 2024. The Russian-built Akkuyu nuclear power project also continues. Perhaps the Russia gas hub is a way of securing discounted supplies.

Renewable integration is key to decarbonising Asia

Curbing carbon emissions in Asia is key to achieving global climate goals. Black & Veatch's **Narsingh Chaudhary**, outlines the key findings of a report that reveals what industry executives see as the main issues surrounding decarbonisation in the region.

As Asia races to expand its variable renewable energy generation, more integration of generation, transmission and distribution technologies will be required to balance electric grids, enhance energy security and reach decarbonisation goals.

Integration of renewable energy into grid systems was viewed by senior industry executives in the 'Black & Veatch 2022 Asia Electric Report' as the biggest challenge facing Asia's electric industry.

With the rising threats and impacts of severe weather events on Asia's grids, alongside the increasing deployment of more variable solar and wind power, the need to focus investments beyond generation into transmission and distribution is underlined throughout the report.

For example, one in four industry respondents revealed they were not confident in the performance and resilience of their transmission and distribution systems. Additionally, under-investment in transmission and insufficient energy storage were highlighted as top threats to providing reliable service to customers.

Advancing the energy transition is complex, particularly in regions, like Asia, where the coal power plant fleet is young and there is significant dependence on fossil fuels to meet its base load energy demand.

What's more, the survey was conducted before the current energy crisis, which is tightening global supplies of natural gas. These constraints have restricted the ability of the region's power sector to develop gas fired generation facilities as an energy transition solution that lowers emissions and continues to provide stable, base load power.

Prior to the crisis, approximately half of survey respondents believed that over the next five years there would be "more investment" in gas or liquefied natural gas (LNG)-to-power facilities combined with carbon capture, while, separately, 46 per cent of respondents believed gas fired generation would remain an important part of the grid beyond 2035. Today, the price of gas, driven up by the current energy crisis, has led to uncertainties of expanding gas capacity in Asia in the mid-term.

It is within this global context that the United Nations Climate Change Conference 2022 (COP27) will urge an acceleration of renewable energy and other new technologies that will reduce greenhouse gas emissions. In his welcome message to COP27, Abdel Fattah El-Sisi, President of host nation Egypt, anticipates a "stronger will and higher ambition", for mitigation measures.

The current challenges with development of LNG-to-power facilities offer a huge opportunity for Asia to adopt an even higher percentage of renewables in the energy mix, provided the transmission infrastructure is planned and developed in tandem with the new renewable generation being added to the grid.

This points to a continued focus on integrating renewables successfully while global gas markets stabilise and enable more certain investment in gas fired generation assets.

Having a clear sense of how existing and emerging technologies will work together will be critical in achieving lower emissions grids in Asia and will underpin the power market's efforts to decouple fossil fuels from the provision of affordable, reliable and resilient power supply over the mid- to long-term.

Adopting a 360-degree view of the entire grid system is key. Notably, systems integration surpasses last year's top concern around investment uncertainties.

The finding indicates an acceptance of the electric grid's ongoing shift from a centralised model with a few large base load facilities to a more distributed, digitalised array of generation sources equipped to accommodate the electrification of everything.

What remains constant is the goal of any electricity provider — reliable and resilient grid operations and service. The survey shows this core business is threatened most by government policies that continue to evolve and, in the wake of 2021's COP26, have pushed decarbonisation goals sharply over the past 12 months.

These policy challenges are compounded by an under-investment in transmission systems and insufficient energy storage capacity, systems that help in mitigating renewable intermittency while traditional conventional generation capacity is reduced.

Alongside critical grid management and technical issues, where the sun shines and the wind blows are also key integration factors. The location of new solar and wind facilities often is distant from existing base load plants, transmission lines and, indeed, from where major demand centres exist.

Such practicalities have coincided with increased interest in and debate about the use of hydrogen as an energy carrier. Hydrogen can be used as seasonal energy storage to respond to the variable generation of wind and solar energy, and as a fuel for existing gas turbine facilities. Such a solution could underpin nations' energy security planning.

While the production of hydrogen via electrolysis scales – and corresponding cost barriers decrease – adoption can be encouraged through gateway approaches that combine hydrogen production from fossil fuels with carbon capture. In parallel with incentivised investment in green hydrogen production as part of nations' new and emerging energy security plans, these two commercialisation pathways can bring scale to a hydrogen economy and help lower the cost per kilogram of green hydrogen over time.

Asia's energy industry is optimistic, with three out of four respondents believing that, beyond 10 years, hydrogen will help meet emissions reduction and clean energy goals. This is significantly more than any other technology over the mid-term and also reflects findings conducted before the current energy crisis in Europe. Only 8 per cent of respondents believe there is no future for hydrogen as a feasible, clean and affordable alternative to natural gas.

Vietnam is a frontrunner in Asia with respect to decarbonisation. Vietnam's The Green Solutions (TGS) has appointed Black & Veatch to study the production and storage of green hydrogen in the country utilising solar or wind power supplied through the grid. The study also includes development of a green ammonia production plant as well as plant configuration and technology review; technology evolution risk and tentative mitigation; conceptual design; order of magnitude cost estimates; and levelised cost calculations.

Despite these and other emerging challenges, industry respondents recognise the importance of the region's energy transition. A mere 2 per cent of respondents disagree that investments are being channelled to clean energy.

The energy transition will require the development of prioritised decarbonisation roadmaps, essentially the detailed, yet flexible plans that electricity providers will use to maximise returns on their asset investments and realise their sustainability goals.

The survey findings show that one in three respondents do not have decarbonisation roadmaps in place today, highlighting a significant financial risk. Such technology and investment blueprints help electricity providers plan-out capital investment over 10 years or longer horizons. Only 15 per cent of respondents claim to have such robust investment roadmaps in place, indicating there is much room to prioritise and optimise ongoing clean energy investments in the years ahead.

So where to start? Rising demands from intensive power users like data centers and the electrification of transportation is increasing the load burden and profiles on Asia's grid. At the same time, the region is looking to balance the increasing price of energy with its decarbonisation efforts.

Taking the long view when it comes to decarbonisation is critical. Natural gas remains a critical transition fuel as it is a highly flexible, dispatchable generation source that can stabilise and enhance the resilience of regional grids with high renewable energy generation.

At today's price point, gas will not be able to replace coal fired generation yet. However, in the longer run, gas prices are anticipated to stabilise as additional capacities are being built across the globe. When that happens, Asia will be able to continue expanding its gas capacity to support decarbonisation efforts.

In addition to the availability of gas, realising an affordable and successful energy transition also requires all stakeholders in Asia's electric industry to be aligned and to embrace holistic planning and design of generation, transmission and distribution systems.

Governments can assist to further adapt policy and regulations to encourage the scale-up of commitments around firm power renewable energy developments and required grid augmentation. Technology providers, like Black & Veatch, can contribute existing and emerging decarbonisation, hydrogen, renewable and energy storage solutions to help power infrastructure developers gain the competitive edge that they need to remain profitable.

Narsingh Chaudhary is Executive Vice President & Managing Director, Asia Pacific at Black & Veatch.

From your perspective, what are the most challenging issues facing the electric industry in your region today? *(Select the top three).* *Source: Black & Veatch*

Challenging issue	%
Renewable integration	35.1
Economic regulation (i.e. rates)	24.6
Uncertainty of investment	24.6
Market uncertainty due to the pandemic (i.e. Covid 19)	24.6
Energy storage	21.1
Planning/forecasting uncertainty	21.1
Environmental regulations	17.5
Aging infrastructure	14.0
Distributed energy resources (DERs) integration	14.0
Distribution system upgrades and modernisation	14.0
Access to capital investment	14.0
Market structure	12.3
Lack of skilled workforce	8.8

Chaudhary: an affordable and successful energy transition requires all stakeholders in Asia's electric industry to be aligned

Global shocks will not alter the direction of travel

Looking beyond today's high energy prices to see what the longer-term energy future holds is difficult. DNV's latest *Energy Transition Outlook* assesses the short- and long-term effects of the shocks caused by the pandemic and Russia's invasion of Ukraine.

High energy prices and a heightened focus on energy security due to the war in Ukraine will not slow the long-term energy transition, according to the sixth edition of DNV's 'Energy Transition Outlook 2022: a global and regional forecast to 2050'.

Launching its annual flagship publication, DNV stressed that the long-term trends of the energy transition remain, with the rapid rise of renewables and growing electrification outweighing short-term shocks.

"The turbulence in the energy market does not dramatically alter the decarbonisation pathway towards mid-century," said Remi Eriksen, Group President and CEO of DNV. "The strongest engine of the global energy transition is the rapidly reducing costs of solar and wind energy, which will outweigh the present short-term shocks to the energy system."

In short-term, DNV says Europe is likely to accelerate its energy transition during and after the war in Ukraine. There will be a rapid phase-out of imported Russian fossil fuel sources and rising to the top of the agenda will be energy security, which hinges on a renewables-dominated energy system and measures to accelerate energy efficiency. Energy security and sustainability thus pull in the same direction.

Affordability is a major concern, with record high prices for natural gas and electricity. The policy response focuses on diversification of supply initially, giving some fossil sources a short-term boost, but the main policy thrust is to achieve energy independence for Europe earlier, based primarily on renewable energy.

Outside of Europe, and particularly in low- and middle-income countries, high energy and food prices plus the looming risk of global recession have shifted attention to short-term priorities. Long-term climate change investments and actions such as electricity infrastructure build-out are likely to be postponed. High-priced LNG could make for a short-term coal resurgence, and although renewables are local and support domestic energy security, domestic coal could find favour over imported gas.

The net effect, says the Outlook, is that, due to short-term pressure, there is reduced likelihood of extraordinary action being taken to reach a net zero future; however, the steady pace of the financially-driven energy transition will continue. Commodity cost increases and the war in Ukraine will not put the brakes on the big drivers of the transition, i.e. the plunging costs of renewables, electrification, and rising carbon prices.

Forecasting the long-term, for the first time DNV sees non-fossil energy nudge slightly above 50 per cent of the global energy mix by 2050. This is mainly because of the growing and greening of electricity production.

The report says electrification will expand in all regions and almost all sectors, while the electricity mix itself is greening rapidly. Electricity production will more than double, with the share of electricity rising from 19 per cent to 36 per cent in the global energy mix over the next 30 years. In addition, electricity will take over and dominate hydrogen production.

The share of fossil fuels in the electricity mix reduces sharply from the present 59 per cent to only 12 per cent in 2050.

Solar PV and wind are already the cheapest forms of new electricity in most places, and by 2050 it will grow 20-fold and 10-fold, respectively. Solar PV takes a 38 per cent share of electricity generated in 2050 and wind 31 per cent. Nuclear will only manage to slightly increase present production levels due to its high costs and long lead times; its share of the electricity mix will therefore decline. The strong growth of renewables in electricity is the main reason why the fossil-fuel share of total energy use in 2050 is pushed to just below the 50 per cent mark.

Despite the publicity surrounding hydrogen, DNV says it will represent only a small fraction of global energy demand in 2050. Hydrogen is inefficient and expensive compared with direct electricity use, says the report, but is essential for decarbonising hard-to-abate sectors like high-heat processes in manufacturing, maritime transport and aviation. Nevertheless, the global uptake of hydrogen as an energy carrier sees it supplying only 5 per cent of energy demand in 2050, a third of the level needed in a net zero energy mix.

Green hydrogen from dedicated renewables and from the grid will dominate hydrogen production, says DNV, but blue hydrogen remains important, for example in ammonia production. It notes that the number of hydrogen initiatives in hard-to-abate sectors is growing rapidly, but few projects have reached final investment decision.

With the UN's COP27 climate change summit just around the corner, the Outlook also noted that COP26 and the International Panel on Climate Change (IPCC) have called for urgent action, which has not materialised, and emissions remain at record levels.

At last year's COP26 in Glasgow, UK, UN Secretary António Guterres stressed the urgency of immediate action on global warming, calling it a "Code Red for humanity". His warning has been amplified by the successive AR6 reports from the IPCC. COP26 saw agreements on important issues like coal phase-down, methane reduction, and land-use changes, but that sense of urgency has generally not been reflected since then in national policy plans or actions, says DNV's report.

"Global GHG emissions reduction of some 8 per cent every year is needed for a net zero trajectory. In 2021, emissions were rising steeply, approaching pre-pandemic all-time highs, and 2022 may only show a 1 per cent decline in global emissions. That makes for two 'lost' years in the battle against emissions," it stressed.

The lack of action is attributed to a weakening global economy amid inflation challenges. However, DNV's analysis points to enormous opportunities inherent in decarbonisation for both companies and nations. Renewables expenditures are expected to double over the next 10 years to more than $1400 billion per year, while grid expenditures also are likely to exceed $1000 billion per year in 2030.

The report shows that building-out renewable technologies does not come at a green premium, but rather "as a green prize". Owing to the considerable efficiencies linked to electrification and the plunging costs of renewables, the world will be spending far less on energy as a proportion of GDP by 2050. There is scope for accelerated action, and for private sector frontrunners to run well ahead of anticipated governmental support, says the report.

Alongside the 'best estimate' forecast for the energy transition the Outlook this year also includes the 'Pathway to Net Zero', which is DNV's most feasible route to achieving net zero emissions by 2050.

DNV forecasts that the world is heading towards 2.2°C warming, and securing 1.5°C without a temporary carbon overshoot is already out of reach. The report states: "On their own, technological and market developments are insufficient drivers of the change needed for net zero; war-footing-like policy implementation with massive early action across regions and sectors is needed. Low-income regions need dedicated technology and financial assistance to transition at the required rate."

DNV forecasts no new oil and gas will be needed after 2024 in high-income countries and after 2028 in middle- and low-income countries. However, renewables need to triple and grid investment rise more than 50 per cent over the next 10 years.

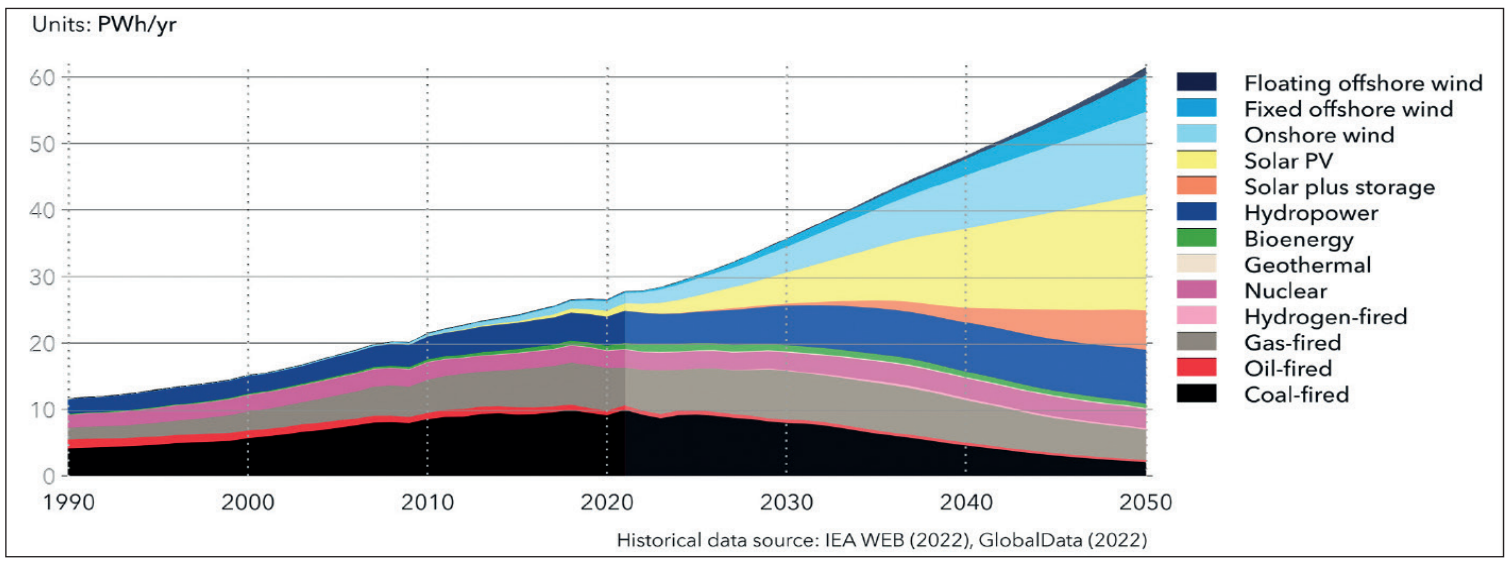
Different regions and sectors have different starting points and capabilities, and to reach net zero in 2050, leading regions and sectors have to go much further and faster. OECD regions must be net zero by 2043 and net negative thereafter via carbon capture and removal. China needs to reduce emissions to zero by 2050, while the remaining regions all reduce emissions significantly, but do not reach net zero by mid-century. Some sectors, such as power, will reach net zero before 2050, while others, like cement and aviation, will still have remaining emissions.

Renewable electricity, hydrogen and bioenergy are essential, but insufficient: almost a quarter of net decarbonisation relies on carbon capture and removal, including CCS from power and industry, direct air capture, and nature-based solutions.

DNV concludes that its Pathway to Net Zero requires much greater policy intervention than we see today. The full policy toolbox must be unpacked, including: higher carbon taxes and subsidies, stronger mandates, bans and financial incentives to encourage renewables to replace fossil fuels, and smarter regulation and standards.

Eriksen summed up: "With COP27 approaching, it is important that policymakers recognise the huge opportunities inherent in decarbonising the energy mix in light of the mounting costs of climate change impact. The technology exists to achieve net zero emissions by 2050, but for this to happen we must utilise the scope of the policy toolkit."

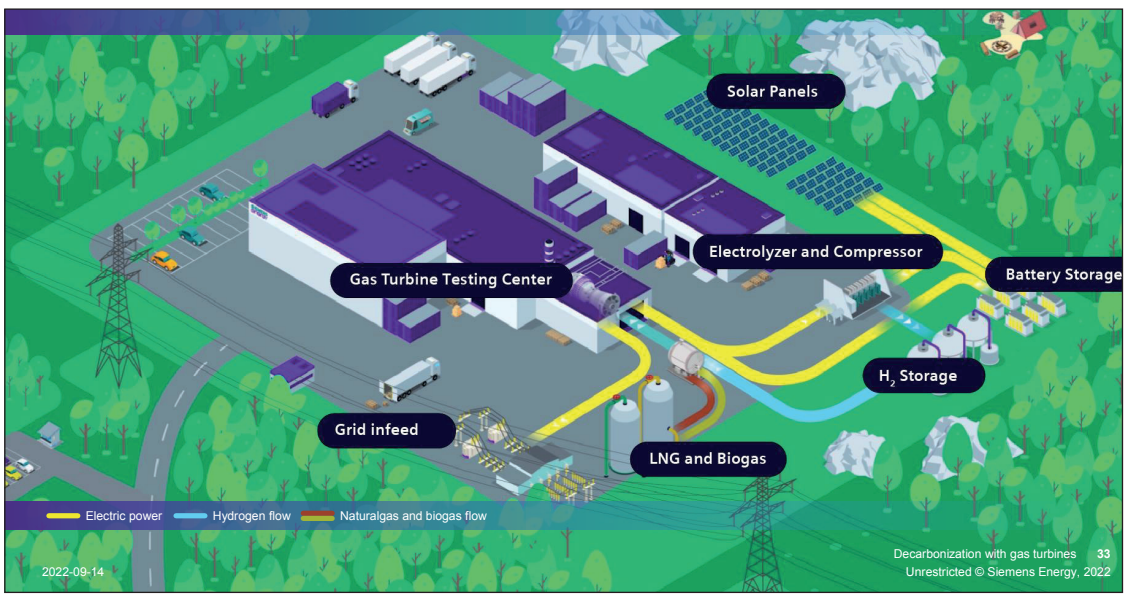
World grid-connected electricity generation by power station type



Demonstrating the value of hydrogen

With pressure on carbon emissions and high gas prices, there has been much debate on whether gas turbines have a future. Many believe the answer lies in adapting these machines to run on clean hydrogen. **Junior Isles** visited Siemens Energy's Zero Emission Hydrogen Turbine Centre in Sweden, to hear the company's views on the market and catch up on technology developments.

Does the gas turbine have a future? "It's a big debate," said Karim Amin, Member of the Executive Board and Executive Vice President of the Generation Division at Siemens Energy. During a press visit to the company's Zero Emission Hydrogen Turbine Centre (ZEHTC) in Finspång, Sweden, Siemens Energy set out its views on the market and gave journalists a first-hand view of what it is doing in hydrogen – the technology that it believes could be key to the continued use of gas turbines in the future.



CAD drawing of the ZEHTC

Setting out how he sees the gas turbine market going forward, Amin noted that "it's a matter of perspective and timeline". Citing data from IHS Markit and its own "bottom-up" numbers, he showed that in 2020 there was an average addition of 44 GW/a of new gas turbine capacity worldwide. Its latest data for 2021 put the average at 61 GW/a. This number stays steady through 2025 and increases to 65 GW/a in 2030.

The growth is largely attributed to: a growth in distributed generation; an accelerated switch from coal to gas in markets such as the US and Asia; as well as the need for back-up generation for the growing amount of renewables. Looking longer term, Amin said: "The question is how to make the impact of gas on the environment and climate change as least as possible."

To this end, Siemens Energy has been developing hydrogen-burning capabilities across its portfolio of gas turbines – from its small industrial machines, right up to its large Frame HL-class units. According to the company, its popular SGT-800 industrial turbine can already handle natural fuel mixtures with up to 75 per cent H_2, and will be ready for 100 per cent H_2 by 2025.

At the upper power range of the portfolio, its large 600 MW-scale HL machine can run on 50 per cent hydrogen today, says Amin, with a development schedule in place to enable 100 per cent H_2 operation by 2030. "This programme could be accelerated so we are 100 per cent ready by 2025, but we don't believe the hydrogen infrastructure will be ready by then to provide the amount of hydrogen needed."

Siemens Energy's experience with testing fossil-free fuels started more than 15 years ago but it was not until 2016 with the introduction of 3D printing of the combustion parts, i.e. the burners, that "things really took-off".

Hans Hölmstrom, Vice President, Generation , Industrial Gas Turbines and Managing Director of Siemens Energy Sweden, explained: "If you burn hydrogen, it burns so quickly, that it heats up the metallic parts that are close to the flame. With 3D printing, we can make cooling holes inside the metal that allow us to manage this process of burning 100 per cent hydrogen."

Commenting on the roadmap, he said: "It's important to reach 100 per cent [hydrogen burning] capability as soon as possible because although some customers may not need to burn it now, it's important for them to show their investors that they are future-proof and that the plant will not become a stranded asset."

Much of Siemens Energy's ongoing development and testing of its H_2-burning capabilities is being undertaken at its ZEHTC.

Åsa Lyckström, Sustainability Strategist and Product Positioning Expert and Member of the Executive Leadership Team of Siemens Energy AB, Sweden, was part of the launch of this demonstration facility in 2018.

"We wanted to show the role of the gas turbine in the future energy system and make it visible for everybody," she said. "We formed a consortium including two universities – one in Italy and one in Sweden – along with Linde and the Finspång municipality. With funding from the EU, the idea was to use available technology to make people aware of how the various technologies fit together."

The ZEHTC is used to run H_2 tests on Siemens Energy's gas turbines before they are delivered to customer sites. The facility comprises the gas turbine test centre, electrolyser and compressor, solar panels, H_2 storage, battery storage, LNG and biogas storage tanks, and the grid in-feed connection. Roughly one test per week is conducted with a small portion of the electricity produced used to power the electrolyser and the remainder sent to the local grid.

"Here we have the main puzzle pieces of the future energy system," said Lyckström. "We have the renewables and the gas turbine, working hand-in-hand with the energy storage. The universities of Bologna and Chalmers [Gothenburg] are now making models of the future energy system to scale-up this demonstration plant."

She offered an example of what a net zero electricity system – based on this modelling with real weather and demand data from Germany included – might look like.

The system would serve a city of around 250 000 inhabitants and industry. The model features 600 MW of wind power, 300 MW of solar, which would deliver electricity to the city as long as demand is there. When there is excess electricity, it would be used to power 160 MW of electrolysers to produce hydrogen for long-term energy storage, and charge a 40 MW/320 MWh battery that might typically be used for short periods in the mornings and evenings.

The system would be capable of storing 150 t/5000 MWh of hydrogen; enough for up to 2.5 days operation in a 89 MW hydrogen-fired SGT-800 combined cycle power plant. This power plant would operate only when needed, i.e. for about 100 starts/year. Overall it is calculated that such a system would generate 80 per cent of the electricity consumed directly from wind and solar, 15 per cent from the hydrogen power plant and 5 per cent from batteries.

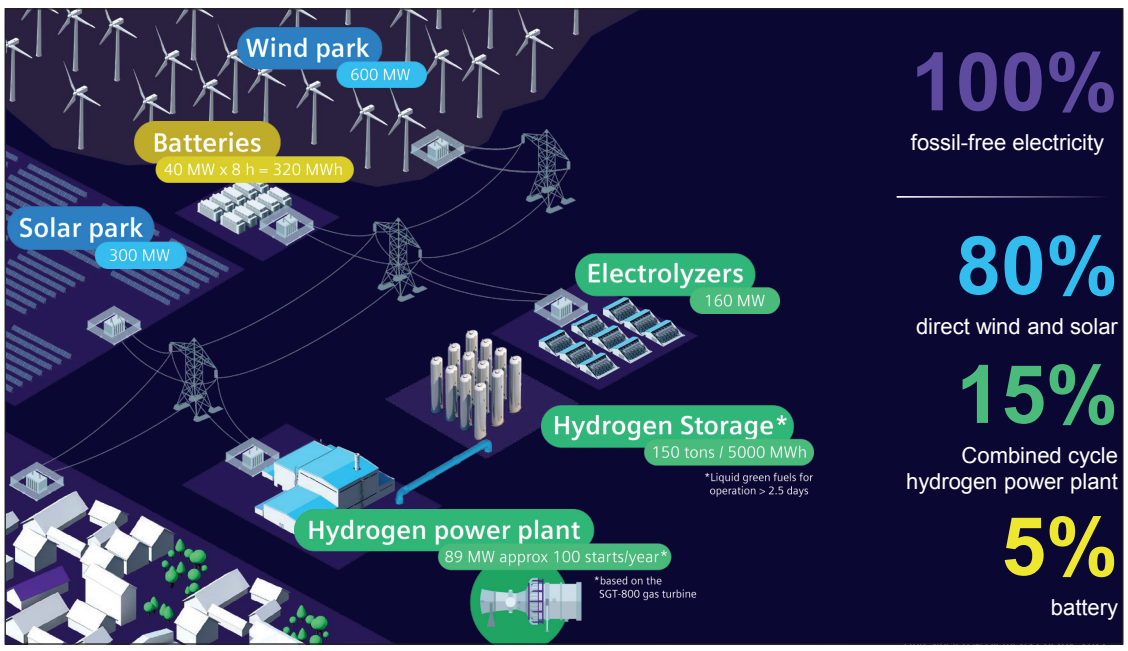
Depending on the location, such a system could replace a traditional 200 MW gas fired plant. In its modelling, the 100 per cent fossil-free system would produce electricity at around €75/MWh.

Lyckström commented: "All the components are needed but the sizes might change. It's really about the gas turbine's role in the energy system. Considering the round trip efficiency – converting wind and solar to hydrogen – it's quite expensive compared to using wind and solar directly. But in the model, we've seen that the cost of electricity in the system would double if we eliminate the gas turbine from it because you would have to scale up the transmission lines, the solar and wind park and the batteries…"

She added: "The overall efficiency of the system could be further improved, especially in Europe and the Nordic countries, if we make use of the excess heat from the electrolysers by including heat pumps and heat storage. This heat could be used in district heating systems and industries."

While there is a lot of ongoing discussion around such systems with the inclusion of hydrogen, Siemens Energy notes that there are only a handful of actual hydrogen co-firing projects around the world. This, it says, is primarily due to tha lack of hydrogen infrastructure and affordability, not technology.

When customers enquire about the technology readiness, Amin often says: "It's not how much [hydrogen] can you burn, it's more a case of how much have you got?"



Siemens Energy has modelled a 100 per cent fossil-free electricity system for a city of 250 000 inhabitants

Junior Isles

Clouds can have silver linings

We live in strange times. For a country with questionable ambition on climate change, arguably Russia has done more to accelerate the energy transition than the best efforts of the world combined. Clearly its invasion of Ukraine has had unintended consequences.

Although a signatory to the Paris Agreement, Russia has only committed to reaching net zero greenhouse gas (GHG) emissions by 2060. However, its Energy Strategy to 2035, adopted in 2021, focuses almost exclusively on promoting fossil fuel extraction, consumption, and export to the rest of the world. It is hardly a plan aimed at doing much to bend the global emissions curve any time soon.

Fast-forward a year. The war in Ukraine has created a global energy crisis; seen gas exports to Europe, its leading customer, fall to a trickle; and triggered what the International Energy Agency (IEA) recently described as "profound and long-lasting changes" in the speed towards a more sustainable and secure energy system.

Speaking at the launch of its annual flagship publication, the 'World Energy Outlook 2022', IEA Executive Director Fatih Birol, said: "The Outlook comes at a very pivotal time. The global energy system is going through a major turmoil – which I consider to be the first truly global energy crisis. At the same time, our world is going through a major geopolitical upheaval… In our WEO, we try to look at the responses of governments and businesses to this crisis."

This year the WEO, which takes its customary look at the global energy system through to 2050, focuses on energy and climate scenarios in the short- to mid-term, i.e. to 2030.

Just a few months ago, the Paris-based agency said the current energy crisis could be "a turning point in the history of energy by accelerating clean energy transitions". According to Birol, the findings of WEO 2022 confirm this is the case.

"Getting the data is our job. We are seeing unprecedented increase in different clean energy options – solar PV, wind, batteries, heat pumps, nuclear power," he said. "…When we look back at this year 10 years from now, I believe that we will see 2022 as the year when clean energy technologies saw major turbocharging."

Alongside short-term measures to try to shield consumers from the impacts of the crisis, the IEA notes that many governments are now taking longer-term steps. Some are seeking to increase or diversify oil and gas supplies, and many are looking to accelerate structural changes.

The most notable responses include: the US Inflation Reduction Act, which has put $400 billion on the table in the form of subsidies and incentives for clean energy technology; the EU's Fit for 55 package and REPowerEU; Japan's Green Transformation (GX) programme; Korea's aim to increase the share of nuclear and renewables in its energy mix; and ambitious clean energy targets in China and India.

Notably, today the biggest driver for clean energy investment is energy security – ahead of climate commitments, which was the main driver in the past. Many governments also want to be a part of the new industrial era based on clean energy manufacturing.

According to the Outlook, this will see clean energy investment increase from around $1.3 trillion today to about $2 trillion in 2030 – a roughly 50 per cent increase under current government policies.

Laura Cozzie, Chief Energy Modeller at the IEA, said: "Clean energy investment has been growing since 2015 when the Paris Agreement was signed but we saw a jump in 2021 as countries started putting sustainable economies in place after the Covid crisis. Now, over the last several months and past year, we've not only seen an increasing number of policies put in place, but also the money backing those policies."

The current policies also result in a "distinct peak" in fossil fuel consumption in the 2030s for the first time since the Industrial Revolution.

"For the last three or four decades, the share of fossil fuels in the global energy mix has been around 80 per cent. In the 2030s we will see it fall below 70 per cent," noted Birol. "Additional policies to further drive clean technologies could push this even further down."

There is no doubt that Russia's actions in Ukraine have prompted this new forecast for a much faster decrease in fossil fuel use. Based on its numbers, the IEA notes that prior to the invasion, Russia was the world's number one exporter of fossil fuels. Since the war, however, Russia has lost its most important customer. Europe had accounted for 75 per cent of Russia's natural gas exports and 55 per cent of its oil exports – a market the IEA believes will be "very difficult" to replace. It therefore sees Russian exports of oil and gas declining in the years to come.

Tim Gould, IEA Chief Energy Economist, added: "In recent months Russia has cut gas deliveries to the EU by around 80 per cent. We assume there is no way back for the EU-Russia gas relationship. That relationship was built up over 50 years on the basis of trust and that trust has disappeared."

The IEA also noted that the "decade of the golden age of gas" is reaching an end. It forecasts that there will only be very modest growth in the next decade, followed by a "very long plateau". It noted that this is due to policies and the availability of many technologies in the power sector that can produce electricity in a much cheaper way than gas.

Notably the IEA cited electricity as "one sector in particular that is moving ahead and really turning the corner". Although coal saw small growth in 2022 for producing electricity, due to some countries keeping plant running to secure electricity supply, increases in wind and solar were even larger. "By 2025, coal will be on a downward trajectory," said Cozzie.

The trend towards wind, solar and even nuclear, says the IEA, means that the world will be producing more electricity from clean energy sources than from fossil fuel. The upshot of this is that the electricity sector is already "living through" the peak in carbon emissions and they will start to decline "very soon".

While the WEO 2022 offers some level of optimism, it comes with a warning. According to IEA calculations, the current trend under existing policies will increase average global temperatures by 2.5°C by 2100 – still well short of the ambitions set out under the Paris Agreement to limit the temperature rise to 1.5°C, the level needed to avoid catastrophic and irreversible climate change. The IEA added that if the pledges made at last year's COP26 climate meeting in Glasgow are fulfilled, temperature rise would be 1.7°C; still short of what is needed.

"There have been many important achievements but there is still a significant gap in meeting our net zero targets and securing 1.5°C," said Birol. "That $2 trillion investment in clean energy to 2030 needs to double to $4 trillion."

Most of the work, says the IEA, needs to be done in the emerging economies and it is a critical issue that will need to be addressed in the upcoming COP27 meeting in Egypt. "If there is one outcome I would like to see at COP27, it would be for the advanced economies to show that they are serious about climate change by providing strong support for the clean energy investment in developing countries, especially in Africa," said Birol.

Despite all the challenges in today's energy markets, the IEA believes that reaching the 1.5°C target is still achievable. As Russia's war in Ukraine has shown, even the darkest of clouds can have a silver lining, Let's just hope it does not take another war or some other major disruption to accelerate the pace of change still further.

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