



GE-led carbon capture to curb 95% of emissions at 'Plant Barry'

GE Gas Power has been awarded \$5.7 million in US government funding to cut 95% of carbon emissions at Alabama Power's 2,370 MW 'Plant Barry.' To that end, the combined-cycle unit will be retrofitted with Linde's Gen 2 carbon capture solution based on BASF OASE blue technology. Commercial deployment needs to commence by 2030.

Alabama Power's James M. Barry Electric Generating Plant, also known as "Plant Barry" is a coal- and natural gas fired generator situated in Bucks, Alabama, powered by two GE 7F.04 gas turbines. In a front-end engineering design (FEED) study, GE looked at integrating the CCGT units with carbon capture utilisation and storage.

"Plant Barry" is the reference plant for the FEED study which will receive \$5,771,670 in federal funding from the U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management once the award negotiations are completed successfully. However, the funding for CCUS applications is contingent on the retrofitted power plants to start operations by 2030.

Eager to stick to this timeframe, GE will with Alabama Power's parent Southern Company, Linde, BASF, and Kiewit to integrate



Plant Barry in Bucks, Alabama

carbon capture with a combined-cycle power plant. Apart from retrofitting the GE 7F.04 gas turbines, the project will also enhance the steam turbine with a view to reducing the impact on the plant's electricity output, performance, and equipment cost.

Post-combustion Carbon Capture

Linde and GE reiterated plans explore CCUS opportunities in North America by retrofitting gas turbines with Linde's post combustion amine-based carbon capture processes. The German chemical

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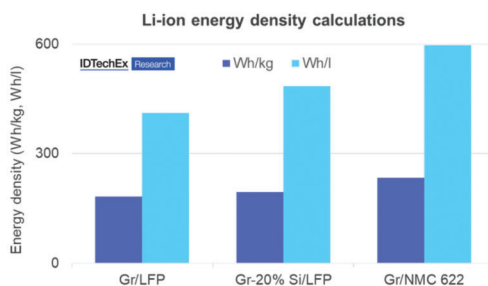
Anode technology – the way forward for better Li-ion batteries

Lithium-ion batteries have hit their performance ceiling, but a shift in the anode material used to silicon or lithium-metal could improve their energy density. Start-up companies rush to develop anodes based on silicon which is expected almost double cell-level energy density, compared to the commonly used graphite – expanding the range of electric vehicles and energy storage.

Silicon can also improve the appeal of lower energy cells, such as lithium iron phosphate (LFP), narrowing the gap to nickel-manganese-cobalt oxide (NMC) type cells and minimizing the core disadvantage of LFP, especially for battery electric vehicles. IDTechEx calculations estimate that incorporating 20% silicon into an anode could improve energy density by 17%.

Longevity issue

However, the issue with using silicon as an anode is longevity or lack thereof. The volume changes that it undergoes during cycling leads to the consumption of electrolyte and lithium and causes me-



Silicon can help narrow the gap to today's NMC and NCA type Li-ion cells. Source: IDTechEx - "Advanced Li-ion and Beyond Lithium Batteries 2022-2032: Technologies, Players, Trends, Markets"

chanical stresses that ultimately result in the loss of electrical and ionic conductivity. To help solve this issue, developers are working to incorporate porosity, electrolyte additives, and conductive and binding networks.

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company BASF will provide OASE Blue, developed specifically for large-scale post-combustion CCUS.

"With low energy consumption and exceptionally flexible operating range is paramount technology for use in flue gas carbon capture from sources such as fossil power generation plants or steam turbines," explained Todd Spengeman, business director – Standard Amines & OASE Gas Treating Excellence.

"Plant Barry" – template for future retrofits

Broadening its scope, GE stressed this retrofittable solutions can later be applied to other power generation units. "Plant Barry" is meant to serve as a template for lowering carbon emissions across more than 1,500 F-Class gas turbines worldwide, which currently deliver up to approximately 280 GW of electricity daily.

The FEED study – a detailed blueprint and

operating business guide – can accelerate commercial deployment of other projects. "To develop a sustainable and viable carbon capture solution integrated into the existing power plant, we will go beyond the scope of the study to consider the economics and the performance of the plant holistically, including a plan for the transportation and storage of the captured carbon dioxide emissions," said John Catillaz, GE Gas Power's director of decarbonization. ■

ABB changes name of turbocharging division to Accelleron

ABB has rebranded its turbocharging division for diesel and gas engines by renaming it Accelleron: a combination of Access – Accelerate – Excel – on and on. The new name is part of ABB's strategy to carve out the turbocharging unit before a decision is made between a sale or a spin-off at the end of the first quarter.

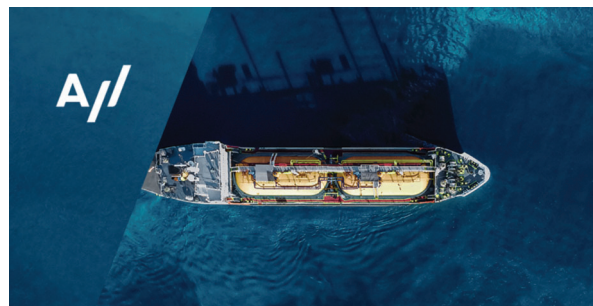
Accelleron focusses on 0.5 to 80+ MW engines, in the marine, energy, rail, and off-highway sectors with about 180 000 turbochargers installed worldwide. In 2021, the company reaped revenues of approximately \$750 million and has over 2,300 employees worldwide.

Turbochargers made by ABB have been helping to balance electricity flows in national grids, power extensions in emerging economies and microgrids as well as back-up power for critical infrastructure, e.g. data centers and hospital.

The corporate colour of ABB's former turbocharging division was changed to bright purple which is meant to represent a "powerful, inspirational, and noble brand."

"Unveiling the Accelleron brand is a seminal moment for our business. We are proud about our heritage but are also excited about our next chapter of growth, providing cutting-edge technology and service solutions for our clients," said CEO Oliver Riemenschneider, who will be succeeded by Daniel Bischof-

berger on March 1. Bischofberger is re-joining ABB from Sulzer. In the case of a spin-off, Riemenschneider is likely to become chairman of Accelleron. ■



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Silicon also has a reduced risk of dendrite formation, while the porosity and conductive additives that are needed help with fast-charge capability and operation

at low temperatures. Overall, silicon anodes are "a highly promising proposition," IDTechEx finds and several start-ups are now advertising cells with "reasonable cycle lives."

Cycle life

Lithium-metal anodes, meanwhile, also hold great promise for improving energy density but again, they suffer from poor cycle life. They are also at higher risk of dendrite formation and short-circuits.

Solid-state electrolytes are being widely developed as a solution but designs using a thin protective barrier and a stable liquid electrolyte are also being explored as a means to enable lithium-metal anodes. SES is a company that uses this approach.

With some of the performance challenges with silicon and lithium-metal being solved, the focus is now on how these solutions can be manufactured at scale and integrated into current battery making processes.

Fast-charging

Beyond just energy density, fast charging is another key metric. Silicon anodes may be well suited to fast charging and claims around fast charging of Li-metal-based cells suggest improvements are being made here too.

But IDTechEx cautions some applications may require both fast-charge capability and very long cycle lives – beyond the 1000 cycles generally possible with Si or Li. More novel anode materials based on niobium and tungsten oxides are under development by Toshiba, Echion, and Nyobolt, with promises of 5-6 minutes charging times, cycle lives in the 10's of thousands but with energy densities likely to sit below lithium iron phosphate.

Graphite, followed by silicon and lithium-metal are set to be the key anode materials over the coming decade, IDTechEx concludes. Demand for silicon anode material, by weight, is forecast to grow at a rate of 45% between 2022 to 2032. ■

Gas to Power Journal

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Nord Stream 2 would be 'dead' if Russia attacks Ukraine

German chancellor Olaf Scholz has met the Russian President Vladimir Putin in Moscow to deescalate tensions, well knowing the US will levy sanctions to derail the Nord Stream 2 gas pipeline if Russia attacks Ukraine. An outright war could put 155 Bcm/y, or 30% of Europe's annual gas imports at risk, Rystad Energy warns.

"There will be no Nord Stream 2 in this event," US President Joe Biden told Scholz in Washington last week. Scholz, as well as his predecessor Angela Merkel, have for long branded Nord Stream 2 as a "purely commercial project." But the United States adamantly wants to levy sanctions on the Swiss and German project company in the event of a military escalation at the Russian-Ukrainian border, where the Kremlin has amassed some 120,000 troops.

LNG could fill the gap "with ease"

Of the 155 Bcm of piped gas Europe imported from Russia in 2021, some 40 Bcm

was piped through Ukraine – a supply that would likely be disrupted in the event of military escalation between the two countries. If only the 40 Bcm were taken off the table, Europe could make up the difference with "relative ease," but would have to pay higher prices for replacement volumes via spot LNG cargoes.

"Western European countries have nearly enough LNG import capacity to replace all Russian gas but would need an additional 8 Bcm of domestic production to make up the difference to 2021 levels, Rystad analysts reckon.

But Western Europe has already maximised its LNG import capacity after Russian supplies dropped significantly last month because of lower gas flows through Ukraine and the Yamal-Europe pipeline running in reverse. LNG imports into Western Europe totaled 294 million cubic meters per day (MMcmd) in January 2022 – a new all-time high utilizing 100% of the region's regasification capacity – with most additional vol-

umes coming from the US. According to Rystad data, of the total 8.6 Bcm of LNG that Western Europe imported in January, 56% or 4.8 Bcm came from the US, 1.7 Bcm came from Russia and 0.7 Bcm from Qatar.

Storage at historic low

Though a total shutdown of Russian piped gas is unlikely, European gas markets are entering the final stretch of winter in a precarious position: Gas stocks in underground storage are at five-year lows, global LNG prices are highly volatile and additional supply is not forthcoming given that regulatory issues have delayed the planned start-up of Nord Stream 2 until the second half of this year.

Gas storage levels in Europe remain historically low at 45 Bcm currently. This is 30% lower than the five-year average and amounts to only two months of gas to meet average winter demand. Any supply disruption would hence lead to price spikes at the Dutch Title Transfer Facility (TTF), and would trigger gas-to-coal switching for power generation. ■



Works on a Nord Stream 2 section near Kingisepp, Leningrad Region

Gas flows via Yamal-Europe pipeline stay reversed

Flows of Russian gas via the Yamal-Europe pipeline remain reversed until Wednesday at least. Data from the TSO Gascade shows a steady stream of 1.52 million kWh/h of gas exiting Germany via the Mallnow border point to Poland. Gazprom normally uses the pipeline of 15% of its annual westbound supply, but currently not booked any capacity.

Gazprom can book pipeline capacity at the Yamal-Europe link at daily auctions but the Russian gas export monopoly has not booked any transit capacity for February. Neither did it book capacity for the second and third quarter of 2022, so far.

The lack of booking proves that Gazprom is deliberately withholding supplies to Europe in a bid to push up prices and pile pressure on EU and Germany regulators to approve the North Stream 2 link. Once approved, the controversial pipeline would double Russia's piped gas export capacity via the Baltic Sea to 110 Bcm – making parts of the current gas transits through Poland and the Ukraine superfluous.

Europe has very little storage buffer this winter and Europe's gas balance is therefore heavily dependent on imports. Reduced Russian supplies have to be balanced with more

expensive LNG, though spot cargoes may be hard of come by if prices increase in Asia.

January flow to Europe nearly halved

Gazprom openly stated it reduced deliveries to its European off-takers in January by more than 41% year-on-year, though it claims "gas deliveries are carried out in full compliance with contractual obligations. Though Russia's domestic gas production notched up 1%, or 0.5 Bcm to a total of 47.4 Bcm, most additional volumes were sent to Bulgaria and China.

Turning away from Europe, Gazprom is increasing supplies via the 'Power of Siberia' interconnector

to eastern China under a long-term bilateral contract with CNPC. Supplies are being delivered at an estimated price of \$350-\$400 per thousand cubic meters. Anticipating growth in Asia, Gazprom has proceeded the pre-investment phase for the 'Power of Siberia 2' pipeline. Supplies via this route may total up to 50 bcm/y, with the gas set to be brought to western China. ■



RWE, Neptun Energy to build green hydrogen plant in Dutch North Sea

Germany's biggest power generator RWE and independent petroleum producer Neptune Energy have agreed to develop H2opZee – a green hydrogen plant in the Dutch North Sea. The project will combine 300 to 500 MW electrolyser capacity, using offshore wind, with the hydrogen to be transported to land through an existing pipeline with up to 12 GW capacity.

Given the large pipeline throughput, it is suitable for the roll-out of further green H2 production capacity up to Gigawatt-scale.

Scalable H2 production at sea

Green hydrogen is seen 'vital' for future energy supply and it can be "produced in our own North Sea," said Lex de Groot, Managing Director of Neptune Energy in the Netherlands. This makes the energy transitions "faster, cheaper and cleaner" given that the H2 from H2opZee can be directly integrated in the existing gas infrastructure. No new pipeline at sea is needed and no new landfall needs to be made through the coastal area.

"With the PosHYdon pilot [the world's first offshore green hydrogen plant] we are one of the leaders in this field of offshore energy system integration and reuse. The lessons learned from this project apply to H2opZee. The faster we can scale up green hydrogen at sea, the faster industry such as chemicals and steel production can become more sustainable," de Groot explained, showing enthusiasm that the existing pipeline can 10 to 12 GW of green hydrogen in the future.

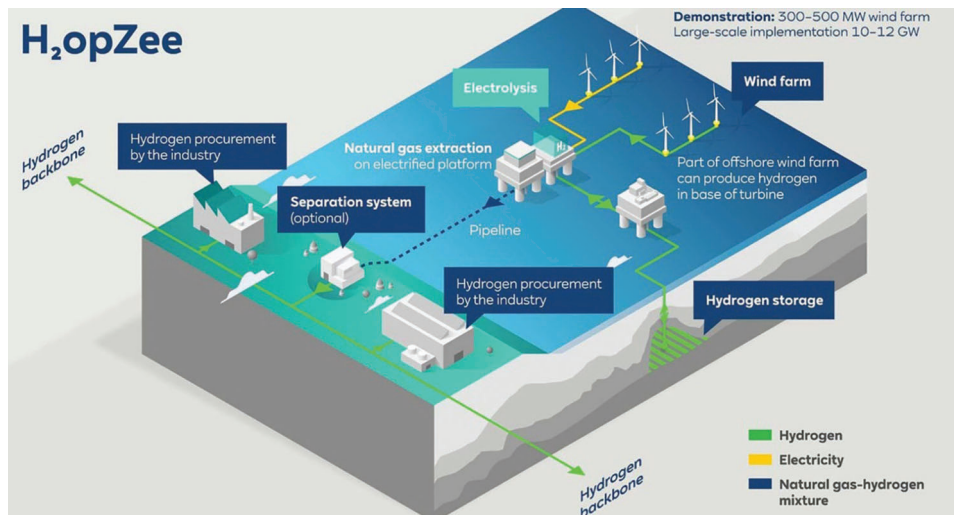
Tapping offshore wind

To realize H2opZee, a feasibility study will be carried out first followed by an implementation phase for which a tender methodology has yet to be designed. The actual project was proposed by TKI Wind op Zee, a Dutch initiative that brings people, knowledge and financing together to realize the offshore energy transition.

"With Neptune Energy at our side, we want to demonstrate how offshore wind can be an ideal partner to produce of green hydrogen at scale," said Sven Utermöhlen,

CEO Offshore Wind, RWE Renewables. "Hydrogen is a gamechanger in the decarbonisation of energy-intensive sectors, and H2opZee is among the world's first projects of this kind and scale."

RWE has a 20-year track record in offshore wind as well as hydrogen expertise. Learnings from H2opZee are meant to help ramp up the hydrogen economy in the Netherlands, as it is seen as a step towards rolling out large-scale green hydrogen production offshore. The technology, once proven, can be exported globally. ■



Tokyo Gas to issue energy transition bond to finance LNG and hydrogen

Tokyo Gas has decided to issue a corporate bond to finance low-carbon initiatives in March. The bond will be issued in two tranches of 7-year and 10-year terms, with a combined value of 20 billion yen (\$173m). Proceeds will be used for the Niihama LNG import project, smart energy networks as well as the Harumi hydrogen venture.

No firm date has been given for the bond sale, but Tokyo Gas said it would be handled via a domestic public offering platform. The issuance will be managed by the Japanese investment banks Mizuho Securities and Nomura Securities.

The novel 'energy transition bond' has

been selected as a model case for the Ministry of Economy, Trade and Industry's "Climate Transition Finance Model Project" set up in 2021. Tokyo Gas committed to use all proceeds for low-carbon and decarbonisation initiatives in line with the government's goal to establish a "carbon-neutral society" by 2050.

LNG, gas-fired power and hydrogen

All funds raise from the bond sale will be channelled into three projects: the Niihama LNG import terminal, under development by a Sumitomo-led joint venture, the Tamachi Smart Energy Network project and a hydrogen project.

Niihama LNG is designed with an import capacity of 1 million tons per annum (mtpa) and an adjacent 150 MW gas-fired power plant.

The Smart Energy Network will be developed at the Kinyohare Industrial Park with a view to save energy and cost through demand-side management. The project is developed together with Nomura Real Estate.

For the Harumi Hydrogen project, a basic agreement was concluded in connection with the Olympic Village, though no details have been communicated yet.

Going forward, Tokyo Gas committed to spend around two trillion yen (\$17 billion) in the clean energy growth areas through 2030. ■



France remains Europe's biggest net electricity exporter

Despite relying heavily on imports at the start of the winter, France has maintained its position as the biggest net exporter of electricity in Europe in the second half of 2021. According to EnAppSys data, France's net exports amounted to 21.5TWh, with most of the electric power flowing to Italy (7.5 TWh) and Great Britain (6 TWh).

Exports to France's neighbouring countries reached an all-time high of 21.6 TWh in the third quarter, but the 'Grande Nation' turned into a major import moving into winter: Day-ahead prices rose on the continent and high French electrical heating demand pushed up prices relative to neighbouring countries over much of November and December, incentivising more flows into France. Even structural importers of French power like Italy and Great Britain at times reversed their interconnector flows to alleviate the tightness in France.

Cold weather in December came for France alongside high demand, low wind and hydro generation and a series of nuclear maintenance outages which seriously curtailed baseload power supply. During this time France mainly relied on imports from Belgium, and from Spain which switched

from being a net importer to a net exporter during the last 6 months. Peak French imports were as high as 13 GW.

Italy and Britain biggest importers

Looking at the buy-side, Enappsys figures found Italy to have been the biggest net importer during the last six months of 2021, sourcing 20 TWh from outside the country, of which 9.4 TWh came from Switzerland and 7.5 TWh came from France.

Britain remained Europe's second biggest net importer, recording a net import of 12.9 TWh, up slightly from 12.3 TWh in the previous six months. This was sourced mainly from France (6.05TWh), with 3.47 TWh imported from the Netherlands and 3.41 TWh from Belgium.

Potential import capacity in Britain increased by 1.4 GW as the North Sea Link

came online on 1st October. This is the first direct link to Norway, which generates the vast majority of its electricity from hydropower and is therefore less sensitive to carbon (EU ETS) prices. These prices have increased substantially from €57.81/tce on the first day of July to €79.39/tce on the last day of December, meaning countries with a lower-carbon fuel mix benefit from relatively cheaper power and there is an increased likelihood of exports to other countries with higher prices.

Flows on the North Sea Link have been at maximum capacity, exporting from Norway to Britain, though the Norwegian TSO Statnett claims technical constraints mean they are unable to export more than 700 MW. This comes during a time of relatively low hydro reserves in Norway whilst the energy markets across Europe are under stress from high wholesale prices. ■

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DEWA's Hassyan plant adds 1.2 GW gas-fired power to Dubai grid

Production capacity of the converted Hassyan power complex in Dubai has reached 1,200 MW, Dubai Electricity and Water Authority (DEWA) confirmed. A further 600 MW will be added in the fourth quarter and another 600 MW in the third quarter of 2023 – once the plant has been fully switched from burning 'clean coal' to natural gas.

Hassyan had been designed and built as a dual-fuel plant, capable run full-time both on natural gas and clean coal. "When we decided to convert the complex to run on natural gas, there was no downtime and the conversion process went smoothly. This step supports the vision and directives of the leadership to turn Dubai into a carbon-neutral economy," said DEWA's chief executive Saeed Al Tayer.

By 2030, the emirate aims to generate 61% of its electricity needs from less polluting gas, most of which imported from neighbouring Qatar.

The fuel switch at the Hassyan complex will result in an entirely coal-free ACWA Power portfolio which is in line with the company's 2050 net-zero emission targets. Once converted and fully commis-

sioned, the Hassyan natural gas power complex will complement the Jebel Ali power and water desalination complex, both providing Dubai with cleaner electricity and water services.

ACWA Power owns a net stake of 26.95% of Hassyan power plant. The complex also includes a water desalination unit with a production capacity of 120 million gallons of water per day, using reverse osmosis. ■



Parts of Hassyan IPP now run on gas

First dual-fuel engines enter service on Japan's Miyako Island

Two MAN 12V51/60DF engines, installed at Okinawa Electric's power station on Miyako Island, have entered service. The dual-fuel engines will generate around 24 MW of electricity used for baseload but mainly for peak-shaving power demand of the small holiday island, home to 50,000 inhabitants plus a fluctuating number of tourists.

The engines were ordered by Kawasaki Heavy Industries back in 2020 but the Covid-19 pandemic proved to be the biggest hurdle to commissioning the Miyako project: Japan had fully closed its borders to foreign nationals earlier in 2021.

As a result, Augsburg-based MAN Energy Solutions drafted an alternative plan in conjunction with MAN Japan and used local personnel for the commissioning – backed up remotely by technical staff from Europe –

with the project ultimately proceeding smoothly and on schedule.

"The Miyako order is a first for the Japanese power-generation market as these MAN units are the very first dual-fuel engines to be installed in the entire country. They will mainly run on natural gas and their dual-fuel flexibility and reliability is perfectly suited for delivering an independent power supply in remote regions," explained MAN ES' head of power for Asia-Pacific, Martin Höhler.

Kawasaki Heavy Industries is one of MAN Energy Solutions' longest-standing partners in Japan with a mutual history dating back to 1911. Similarly, Okinawa Electric Power Company (OEPC) worked with the German manufacturer more recently when two MAN 18V48/60B engines were installed at a power plant on the neighbouring island of Ishigaki. ■



Miyako Island power plant

Ansaldo Energia wins gas turbine service contract in Egypt

Italian manufacturer Ansaldo Energia has been awarded a 20-year contract to service and maintain the gas turbines of the '6th October' power plant, owned by Cairo Electricity Production Company. The plant consists of an open cycle and a combined cycle phase (4 x 150 MW), each equipped with four AE 94.2 gas turbines.

Situated at the outskirts of Cairo, the gas-fired power plant had been manufactured by Ansaldo starting from 2014 and the turbines were built and shipped from its factory in Genoa. These turbines were already covered by two expiring 'Frame Agreements' service contracts.

The new deal is a 'turnkey' long-term service agreement which covers all eight gas turbines of the plant. It provides for complete parts supply, service activities for scheduled maintenance, repair of vanes, spare parts, instrumentation and training activities for the local staff working in the plant.

"Service is a strategic asset for Ansaldo Energia, strengthening long-term relationship with key customers and paving the road to keep enhancing our products" said Giuseppe Marino, CEO of Ansaldo Energia. The latest order shows "a concrete appreciation of our work by Cairo Electricity Production Company, so much so that we have been confirmed for the maintenance of the 'heart' of their plant" said Stefano Gianatti, Vice President of Ansaldo's Global Service segment. ■



View of the '6th of October power plant' near Cairo

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