



Electrification not enough to meet net zero target, DNV warns

Though massive efforts are underway globally to electrify industry and transport, this will not be enough to meet the Paris Agreement's net zero emission goals, the classification society DNV warns. Scaling of hydrogen could take 20 years and is expected to "arrive too late to have the impact needed today."

Transforming the power generation sector alone will not suffice. Even if all electricity was 'green' from this day forward, the world will still fall a long way short of achieving the 2050 net zero emissions ambitions of the COP21 Paris Agreement. According to DNV's Energy Transition Outlook (ETO), renewables are already the most competitive source of new power but this will curb global emissions only 9% by 2030, with the 1.5°C carbon budget agreed by global economies emptied by then.

Though the reduction of fossil fuel use was "remarkably quick," natural gas will still make up 50% of the global energy mix by 2050. Natural gas emits only about half the emissions than coal when burn, but it remains a fossil fuel – making the need to invest in and scale hydrogen, and carbon capture and storage (CCS) all the more

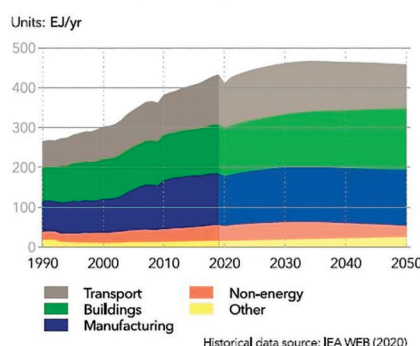
important. Oil demand looks set to halve, DNV's the ETO 2021 finds, with coal use reduced to a third by mid-century.

The ETO 2021 also reveals that while 69% of grid-connected power will be generated by wind and solar in 2050, and indirect electrification (hydrogen and e-fuels) and biofuels remain "critical,"

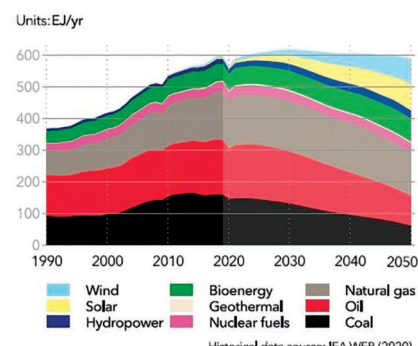
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World final energy demand by sector



World primary energy supply by source

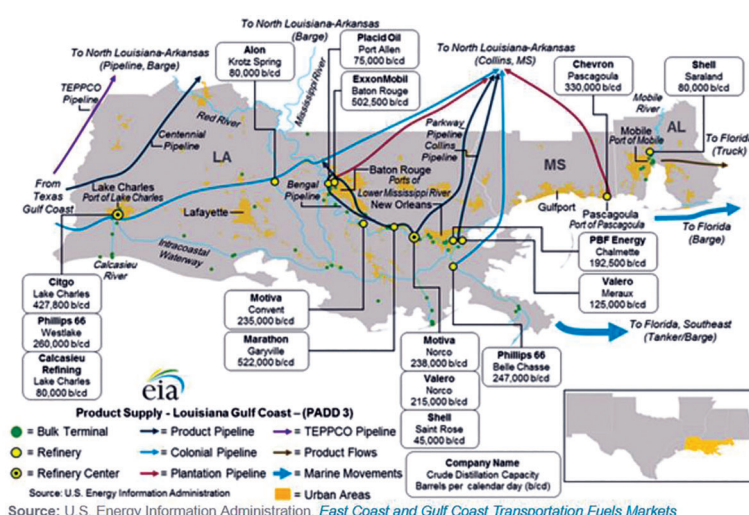


Hurricane Ida leaves New Orleans in the dark, causes petrol shortages

Hurricane Ida made landfall at Port Fourchon, Louisiana, late Sunday, with 150 mph winds, devastating key energy infrastructure. Though the centre of the storm stayed some 45 miles southwest of New Orleans, the city experienced widespread power outages that accumulated to a full blown blackout of the entire city.

Only emergency generators were working in the hours after Hurricane Ida made landfall as the storm brought down hundreds of pylons at key power distribution lines.

An Energy Disruptions Map shows storm-related geographic data from the National Hurricane Center, combined with map layers for energy-related infrastructure such as high-voltage transmission lines, power plants, and



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though none of these sources are scaling rapidly enough.

Hydrogen adoption "too late"

Hydrogen is widely seen as the energy carrier that holds the highest potential to tackle hard to abate emissions. However, DNV's forecast indicates hydrogen only starting to scale from the mid-2030s and, even then, only building to 5% of the energy mix by 2050.

Technology innovations and investment need to focus on hard-to-decarbonise sectors like heavy industry, shipping, trucking

and aviation – now.

Striking a pessimistic tone, DNV says that "despite every effort being made, the energy transition remains definitively not fast enough for the world to achieve the ambitions of the Paris Agreement." Analysts warn the planet will "most likely" reach global warming of 2.3°C by end of the century.

Pandemic, a "lost opportunity"

The pandemic and its radical impact on electricity and fuel demand is seen as a "lost opportunity" to speed up the energy transition: "Many of the pandemic recovery pack-

ages have largely focused on protecting, rather than transforming, existing industries. A lot of 'building back' as opposed to 'building better' and although this is a lost opportunity, it is not the last we have for transitioning faster to a deeply decarbonised energy system," commented DNV chief executive, Remi Erikson.

Energy efficiency consequently remains the biggest opportunity to tackling climate, analysts reckon, explaining that "achieving greater efficiency is the reason why global energy demand will level off, even as the global population and economy grows." ■

Google buys clean energy from ENGIE for its operations in Germany

Google has announced it will invest approximately €1 billion in digital infrastructure and clean energy in Germany. The US technology company signed a power purchase agreement (PPA) with the French utility ENGIE with power its operations in Germany at nearly 80% carbon-free energy on an hourly basis beginning in 2022.

The US technology giant has set a firm commitment to operate all its campuses and data centers worldwide on carbon-free energy 24/7. "Already today, two thirds (67%) of our energy needs are met with locally sourced clean energy on an hourly basis," Google said in a statement.

Under the terms of the PPA with ENGIE, the French utility will assemble and develop a carbon-free energy portfolio on Google's behalf which could grow as the company's needs change in Europe. Google is working on a new cloud region in Berlin-Brandenburg and the expansion of its existing cloud region in Frankfurt.

The German Energy Agency (dena) head Andreas Kuhlmann said the deal underlines

the growing importance of PPAs, which are becoming a "central pillar of the energy transition." German economy minister Peter Altmaier welcomed Google's investment decision. "This shows green energy has become a central factor in the choice of location," he commented.

Green PPAs can help sustainably-run companies to get a better handle on power prices. These contracts between a power generator and a consumer – for example, between a wind park and a factory – specify the terms for the sale of electricity and guarantee long-term price security. How-



ever, the volume of new renewable energy projects backed by PPAs in Germany still trails that of other European countries – but Google's latest deal with ENGIE is might well prompt other companies to follow suit. ■

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petroleum bulk terminals. In addition, the US Information Administration (EIA), publishes detailed hourly electric load data in

the Lower 48 states but analysts noted the full effects of effects of storms on electric load will only become apparent when more data can be made available from local balancing authorities.

Destroyed power grid restrains supply

Power generation was not the main cause of concern, but distribution was. Louisiana is home to two nuclear power plants: Waterford Unit 3, located near New Orleans, and the River Bend nuclear power plant, located farther inland. Both facilities were operating at full capacity as of August 27, providing baseload supply of electricity before the storm made landfall.

Most thermal power generating facilities

remained unaffected from the storm but several power pylons and other distribution infrastructure was left severely damaged.

Restriction imposed on petrol use

Demand for transportation fuels, notably petrol, increased rapidly in the days before the hurricane's arrival as people seek to escape the storm and often drive for hundreds of miles to seek shelter. The rapid increase in demand put pressure on local inventories, particularly as Gulf Coast region had 84.9 million barrels of motor gasoline, or petrol – 6% less than last year in mid-August.

Striving to curtail demand and reduce the risk of severe petrol shortages, the state of Louisiana had to declare a state of emergency ahead of Hurricane Ida's landfall. ■

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Gazprom increases net sales to Europe prior to Nord Stream 2 start-up

Russia's Gazprom has posted a 60% rise in net gas sales to 272.3 billion cubic metres for the six month ending June, triggered by a stark rise in sales to Europe. Income from net sales doubled to 1.4 trillion Roubles (\$19.8 billion), mainly due to the rise in average gas denominated in Rouble and the higher volumes sold to Europe and China.

At the same time average prices denominated in US Dollar increased by 53%. Gazprom's latest earnings statement shows that the average price of gas sales to Europe per million cubic metres, including excise tax and customs duties, amounted to 15,469 Roubles (\$210.3m).

Gazprom said that for the second quarter of 2021 its profits more than tripled to 529.9 billion Roubles (\$7.2bn) versus 153.5 billion (\$2.1bn) in the second quarter of 2020. Net debt decreased 12% to 3,395,713 million Roubles, thanks to a rise in cash and cash equivalents, the Russian gas major noted.

Operating expenses increased by 24% to 3,328,167 million Roubles for the six months ended June 30, 2021. Gazprom disclosed the higher Opex was mainly caused by higher expenses for "Purchased gas and oil"

whose costs surged 54% or 240,616 million Roubles for the six months ended June 30, 2021.

First flows through Nord Stream 2 expected in October

Gazprom is gearing up to commence gas flows through the Nord Stream 2 interconnector to Germany in early October. Though commissioning is underway for Nord Stream 2 and due completed in early September, the necessary license to operate by the German regulator BNetzA which is "unlikely to materialise before mid-October.

If the regulator takes the maximum period to issue a license – six month – then first flows would start in mid-December. That scenario heralds a drop of up to a



Pipe-laying for Nord Stream 2

4.8 billion cubic meter (bcm) in Russian gas deliveries in the fourth quarter.

LNG imports will have to make up for the missing supply, pushing up prices at the Dutch TTF gas trading hub. Energy Aspects sees upside on TTF prices to €46/MWh amid risks over Russian flows this winter due to a possible delay of Nord Stream 2.

Gazprom's new sales flow to China since the start of 2020 is still at a very low level in volume terms of 5 Bcm and is not mentioned in the company earnings statement. Meanwhile, gas volumes sales to the Russian Federation increased almost 14% to 133.4 Bcm from 117.6 Bcm in the first half of last year. ■

US gas inventories enter winter season 159 Bcf below average

Inventories of natural gas in the US will reach 3,592 billion cubic feet (Bcf) by November 1, the start of the winter heating season – nearly 160 Bcf less than usual. High withdrawals in winter 2020/21 were not replenished this summer as dry gas production stayed flat while US LNG exports keep rising, leaving little for storage.

Dry gas production has remained relatively flat, averaging 91.5 Bcf/d so far in 2021 (January–July), 0.4 Bcf/d below the same period in 2020, according to the US Energy

Information Administration (EIA). Production in January 2021 and July 2021 both averaged 92.5 Bcf/d. Gas production fell in February 2021 by more than 6.5 Bcf/d because of extremely cold weather and well

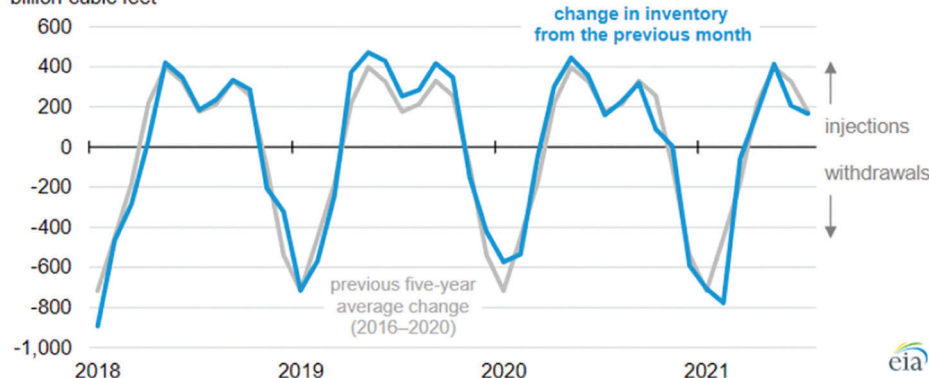
freeze-offs, but it increased to 92.0 Bcf/d the next month.

LNG exports reached record highs so far in 2020 as more and more liquefaction capacity gets added as developers are eager to cash in on high international gas prices. At the onset of the coronavirus pandemic in 2020, US LNG exports averaged 6.5 Bcf/d as demand plunged due to lockdowns to contain the spread of the virus.

Staging a swift upswing, US LNG exports averaged 9.4 Bcf/d so far this year, and EIA analysts forecast that LNG exports will hover around 9.5 Bcf/d for the year as a whole. Pipeline gas exports have also increased in 2021 compared with 2020.

U.S. pipeline gas exports have averaged 8.5 Bcf/d so far in 2021, compared with 7.9 Bcf/d in 2020. We forecast that U.S. pipeline exports of natural gas will average 8.8 Bcf/d for all of 2021. ■

Monthly change in U.S. working natural gas in underground storage (Jan 2018–Jul 2021)
billion cubic feet



Source: U.S. Energy Information Administration, *Short-Term Energy Outlook* (STEO)

INEOS criticises new UK hydrogen strategy as “lagging behind Europe”

British multinational chemical company INEOS has dismissed the UK hydrogen strategy as “massively lagging behind Europe.” Whitehall today specified it will reach its 5 GW goal by 2030 by including hydrogen produced from natural gas through steam reforming, while the EU is most counting on ‘green’ hydrogen with renewable energy.

Blue hydrogen is not emissions free, though the carbon emissions are captured and used in other application. Trying to green-wash its strategy, the UK government stressed it aims to replace nearly a fifth of natural gas with ‘green’ hydrogen, produced by using wind or solar power to split water into hydrogen and oxygen.

The government claimed a UK-wide hydrogen economy could be worth £900 million (\$1.25 billion) and create over 9,000 high-quality jobs by 2030, potentially rising to 100,000 jobs and a value of up to £13 billion by 2050.

Striving to accelerate the adoption of hydrogen by industry and power generators, the government is consulting how to best support projects along the lines of its contract-for-different (CfD) scheme by guaranteeing a minimum price for the produced hydrogen. The government is also working

with National Grid on the feasibility of mixing 20% hydrogen in the existing natural gas network.

“Words are not enough”

INEOS Corporate Affairs Director Tom Crotty is, however, not convinced that the UK’s new hydrogen strategy will herald change. “The government must start to commit to investment in the development of the UK’s hydrogen infrastructure,” he said. “At the moment, we are massively lagging behind Europe and words are not enough.”

Britain currently produces 27 TWh of hydrogen per year, mostly from natural gas, and to meet the government’s 2050 net zero emissions goal it would require 270 TWh. Environmentalists dismiss the inclusion of ‘blue’ hydrogen into the UK strategy, saying this could keep the country dependent on fossil fuels.

The European Commission, in contrast, is

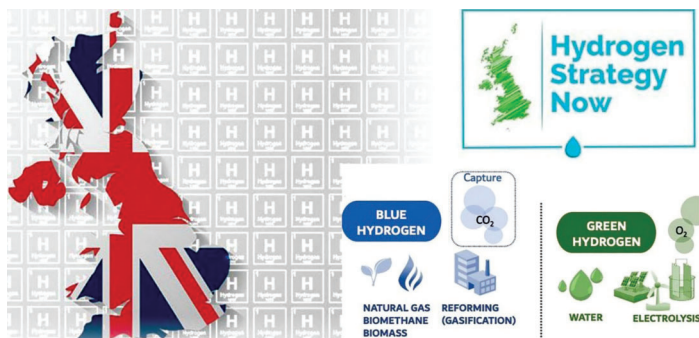
gearing up to produce 2,000 TWh of hydrogen by 2050, mostly from renewable energy sources. Support schemes in Germany, Europe’s largest economy, do not include hydrogen produced from natural gas with carbon capture.

Carbon Capture and Storage (CCS), critical for sequestering CO₂ in the process of natural gas steam reforming, is not yet available at a commercial scale which impedes the production of ‘blue’ hydrogen at large. Moreover, research by US universities Cornell and Stanford show that ‘blue’ hydrogen has a 20% worse emissions footprint than using natural gas directly due to CO₂ and methane emissions that escape during the steam reforming process.

Counting the costs

Aquaterra Energy is counting on blue hydrogen, nonetheless, and the company’s business director George Morrison called on the UK government to offer incentives to the industry to kick-start hydrogen projects. “Today, hydrogen offers the UK the ability to be a world leader, akin to that of subsea engineering – especially in areas like blue hydrogen,” he said, urging industry to get active now: “we either grab the baton and continue the sprint or we fumble and find ourselves several steps behind.”

Platts assessed the cost of producing hydrogen via alkaline electrolysis in the UK (including Capex) at £6.31/kg (\$8.73/kg) on August 11. PEM electrolysis production was assessed at £7.66/kg, while blue hydrogen production by auto-thermal reforming was £2.69/kg (including Capex, CCS and carbon). ■



German energy ministry sets rules for green hydrogen production

Germany’s energy ministry (BWMi) has put forward rules to select areas for offshore wind farms in the North and Baltic Sea. In contrast to grid-connected wind farms that are chosen according to their guaranteed feed-in-tariff, the new offshore project will generate green hydrogen directly at sea that then brought ashore by ship or via pipelines.

But since these new installations will not be connected to the power grid and do not receive remuneration per kilowatt-hour, their nomination and dispatch has to follow different criteria. In a draft regulation, the energy ministry proposes to pay the decentralized wind farms according to their expected energy output and the efficiency of converting wind power to hydrogen.

Technical maturity of the electrolysis plant, ability to scale the project and the cost of the green hydrogen generated through wind power will also be factored into the remuneration. If several projects score the same number of points under these criteria, those will be built that

promise the most local employment.

Project sites to be designated in 2022

The regulation still has to be agreed by the cabinet before it can take effect at the end of 2021. The site for construction of the first project is meant to be designated in early 2022. Successful projects are also entitled to apply for funding from a 500 million offshore hydrogen support programme under the new 2021 “climate pact”.

Germany’s offshore wind power sector had been in a lull after the government cut back on output targets and feed-in-tariffs and reor-

ganised the allocation of marine areas. Today, it seems unlikely that any new wind farms will be built in the North and Baltic Seas until 2023 – projects that were awarded contracts in state tenders back in 2017 and 2018. ■



Wiking offshore wind array in the German Baltic Sea

Mitsubishi develops ammonia combustion for power plant boilers

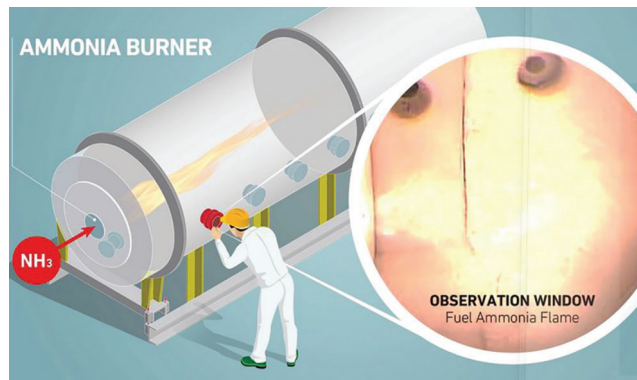
Mitsubishi Power, part of MHI Group, is developing combustion burners that can use ammonia (NH₃) as zero-emission fuel in coal and gas-fired power plants. Tests and simulations have been conducted with basic combustion furnaces to compile data on ammonia and coal co-firing and ammonia-exclusive firing, though the by-product nitrogen oxide (NO_x) is still of some concern.

NO_x, a potent greenhouse gas, is generated when burning ammonia by the nitrogen atom of the ammonia molecule. Gas turbine combustors hence need to be equipped with special techniques to reduce NO_x emission, when converted to ammonia co-firing.

To evaluate several types of burners, Mitsubishi Power recently carried out combustion tests for ammonia and coal co-firing using a small-scale test furnace. Various burner designs were scrutinized with the aim of singling out ammonia-exclusive burners that can be sold to utility and industrial customers for use in decentralized, on-site power stations.

The tests confirmed that flames remained “extremely

stable” during combustion, Mitsubishi noted, while NO_x emissions were as specified by the test target and there was no residual ammonia. Based on the test results, the Japanese manufacturer will now apply the technology on a full-sized combustion system with the aim of introducing ammonia as a fuel for large-scale power generators. ■



Scheme of NH₃ combustion test

NEWS NUDGES

Emission monitoring market surges

Global market for Continuous Emission Monitoring Systems (CEMS) is forecast to grow at a rate of 7.8% from \$2.2 billion in 2020 to reach \$3.8 billion by 2027, according to MarketandMarkets. The power gen segment is likely to surge 8.3% and reach \$1.3 billion over the forecast period.

INNIO joins UN Global Compact

INNIO has joined United Global Compact, the world's largest corporate sustainability initiative. The Austrian manufacturer reinforced its commitment to environmental, social and governance (ESG) goals for its Jenbacher and Waukesha gas engine businesses.

Mitsubishi Power sets up global network of TOMONI hubs

Japanese manufacturer Mitsubishi Power, part of MHI Group, has created a global network of TOMONI hubs to pre-warn operators of impending issues or needed corrective action to avoid unit trips or load reductions. The 840 MW Intermountain Power Project will use the hub to enhance the plant's resilience and operational uptime.

Situated in Delta, in the US state of Utah, the Intermountain Power Plant will be an early adopter of hydrogen co-firing technology and run on two M501JAC power trains. Jon Christensen, manager of special projects at the operating company said: “We sought a partner that could provide actionable insights to ensure that multiple new technologies are working together to ensure availability and operability.

“With the TOMONI HUB, the Intermountain Power Plant will be the smartest, most resilient plant in the Americas when it comes online. It gives us confidence that we will have resources to help us react not only to O&M issues, but also to challenges such as weather extremes and operational flexibility,” he explained.

Five cites part of global network

So far, the TOMONI network includes hubs in the Japanese towns of Takasago and Nagasaki, in the US city of Orlando as well as in Alabang part of greater Manila in the Philippines. A fifth hub is set to be commis-

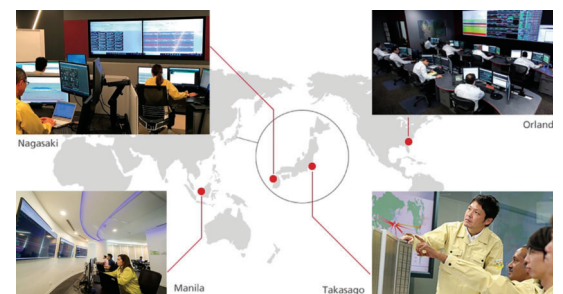
sioned in Duisburg, Germany, in the third quarter of 2021.

Each hub accesses cyber-secure cloud-based analytics and uses distributed knowledge databases, to suggest fast responses to pending issue. Mitsubishi Power pointed out the hubs support all types of energy systems, including traditional steam power plants and combined-cycle gas turbine power plants, as well as renewable power plants, distributed generation, emerging smart energy systems, and all-duration energy storage.

Power plants using TOMONI solutions have 2-4 fewer days of unplanned downtime and 3-4 fewer days of planned downtime per year than similar unconnected plants, Mitsubishi says, claiming this “provides millions of dollars of annual value for their owners.”

Real-time collaboration with plant operators

Going further than just remote monitoring of power generation and energy storage as-



Global network of TOMONI hubs

sets, the Japanese TOMONI concept of working ‘together with’ is establishing a real-time collaboration among the energy system operators and the worldwide resources and expertise of Mitsubishi Power.

Hiroyasu Ishigaki, General Manager of the Mitsubishi Power ICT Operations Department in Yokohama explained remote monitoring has been provided for more than 20 years but artificial intelligence now also allows for remote inspection and maintenance. Many of these technologies have already been validated at Mitsubishi Power's T-Point 2 power plant, operated remotely from the Takasago TOMONI hub. ■

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TAQA Arabia signs MoU with MAN for green hydrogen project in Egypt

TAQA Power, the Cairo-based subsidiary of TAQA Arabia, will set up a pilot project to locally produce green hydrogen in cooperation with MAN Energy Solutions. The German manufacturer will provide electrolysis technology for a hydrogen plant, due to run until autumn 2022.

The technology cooperation comes just days after Egypt's President, Abdel-Fattah El-Sisi urged industry heads to help set up a strategy for producing green hydrogen in the sun-soaked north African country for export. Several EU countries are interested in importing green hy-

drogen from abroad in a bid to decarbonize their heavy industry and the power sector.

Producing green hydrogen via electrolysis of water, using electricity from wind and solar power sources, is still more costly in most markets than the alternative method where natural gas is 'reformed' into hydro-

gen and CO₂. The German government is hence trying to set up energy partnerships with producers in the Middle East, Africa and Australia to import mostly solar-based green hydrogen from abroad.

The green hydrogen plant in Egypt will be based on technology by H-TECH System, an Augsburg-based electrolyser manufacturer acquired by MAN Energy Solutions in June 2021. Both companies are situated in the same city in southern Bavaria and MAN pointed out the H-TECH electrolysis technology helps drive its business further towards of solutions for decarbonisation. Going forward, MAN intends to scale up and industrialise the electrolysis technology with a view to pushing green hydrogen towards the mass market.

H-TEC System produces stacks and megawatt electrolysers based on the polymer-electrolyte membrane process (PEM), aligned to industry and energy-refiner demands for hydrogen. Its electrolysers are based on 20 years of R&D and already make effective sector-coupling possible today. ■



View into MAN H-TEC system

Daroga Power closes \$230 million fund to deploy nearly 33 MW of fuel cells

Daroga Power, an investor and developer of distributed generation energy assets, has closed an infrastructure portfolio fund to deploy 32.85 MW of Bloom Energy solid oxide fuel cells. Approximately 6 MW of fuel cells in the portfolio are already operational, and the additional ones will be deployed through the end of 2022.

The fund was developed through a private joint venture "RAD Energy Solutions", a partnership between Daroga Power and an affiliate of Related Companies. The sponsor and tax equity were privately raised with a sponsor contribution of \$21.5 million. Bank of America has committed up to \$68 million of tax equity. Silicon Valley Bank provided the debt financing of approximately \$135 million.

Baseload power

Bloom Energy will provide fuel cells for the portfolio and maintain the equipment under a long-term O&M agreement. Daroga Power, as managing member of RAD Energy Solutions, will oversee operation and financial performance of the fuel cell assets. Once completed, the nearly 33 MW fuel cells will produce baseload energy at customer sites in California, New York, New Jersey, Massachusetts, Connecticut, and Maryland.

"Scaling capital deployment for fuel cell

technology, including Bloom's SOFC as well as many other innovative decarbonization technologies, is an important part of BofA's \$1.5 trillion 2030 Sustainable Finance commitment," said Karen Fang, Global Head of Sustainable Finance at Bank of America.

Ory Moussaieff, co-founder of Daroga Power underlined the importance of distributed generation to mitigate the risks that companies face from extreme weather, brownouts and blackouts, and unknown energy costs. "Fuel cells enable companies to reduce their environmental footprint, while being able to budget for and reduce their energy spend," he explained.

This is the second fuel cell portfolio deal

for Daroga Power in less than one year. In December 2020, the company announced a 12 MW fuel cell portfolio valued with an enterprise value of \$103 million. That portfolio of 48 Bloom Energy fuel cells is located throughout New York and is reducing consumers' electricity costs through Daroga Power's energy platform goCDG.com. ■



Line-up of Bloom Energy fuel cells

"Our Atlas Copco fuel gas boosters provide us with the reliability and peace of mind we need to keep our power plant running."

Ciector Whitelock
Maintenance Manager
Astoria Energy, New York City

For more than 25 years, Atlas Copco Gas and Process has helped plant operators around the world handle the pressures that come with running their power generation facilities. Our standard and customized compressor solutions cover the entire range of Fuel Gas Boosting applications and readily adapt to the changing conditions in your plant.

Our experts will partner with you from day one to develop a solution to help you save OPEX while reducing your environmental impact, and our worldwide Aftermarket services team is here 24/7 to continue to help reduce your downtime.

Learn more about how our range of Fuel Gas Boosting solutions can help your plant at www.atlascopco.com/powergen