Gas to Power Journal
Peakload Power and Energy Storage

Focus on H2 co-firing and carbon capture

Weekly News 21 January 2022

Gas only deemed 'transitional investment' if unabated gas-burn falls

The EU taxonomy's classifies new gas power as 'transitional investment' – but only if the rate of unabated gas declines over time. At least 30% of low-carbon gas needs to be co-fired by 2026, and the rate is envisaged to reach 100% by 2035 – though European utilities will struggle to source enough hydrogen in time.

Co-firing fossil gas power plants with hydrogen and ammonia is a quick way to decarbonise, as both fuels produce virtually no emissions when burnt. But operators first need to upgrade the boilers in their power plants so that they can actually combust the green fuels.

Mitsubishi Heavy Industries (MHI) is already undertaking test-runs of ammonia co-firing at some of JERA's thermal power stations in Japan.

Engineers are working to demonstrate a 20% ammonia co-firing rate at Unit 4 of JERA's 1 GW Hekinan thermal power station in fiscal year 2024. Looking ahead, the JERA-MHI team vowed to verify co-firing with at least 50% ammonia at two different boiler types by 2028.

Europe lacks strategy for gas-to-H2 transition

Much ado has been made around hydrogen, but EU policymakers have so far not set out a clear strategy of how to transition from fossil gas to hydrogen.

RWE and other key power producers want clarity in terms of regulation, taxation and possible incentive systems before they commit to invest. Germany's new coalition government aims for the coun-

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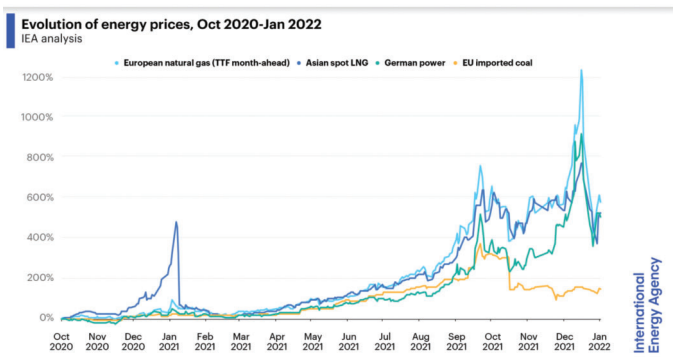
IEA rebukes claim of clean energy crisis, blames Russia for Europe's gas shortage

The International Energy Agency (IEA) has dismissed rumours that Europe's sky-high gas and electricity prices are caused by the clean energy transition. "This is not a renewables crisis; it's a natural gas market crisis," IEA head Fatih Birol said, pointing out Gazprom reduced export to Europa by 25% in Q4-2021 and currently delivers one-third less than could.



"We see strong elements of 'artificial tightness' in European gas markets, which appears to be due to the behaviour of Russia's state-controlled gas supplier Gazprom," Birol commented. Unlike other pipeline gas suppliers – such as Algeria, Azerbaijan and Norway – Russia has cut supplies by over a quarter at the onset of the winter season, in the face of record high prices.

Against today's low baseline, the IEA estimates Russia could increase deliveries to Europe by at least one-third, or over 3 billion cubic metres (bcm) per month. "This equates to almost 10% of the European Union's average monthly gas consumption – and would be the equivalent of a new LNG tanker delivering a full cargo of natural gas to Europe every day," Birol explained, suggesting: "Together with the current high level of LNG inflow, this would provide significant relief to European gas markets."

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AGENDA

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try's electrolysis capacity to reach 10 GW by 2030. A rapid market ramp-up, can however only be achieved through quotas for green H2 in public procurement and attractive incentive schemes for heavy industry and power generators.

"Fossil gas can only be a bridge to a decarbonised electricity supply. As an energy supplier, we have no desire to have the discussion we are having about coal today about gas again in ten years' time," underlined RWE CEO Markus Krebber.

Germany alone will need to build 20-30 GW of new gas-fired capacity to keep the lights on in the event of low wind and solar power availability. "At the moment, our security of supply is based entirely on nuclear energy, lignite and hard coal. We have few gas plants. But nuclear energy and coal must be completely replaced in order to establish security of supply," Krebber explained.

Converting surplus wind and solar power into green hydrogen is one option, but not enough. Imports will have to cover the lion's share of Europe's future hydrogen needs hence it is about time to set up stable and lasting supply chains. ■

Henry Hub-linked LNG at discount to spot prices through 2025

Concerns about exposure to Russia push gas buyers towards LNG contracting. Both oil-indexed and Henry Hub-indexed long-term LNG contracts will trade at a considerable discount to local spot prices through to 2025/6," Wood Mackenzie reckons, though utility companies need to commit to longer duration contracts to take advantage of the current spot price premium.

Start-up of the contentious Nord Stream 2 pipline, Gaprom's 55 bcm direct gas link to Germany through the Baltic Sea, will be delayed until summer 2022, the German regulator BNetzA disclosed. Disregarding the risk of fuel shortages, BNetzA "preliminary halted" the certification process until Swiss-based Nord Stream AG has founded a subsidiary under German law to own parts of the pipeline – a request set to delay matters until summer 2022.

Weather risk

For the winter period, the delay the Baltic interconnector exacerbates the risk of fuel shortages particularly because Gazprom has so far been reluctant to make more gas available on the existing routes – adding to political tensions.

"The start-up of Nord Stream 2 remains the big unknown as Gazprom navigates regulatory approvals. Political relations remain fragile as Russian troops amass along the Ukrainian border," said Wood Mac's principal European gas analyst, Kateryna Filippenko.

Market observers warn the German regulator and EU policy makers may ultimately derail the multi-billion pipeline project which would endanger the country's supply security at a time when it simultaneously exits coal and nuclear power.

Supply shortages

Cold weather might evoke serious supply shortages, that might be barely filled with spot LNG.

At normal weather condition, the low Russian imports will drag down European storage inventories below 15 bcm by the end of March – a record low. "Normal winter weather, including in Asia, and visibility on Nord Stream 2 commissioning would push prices down, although demand for storage (and high carbon costs) will maintain prices above US$15 per MMBtu," Filippenko commented.

Cold weather, in contrast, would adding up to 10 bcm to gas demand through the rest of the winter, pushing storage levels to zero unless more Russian gas is supplied. In this event, European gas companies may have to tap into cushion gas to balance the market.

Refill requirements

Gas prices will eventually come down as spring approaches, but requirements to refill storage facilities will be high at 20-25 bcm more than this year "Without additional Russian imports, the ability to refill depleted storage and to avoid a repeat of last year's crisis will be limited," she warned.

To shield against future full shortages, a new EU strategic gas storage policy would have to overhaul and streamline regulation. Italy, Hungary and Austria also have strategies in place to supply the market in the event of a supply shortage, but others do not. ■

US LNG carrier arriving in Rotterdam

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US LNG cargoes diverted from Asia to Europe

Sky-high gas prices in Europe has made some US LNG exporters divert cargoes – initially sold to Asian buyers – to northeast Europe. Ports in the Netherlands, Belgium and the UK have nearly 30 LNG tankers scheduled for delivery this month, with at least 13 tankers scheduled to arrive from the United States. Possibly more, if further cargoes will be diverted.

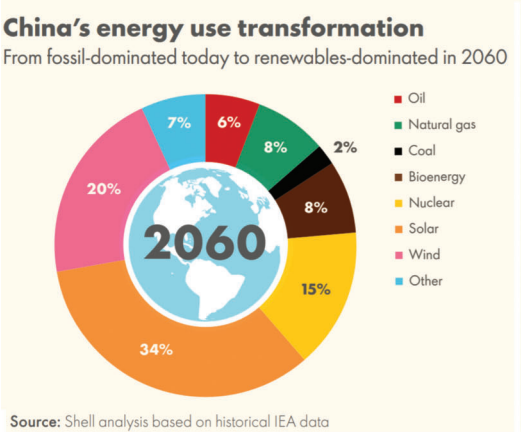
"LNG diversions from Asia are a useful stop-gap measure but are not a sustainable substitute for stable pipeline supplies," Wei Xiong, senior analyst at consultancy Rystad Energy commented. Should Asia's LNG demand soars in January, however, this would pre-empt further cargo diversion to Europe even though the risk of gas supply shortages remains in the face of lower Russian pipeline gas supply. ■

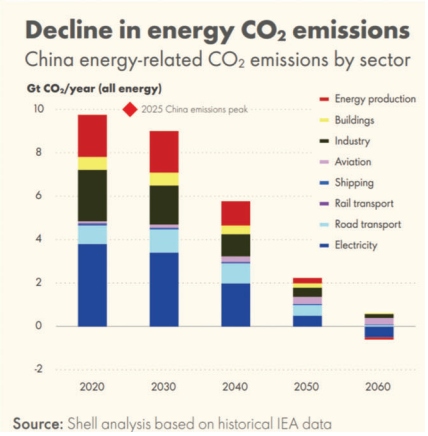
Shell expects electricity to meet 60% of China's energy use by 2060

China may triple electricity generation to cover 60%, instead of the current 23% of total energy demand to reach Net Zero by 2060, Royal Dutch Shell reckons. The oil major also predicts green hydrogen to play a key part in China's future energy mix as the country's carbon price will quadruple to 1,300 yuan ($204.82) per tonne in 2060.

Shell is not only a leading LNG supplier to China but also a large investor in the country's natural gas, petrochemicals and retail fuel network. As of late, Shell is also engaged in expanding hydrogen co-firing of China's gas power stations.

Commenting on China's future fuels, Shell urged the government to take quick action if it wants to achieve its 2060 carbon-neutrality goal. So far, Beijing has detailed plans on how to reach peak emissions by 2030 but has refrained to reveal and carbon reduction pathway going towards 2060.





Switch to renewables and green hydrogen

To decarbonise, China needs to expand its renewable power gen capacity and convince its heavy industry to adopt carbon capture and utilisation (CCU) and green fuels like hydrogen and biogas.

Hydrogen is expected to scale up to 17 exajoules (EJ), or equivalent to 580 million tonnes of coal by 2060, up from near-zero levels today. Over 85% of this hydrogen will be produced through electrolysis powered by renewable and nuclear electricity, Shell forecast. By 2060, hydrogen could cover 16% of China's total energy needs, fuelling heavy industry and long-haul road transport. ■

Chinese corporates seen to double energy-spend in 2022

Electricity demand growth in China is forecast to exceed 8% in 2022, driving up global coal and LNG prices, which forces the heads of state-run utilities importers and major industries to think twice whether to buy fuel from the United States, Australia and Qatar, pipeline gas from Russia or if they rather want to keep burning thermal coal. Wood Mackenzie expects a "doubling of spend by Chinese NOCs in 2022," up from its current US$4 billion guidance.

Economist remain positive for 2022, even though the pandemic has not come to an end just yet: "Fears over both Omicron and a collapse in China's real estate sector are overblown," says WoodMac's head of Asia Pacific Power & Renewables, Alex Whitworth. It's rather that China's resilient manufacturing sector and strong export growth will keep driving up demand, along with prices of coal and LNG.

Exceptionally high gas and power prices are seen as the biggest risk to Asia's wider economy. "Most consumers in China, India and other fast-growing Asian markets have not yet felt the full impact of rising electricity costs," Whitworth commented. In the worst case, spiralling energy demand could cause supply shortages – similar to the ones in summer 2021 during the fast recovery of the Chinese manufacturing sector from the Delta-variant of the coronavirus.

Corporates, especially energy-intensive industries, have been burdened by spiralling costs for electricity, heat and other raw materials. At the same time, they have to comply with ever-more stringent environmental rules and policies that favour renewable energy sources or clean fuels like hydrogen over traditional thermal fuels

Corporates at a tipping point

Most corporates in Asia, the United States and Europe have set out energy transition goals, and some have already provided elaborate strategies and capital guidance. "2022 will be a tipping point on the back of more ambitious pledges at COP26 as strategies materialise into investment decisions," reckon WoodMac's directors for corporate research, Kavita Jadhav and Andrew Harwood. Having evaluated a multitude of corporate guidance, they see 2022 shaping up to be a transitional year as decarbonisation takes a firm hold.

"We could see a doubling of spend by Chinese NOCs in 2022, for example, from the current US$4 billion guidance. Greater country-level ambition and target setting for 2025-30 will bring forward investments," the two analysts commented. Based on WoodMac's emissions benchmarking tool, Chinese NOCs represent up to a fifth of global (Scope 1 and 2) emissions from 2022-30 – meaning there is still much room for improvement.

Will climate goals be watered-down?

At COP26, the UN Climate Summit held in Glasgow in November, there was a rare reprieve in tensions between the US and China. A climate deal was signed in a last-minute action by the heads of both states, but analysts warned that if the political situation worsens again they could cause Chinese state-owned companies to "turn inwards and phase down climate cooperation."

In 2021, the New York Stock Exchange (NYSE) delisted CNOOC, and the national oil and gas company is now in the process of listing on the Shanghai stock exchange along with its existing Hong Kong listing. "A reduction in ownership from global investors lowers transparency and financial disclosure on climate risk and slows capital flows towards the energy transition," analysts warned. ■

TenneT calls for H2-ready gas power to balance onshore wind build-out

Concerned about an excessive onshore wind buildout, Germany's biggest TSO TenneT underlined the vital role of new hydrogen-ready gas power plants. "If we want to exit coal already by 2030 already, the economy ministry needs to honour its commitment to H2-ready power. TSOs need stable capacity to balance the grid," says TenneT COO, Tim Meyerjürgens.

TenneT is the sole transmission grid operator in the Netherlands and also the biggest among the four TSOs in Germany. Its main task is to ensure stable supply of affordable electricity to industry and household customers – an increasingly difficult task. Especially in Germany, where coal and nuclear power is phased-out almost simultaneously by 2030, and 2038 respectively.

Onshore wind vs. flexible gas

Robert Habeck, Germany's new minister for economy and climate, wants to accelerate the wind power buildout of offshore although RWE CEO Markus Krebber had calculated up to 30 MW of new gas generation is necessary to back up the county's coal and nuclear exit. Nevertheless, Habeck opposes the inclusion of natural gas as a 'sustainable investment' the EU taxonomy.

Making more onshore wind capacity additions possible is key for the Green Party which wants to change distance rules of wind turbines from beacons and military areas to free up land for some 9 GW of new wind farms. In total, 2% of Germany's land will be designated to wind energy. Only the northern state of Schleswig-Holstein and Hesse have reached this target, while Bavaria adamantly opposes it.

"The 10H rule will not be changed. The new 'super minister' should be more concerned with the necessary construction of power lines and the prevention of gaps in supply," Markus Blume, general secretary of Bavaria's conservative CSU party.

CfDs for industry and hydrogen

Contracts for difference (CfDs) are meant to incentivise the chemical industry to invest in climate-friendly power supply, notable through hydrogen. Steel making could also be decarbonised through hydrogen, if enough of the emission-free fuel becomes available.

"For the annual consumption of the steel industry alone, we need 15 TWh of hydrogen in 2030," Habeck said, adding that such figures would demand doubling the production plans of Germany's national hydrogen strategy.

Hydrogen, initially derived from natural gas by later mostly from renewables, will also be used to co-fire gas power stations. German industry association BDI commented that a "massive addition to the gas-fired power plant fleet" is "the central prerequisite for an industry and manufacturing location with a secure supply".

Abolishing the renewables levy on the power price was a "welcome but insufficient step to support the switch from fossil fuels to electricity in industry," said BDI president Siegfried Russwurm. He demands more relief from fees and levies on energy, saying that "all companies are suffering from sharply rising energy and electricity costs." ■

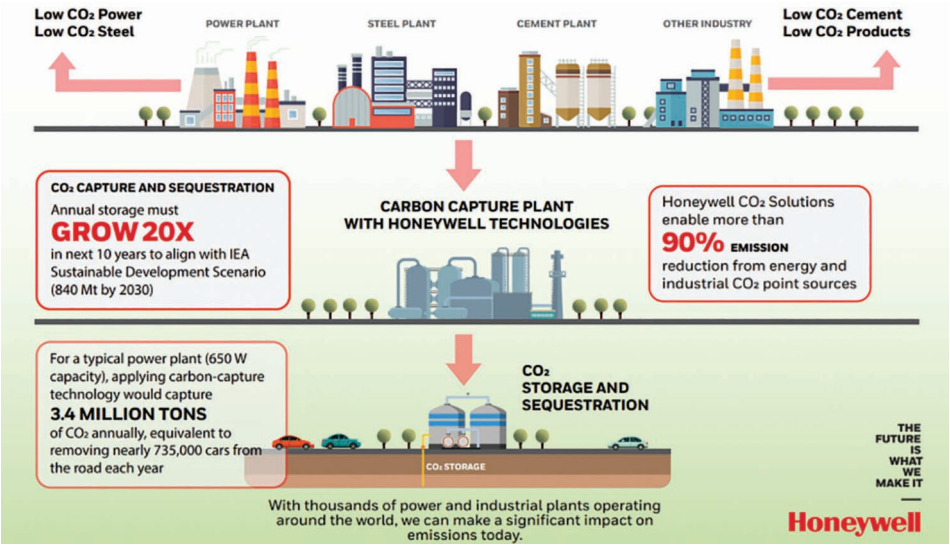
Honeywell turns to Advent Solvent tech to capture CO2 at lower cost

Honeywell has entered a licensing arrangement with University of Texas at Austin to utilize the latter's new Advent Solvent technology to capture CO2 more efficiently. Carbon pricing accelerates retrofits in the power sector and Honeywell says applying advanced solvent CCS to a typical 650 WM plant allows to capture about 3.4 million tons of CO2 annually.

This is equivalent to removing nearly 735,000 cars from the road each year, Honeywell engineers said who based their calculations on conversion factors from the US Environmental Protection Agency (EPA).

CO2 pricing accelerates CCS retrofits

Several national governments, use CO2 pricing as a policy lever make industries retrofit their facilities with CCS. In the United States, developers of permanent carbon storage can benefit from $50/ton tax credit as per IRS Section 45Q while the comparable carbon price is in Europe is $60/ton.



Analysts pointed out in 2022, CCUS projects worldwide were capturing and storing/using 40 million metric tons per year of carbon dioxide. But in order to align with the IEA Sustainable Development Scenario (SDS), which demonstrates a pathway to limit global temperature rise by less than 1.65º C, the CCUS project capacity would have to be over 20 times higher and capture 840 million metric tons per year of CO2 by 2030.

Smaller footprint through advanced solvent

Technically speaking, UT Austin's patented solution utilizes an advanced solvent, which enables CO2 to be captured with much smaller equipment which creates viable project economics today under current CO2 policy frameworks in North America and Europe.

"The licensing agreement with Honeywell enables us to commercially scale this in ways that can make major contributions toward zero emissions efforts," said Gary Rochelle, professor at the McKetta Department of Chemical Engineering and leader of TxCMP at UT Austin,

He and his team have established an efficient, second-generation amine scrubbing system through years of research and analysis. The improved performance from this solution can unlock project economics for "hard to abate" industries such as steel, cement, and chemical plants, and coal, natural gas and bio-energy power plants.

Ben Owens, general manager, Honeywell Sustainable Technology Solutions said by working with UT Austin, our advanced solvent carbon capture system will enable lower cost of CO2 captured post-combustion. Honeywell's cost analysis compares estimated capital and operating costs of its solution against other conventional amine solvents in same applications. Today, 15 million tons per year of CO2 is being captured and used in storage/utilization units through Honeywell's CO2 Solutions process expertise. The company currently has the capacity to capture 40 million tons per year through its installed projects worldwide. ■

Renewables buildout given priority over direct-air-capture

Capturing carbon emissions directly from the air requires a lot of electricity, hence the German government prioritises the renewable build-out. "Carbon Capture and Utilisation (CCU) with direct air capture should only be used once renewables have reached a share of more than 80% of power supply," analysts at the Federal Environment Agency (UBA) stressed.

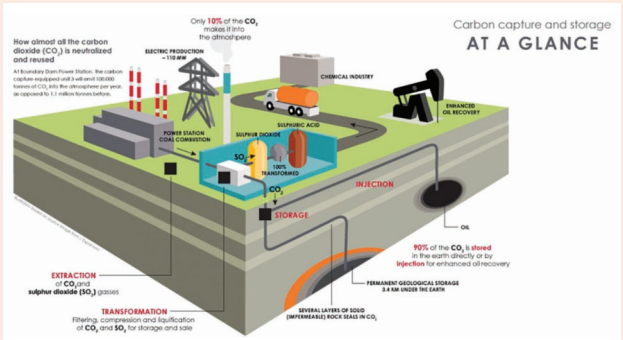
"If fossil carbon is captured by CCU and used elsewhere, it always ends up in the atmosphere at the end of the use chain, regardless of the number of subsequent uses," researchers said in a study compiled on behalf of the German government.

In contrast, US market observers argue that industrialised countries should rush to build up a new industry of CO2 removers. The debate around negative emission has been gaining traction in the wake of the COP26 Climate Summit in Glasgow.

Carbon capture incurs efficiency losses

If applied to combined-cycle power stations, carbon capture reduces the plants' efficiency by 11% on average, a study by Sari Siitonen, Gasum Oy and Leena Pirhonen ÅF-Consult shows. Analyst evaluated how the integration of pre-combustion carbon capture technology in the gas-fired combined heat and power (CHP) plant affects the efficiency, power-to-heat ratio, CO2 emissions and costs of the power plant.

The study modelled a combined-cycle gas turbine power plant producing both head and electricity with pre-combustion carbon dioxide capture. The efficiency of the power plant modelled was 11% lower than a corresponding power plant without CCS, while the power-to-heat-ratio was 6% higher an in a plant without CCS. ■



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Mitsubishi to fire up JAC-class gas turbines at Fujairah F3 plant in 2023

Mitsubishi Power is working to install, test and commission three M701 JAC-class gas turbines at the Fujairah F3 combined-cycle power plant by early 2023. The 2.4 GW unit under development at Ras Al Qidfa will be the UAE's largest power station, capable to supply 380,000 households with electricity.

Fujairah F3 is being built by a consortium of Abu Dhabi Power (ADPower, 60%) and Japan's Marubeni (40%). The two companies were awarded a contract by Emirates Water and Electricity Company (EWEC) to finance, build and operate the 2.4GW facility at a site between the existing F1 and F2 power units.

Fujairah F3 will be built between the F1 and F2 units

EPC works are carried out by Samsung Construction & Trading (C&T) under a contract worth US$977 million. The three M701 turbines were shipped by Mitsubishi Power to the Fujairah, UAE, in December from its Takasago Machinery Works in Japan.

M701 JAC-class gas turbines achieve an efficiency greater than 64%, reliability of 99.6%, and the lowest carbon emissions per unit of power when used in combined cycle. Capable of operating on a mixture of up to 30% hydrogen and 70% natural gas, the turbines can be increased to 100% hydrogen in the future.

For Mitsubishi, the F3 project is the first in the Middle East to utilize advanced JAC-Series gas turbines. To fast-track works, the Japanese OEM dispatching engineers to provide support until the start of commercial operations, and will handle maintenance and repair of the generating units.

These days, Mitsubishi Power is showcasing its turbines and energy solutions t the World Future Energy Summit (WFES), being held from 17-19 January in Abu Dhabi. ■

NEWS NUDGES

Cresta to fund Lapis Energy's CCS projects

Texas-based Cresta Fund Management has agreed to finance Lapis Energy's CCS and clean hydrogen projects. The two partners are now looking to identify, design and develop projects for the permanent sequestration of CO2, targeting customers within the heavy industry and petrochemical companies.

mtu to power Romania's largest data center

mtu Series 4000 gas generators will provide electricity heat and cooling for Romania's largest data center. ClusterPower is building a 273,000-squaremetre technology campus near Craiova by 2025, where it will host five data centers with a Power Usage Effectiveness (PUE) of 1.1

Green hydrogen from Quebec

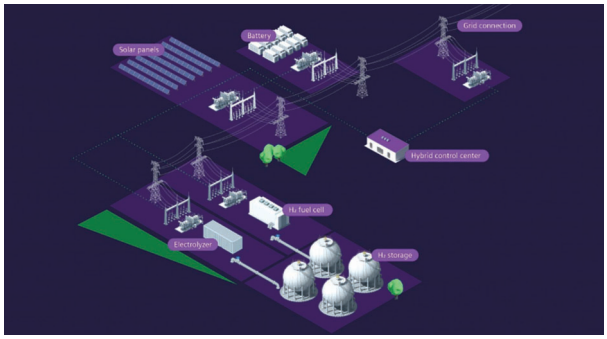
Charbone has agreed to provide the US propane distributer Superior with green hydrogen from its Sorel-Tracy facility in Quebec, Canada, starting from the third quarter of 2022. The hydrogen will be delivered directly from Charbone's H2 plant to Superior's customers which include mining, power generation, transportation and industrial energy users. ■

H2 power plant plus energy storage for French Guiana

Tapping the power of the sun, Siemens Energy will set up a hybrid plant to supply stable baseload electricity to 10,000 households in French Guiana. An intelligent combination of 55 MW photovoltaics, an electrolyser to produce green hydrogen, fuel cells and energy storage is scheduled to be commissioned in the autumn of 2023.

A solar photovoltaic field with around 55 MW installed electrical capacity will be at the heart of the plant. Depending on demand, the electricity will be either directly supplied to consumers, stored in a battery or partially converted into hydrogen. That H2 can be turned back into electricity, if and when needed, by means of a fuel cell. Over 128 MWh of electricity can be stored, making the local industry independent from power supply from the national grid.

At normal time, the combination of photovoltaics, battery, electrolyser, and fuel cell, the hybrid power plant will provide an electrical output of 10 MW during the day and evening and three MW at night.



Scheme of a hybrid power plant

Meridiam turns to sustainable power

The customer of the sustainable power unit is Centrale Electrique de l'Ouest Guyanais (CEOG), a project company owned by Meridiam as majority shareholder, HDF, and SARA. "The projects illustrate Meridiam's capacity to develop, finance and operate sustainable and resilient infrastructures over the long term," said Julien Touati, Corporate Development Director of Meridiam.

"The CEOG power plant will supply half of the current energy needs of the population of Saint-Laurent-du-Maroni and Mana. It will produce clean and reliable electricity that will be fed into the national grid 24 hours a day, 365 days a year. Without fuel imports, without greenhouse gas emissions and without noise, the residents of French Guiana shall be looking forward to an economical, reliable and clean supply of electricity," said Karim Amin, Siemens Energy's Executive Vice President Generation.

Scope of supply includes the hydrogen storage, data analytics to optimise the plant's operation, power forecasting tools and the grid connection. Works will commence over the next month with a view to get the hybrid power unit delivered, installed and operational before winter 2023. ■

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