



Weekly News

4 June 2021

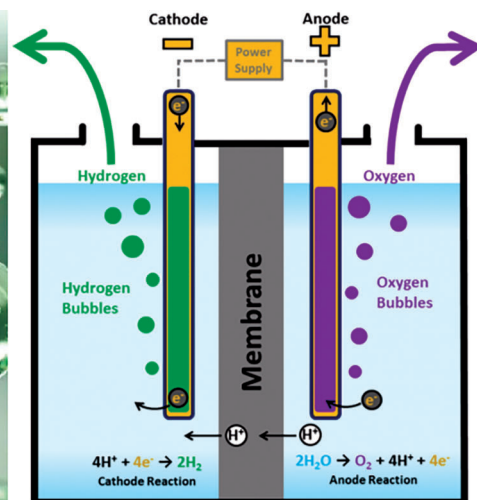
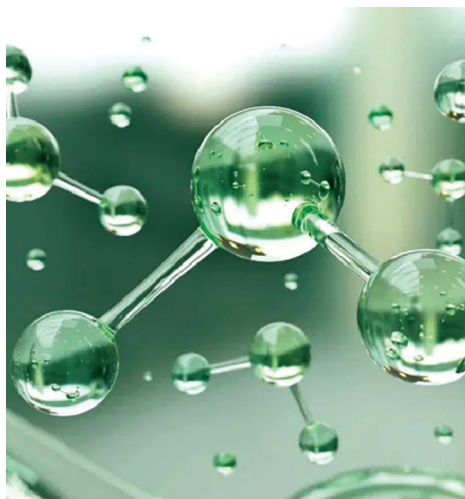
Green hydrogen acts as energy storage but economics don't add up

Though green hydrogen, produced from variable wind and solar generation, can act as long-term energy storage – it is not economically viable yet. To get from 80,000 tonnes produced today to a required 35 million by 2035, governments will need to "heavily incentivise green hydrogen – and soon," analysts say, similar to past subsidies for renewables.

“The use of low-carbon hydrogen can help decarbonise sectors where direct use of electricity is not an option, from shipping and aviation to industrial processes like steelmaking,” commented Tom Heggarty from Wood Mackenzie’s Power & Renewables research team.

Today, hydrogen is already used as a feedstock for refining and petrochemical production, but analysts reckon its importance needs to grow if Europe wants to achieve its Net Zero emission targets.

The lion’s share of today’s hydrogen (99.6%) still comes from hydrocarbons. According to Wood Mackenzie figures, around 71% is grey hydrogen, produced via the reforming of natural gas to pro-



duce CO2 and hydrogen. Most of the remainder is brown hydrogen, derived from coal via gasification. Some grey is turned into blue hydrogen – a lower-carbon alternative – by pairing natural gas reforming with carbon capture and storage (CCS), though that is not widely commercial.

Just a tiny share of 0.1% in 2020 is actually green hydrogen, produced from water by renewables-powered electrolysis. Policy

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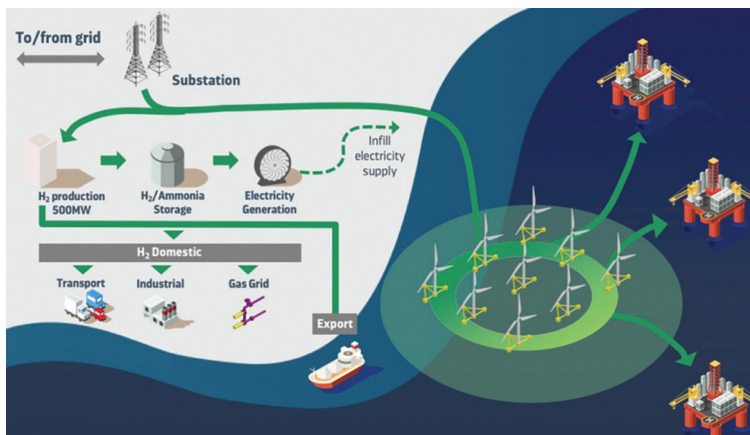
Cerulean realises UK’s largest offshore wind and hydrogen project

Infrastructure developer Cerulean Winds is accelerating plans for a wind and hydrogen development west of Shetland. Proposed are 200 floating turbines with 3 GW per hour capacity, out of which 1.5 GW per hour is being used to produce green hydrogen that can be used for energy storage.

The £10 billion (\$14.2bn) project would have the capacity to abate 20 million tonnes of CO2 and shift the dial on the UK’s new Net Zero target. The UK’s new Net-Zero Target aspires for 100% emission reduction by 2050, mainly through renewables and hydrogen.

Green energy cheaper than gas power

The wind farm will guarantee a 100% availability of green power for offshore platforms of the UK oil industry at a price below current gas turbine gen-



eration. According to Celurian, this is possible through a self-sustained generation scheme with no upfront cost to operators.

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makers and environmentalists strive to boost this share, though analysts warned this will not be feasible without subsidies and regulatory support.

Hype over hydrogen heating

The UK government has been funding initiatives to use hydrogen for heating commercial houses and private households. With over 85% of homes being

connected to the gas grid in the UK, the easiest and simplest way to decarbonise is to convert the existing network and home products such as boilers, to hydrogen.

Future UK Government legislation will likely mandate that all new models of domestic boilers are 'hydrogen-ready' from 2025, but the Energy and Utilities Alliance (EUA) dismissed this move as "short

sighted."

The use of heat pumps must be supported by a network carrying a decarbonised gas, such as hydrogen, which is Net Zero at the point of use and throughout its supply chain. But EUA analysts reckon that "levels of disruption to people in their homes and high upfront costs mean heat pumps are likely to be a solution for a minority of properties only." ■

Gazprom fast-tracks feeder pipeline for 'Power of Siberia' trunkline

Russia's gas giant Gazprom has built 260 km of a feeder pipeline between the huge Chayandinskoye field in Yakutia and the 'Power of Siberia' interconnector to China. Eager to boost exports, Gazprom is also building a link to connect the Kovyktinskoye field to the Power of Siberia pipeline in late 2022.

Chayandinskoye - one of the largest oil, gas and condensate field in Yakutia - serves as a resource base for the Power of Siberia gas pipeline since 2019. The field contains some 1.2 trillion cubic meters of gas and about 61.6 million tons of oil and gas condensate reserves.

To ramp up exports to China, Gazprom built a gas pre-treatment unit in 2020 and brought about 110 wells onstream at the Chayandinskoye field. In addition, six compressor stations are being built on the gas pipeline's operating section stretching to the Chinese border.

At Kovyktinskoye, foundation works and installation of steel structures are underway for the gas treatment unit No. 2, while the site for unit-3 is being prepared, and development drilling continues. Work on a pipeline section from this field to Chayandinskoye is "going on schedule," Gazprom noted: as of today, 261 out of

803.4 kilometers have been welded, laid, and backfilled.

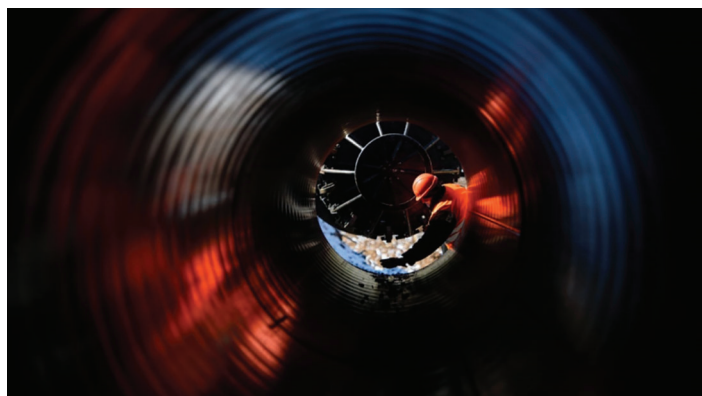
'Power of Siberia 2' in the making

Gazprom has proceeded the pre-investment phase for the 'Power of Siberia 2' pipeline. Supplies via this route may total up to 50 billion cubic meters per year (bcm/y), with the gas set to be brought to western China.

In March 2020, the Russian President Vladimir Putin instructed the go-ahead for both the liner part of the pipeline and the resource base creation, allowing Gazprom to start the pre-investment phase and design-and-survey works. Under the Russia-China gas deal, supplies are

being delivered at an estimated price of \$350-\$400 per thousand cubic meters.

Power of Siberia 2 allows for pipeline gas deliveries from Russia's Western Siberian fields to China, complementing the eastern route - the initial Power of Siberia gas pipeline - which already supplies 38 Bcm/y under a 30-year sales and purchase agreement between Gazprom and CNPC. ■



Pipe-laying works

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Dan Jackson, founding director of Cerulean Winds warned that "with emissions penalties and taxes coming, the UK oil and gas industry's role in home-grown energy security during the transition could be threatened unless current decarbonisation efforts can be greatly speeded up."

Once in full swing, the wind farm will facilitate the production of green hydrogen at scale and open up and £1 billion hydrogen export potential. Developers stressed there are "no subsidies or Contract for Difference (CfD) requirements." On the contrary, the project promises to provide "hundreds of millions of pounds to government revenue via leases and taxation through to 2030."

Financial close targeted for Q1-2022

Infrastructure planning has been finalised to ensure project readiness as Cerulean targets financial close in the first quarter of 2022. Construction would start soon after with energisation commencing in 2024.

Funding is being arranged through and Infrastructure Project Finance model in co-operation with the French bank Société Générale and the advisory Piper Sandler.

Cerulean estimates that the current 160,000 oil and gas jobs can be safeguarded and 200,000 new roles within the floating wind and hydrogen sectors will be created within the next five years. ■

FLNG technology helps expand Asia's gas-to-power infrastructure

Fast adoption of floating LNG technology across Asia is opening up new gas markets in Indonesia, Malaysia, Singapore and the Philippines. According to Black & Veatch, gas-fired power projects are "attractive for emerging markets" due to advantages in price, reliability and fuel access over developing technologies such as battery storage.

Energy demand in Asia is expected to almost double by 2030. India, for instance, has a current installed capacity of approximately 365 gigawatts (GW) is expected to grow five-fold in the next 30 years to a whopping 2,300 GW. Hence, investment in new gas power projects is see surge 64% in the next five years amid escalating energy demand.

"We anticipate that the spending on gas-fired projects will surpass coal investment as spending is driven by sustainability goals, financing issues and government regulations," said Narsingh Chaudhary, Executive

Vice President, Asia Power Business, Black & Veatch.

To promote energy security and access, Asian utilities are integrating their generation, transmission and distribution assets. According to Mr Chaudhary, "this approach helps them overcome the pitfalls of aging infrastructure assets while meeting rising customer demand for energy that is renewable and reliable."

Debt financing is also forthcoming for projects in fast-growing Asian markets – both from commercial and development banks. The Asian Development Bank (ADB),

for example, recently provided \$305 million for the Jawa-1 project, Indonesia's largest combined cycle gas turbine power plant (1,760 MW). The integrated LNG-to-power project is expected to sup-

ply electricity to 11 million homes from 2021.

In Thailand, Black & Veatch in consortium with Marubeni Corp recently provided EPC services to Glow Energy for the completion of a combined-cycle cogeneration plant near Rayong, Thailand. Glow Phase-5 delivers up to a nominal 382 MW of electricity when operating in full condensing mode, and 342 MW in cogeneration mode.

To identify opportunities in complexities and sustainability, the energy leaders in region are teaming up with business partners that provide quality engineering, procurement and construction solutions at varying scales.

According to Black & Veatch, global EPC firms and project financiers can offer local utilities consistent execution and safety practices to make LNG import and power generation projects more bankable and revenue more certain. On the other hand, international project developers are relying on regional experts to mitigate business risks and overcome complexity from planning and development to construction and operations. ■



Pertamina plans onshore LNG terminal to power refinery on Java

Indonesia's national oil company Pertamina plans to build an onshore regas terminal to power the country's largest oil refinery on Java. As an island nation, Indonesia uses floating LNG terminals to distribute domestic gas supplies to where long-range pipelines are lacking.

Pertamina is also a leading LNG exporter through the Botang liquefaction plant with a nameplate capacity of over 20 mtpa in the province of East Kalimantan, however exports have been in decline due to rising domestic demand. Hence, the national oil company has built several FLNG and on-shore regas units.

Construction costs to top \$151 million

The latest venture will be built near Cilacap refinery, one of seven in Indonesia. The proposed regas terminal will supply 111 million cubic feet per day of gas for 20 years to the refinery for use in an onsite gas-fired power station.

Construction of the Cilacap regas terminal will incur an estimated cost US\$151.7 million, backed by government support

under Indonesia's land-based regasification expansion programme. As an archipelago, Indonesia cannot connect its demand centres through long-range pipelines and has instead installed an array of regas facilities and FSRUs.

Plans for retail LNG fuel market

In southern Java, Pertamina aims to develop a retail LNG fuel market to supply both industries and remote power generators. The oil major also has a stake in the local wholesale power market and is operating major combined-cycle power stations, such as the 1,760 MW Jawa-1 combined-cycle power plant. Built together with Marubeni and Sojitz, the CCGT is sourcing all its fuel from an adjacent FSRU.

Java 1 is supplying electricity to PLN for 25 year under a Power Purchase

Agreement (PPA) stipulating payment of 5.5 \$cents per kilowatt hour (kWh). The 2x800 MW plant, powered by two gas turbines, has an annual availability factor of 60%.

Looking ahead, the Indonesian government has set a target to build 35,000 MW additional power generation capacity. Out of that, around 19,400 MW will be utilized to meet the growing energy needs on Java Island. ■



Aerial view of Cilacap refinery



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Bloom Energy uses nuclear energy to generate hydrogen in Idaho

California-based Bloom Energy has agreed with Idaho National Laboratory to independently test the use of nuclear energy for electrolysis. Rather than ramping down baseload nuclear power plants, the surplus energy can be used to cost-effectively produce green hydrogen.

Electrolysers convert water or steam into oxygen and hydrogen which can then be injected into the natural gas network to be stored and used for power generation with a fuel cell at a later time. The hydrogen can also be dispensed to fuel cell vehicles, or used by industrial processes.

Bloom's electrolyser has a higher efficiency than comparable low-temperature units, so less electricity is needed to produce hydrogen. The steam used in the electrolysis process can also be derived from the thermal energy of a nuclear power plant.

Simulating load following conditions

At Idaho National Laboratory (INL), re-

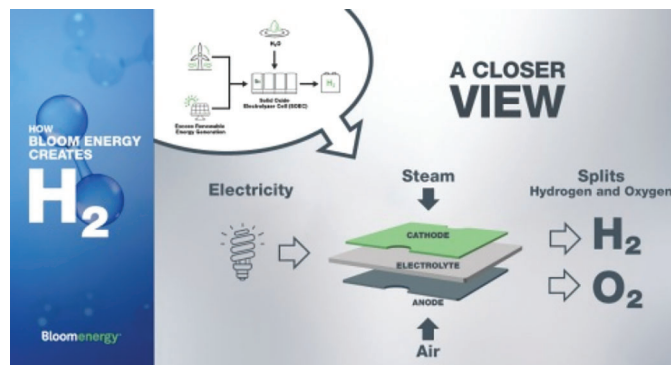
searchers will simulate steam and load following conditions as if the electrolysers were already integrated with a nuclear power station. These simulations will provide the opportunity to model operations in a controlled environment.

"The high-temperature electrolysers take advantage of both the thermal and the electrical power that are available at nuclear power plants," said Tyler Westover, the Hydrogen and Thermal Systems Group lead at INL. "This expands the markets for nuclear power plants by allowing them to switch between sending power to the electrical grid and producing clean hydrogen for trans-

portation and industry energy sectors."

Striving to enhance sustainability, Venkat Venkataraman, Bloom Energy chief technology officer (CTO) urged the industry to "think creatively and seek all possible low, zero, and negative carbon solutions." Harnessing excess energy to produce hydrogen is one way to decarbonise.

"As a result of this pilot [at the Idaho lab], we expect to establish carbon-free hydrogen generation with the highest efficiency of any electrolyzer in the market today." ■



Batteries and hydrogen electrolysers 'ready for the big time'

Falling costs for lithium-ion batteries and hydrogen electrolysers have rendered both technologies ready for mass commercialization. The International Energy Agency (IEA) anticipates the cost of 4-hour battery systems will fall to \$220/kWh by 2040, so utility-scale battery deployment could reach nearly 220 GW by 2040.

Stimulus-fuelled investment to rekindle economies after the corona crisis could help trigger a large-scale rollout of green energy sources and drive cost declines as the technologies progress. Both lithium-ion batteries and electrolysers are at the stage in their development where wind and solar were in 2008-2009, the IEA executive director Fatih Birol said, suggest-

ing "they have the potential to be the coming decade's breakout technologies."

Similar support schemes were once set up for wind and solar PV – "today both are cost-competitive in large parts of the global energy system in their own right," Dr. Birol noted. Offshore wind, in particular, "is now ready for massive investment," he stressed. Wind turbines are based on mechanical en-

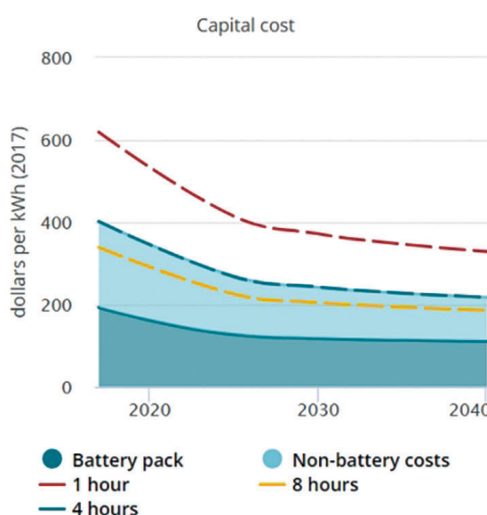
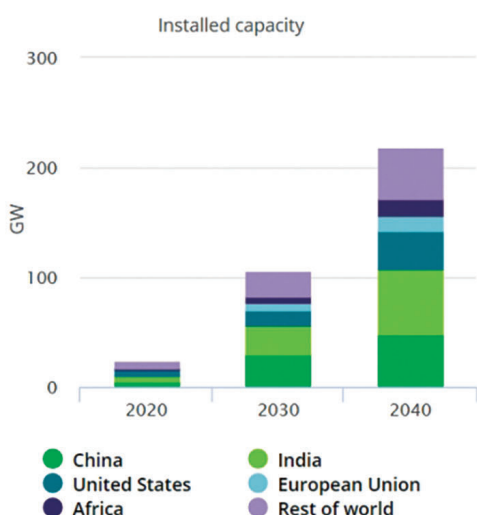
gineering in which European countries, especially Germany, have a comparative advantage. But solar panels are an extension of semiconductor electronics, an area where China already had a competitive edge.

Clean energy investment help rekindle economy

Trying to revive the economy, governments around the world are cobbling together massive stimulus packages. These huge public spending programs will shape countries' infrastructure and energy systems for decades to come.

Time is of the essence, given that the pandemic has triggered the biggest economic collapse since the Great Depression. Hence, the IEA is urging national government to put clean energy jobs at the centre of stimulus packages. Investing in energy efficiency also has large benefits for employment; previous stimulus plans in the United States and elsewhere supported large numbers of jobs by fuelling demand for the labour-intensive work of upgrading building. ■

Deployment and costs of utility-scale battery storage systems in the New Policies Scenario



SuedOstLink to transmit over 2 GW green energy across Germany

German TSOs TenneT and 50Herz are building an electricity highway to transport over 2 Gigawatt of wind energy from the North Sea over 500 kilometres to southern Germany. Siemens Energy will deliver the HVDC converters to minimise electricity loss during transmission.

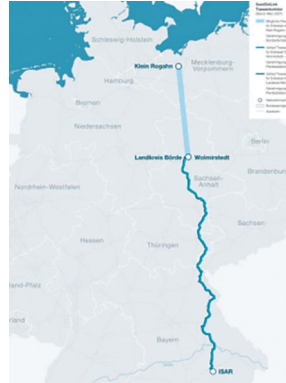
Most of Germany's renewable energy is produced on land and at sea by large wind power plants in the north, though demand is centred in the industrialised Ruhr region and particularly in the South of the country. The SuedOstLink will hence become a vital interconnector, capable to transmit up to 2 GW of electricity – enough for four million households – in both directions to flexibly react to demand fluctuations.

Bi-directional flows

The converter stations, designed to convert direct to alternating current and vice versa, will be built at Wolmirstedt in Saxony-Anhalt and near Landshut in Bavaria. In the case of excess wind energy, the northern unit will convert the alternating current into direct current, for the electricity to be transported

southbound via underground cables with a voltage of 525 kilovolts. The Isar station in Bavaria will convert the incoming direct current back into alternating current and feed it into the distribution network.

The high-voltage direct current (HVDC) link will include Siemens' HVDC PLUS with voltage-sourced converters based on modular multi-level technology. Compared with rival systems, the Siemens converters control the flow of electricity also regard to reactive power. This includes black start capability to restore the power supply on the grid in the event of a blackout.



"An essential component of the energy transition is an efficient grid. If we want to exploit the full potential of renewable energies and thus also of the energy transition, the transmission networks must be expanded accordingly," Tim Holt, board member of Siemens Energy said, noting: "We are pleased to be able to make an important contribution to the European energy transition with SuedOstLink."

GE's first HA turbine in Bangladesh arrives at Summit Meghnaghat-II

Summit Power and GE have placed a 9HA.01 gas turbine on the foundation of the 583 MW combined-cycle power plant in Meghnaghat. GE supplied key equipment under a turnkey EPC contract and once commissioned in 2022, the CCGT will be largest one of its kind in Bangladesh, powering up to 700,000 homes.

The project is the single largest private sector power project investment in Bangladesh. Muhammed Aziz Khan, founder and chairman of Summit Group explained "Bangladesh is still one of the lowest per capita consumers of electricity in the Indian subcontinent while GDP growth per capita-wise, the highest. Summit wants to support Bangladesh's growth trajectory by providing the citizens with primary infrastructure."

At the Meghnaghat-II CCGT project, GE's HA turbine technology will be used for the first time in Bangladesh. Highly efficient H-class turbines are the fastest growing fleet of gas turbines in the world in its class. Over its lifecycle, total cost of ownership is the lowest in the industry driven by lower capex, simplified configuration, decreased fuel cost from industry-leading efficiency, and lower cost through extended maintenance intervals.

Under the turnkey EPC contract, GE will provide Summit with one 9HA.01 gas turbine, one three-pressure level with reheater



Arrival of GE 9HA.01 turbine at Meghnaghat-II

(RH) drum type Heat Recovery Steam Generator (HRSG), one steam turbine, one gas turbine generator, one steam turbine generator, one condenser and associated systems, along with balance of plant (BOP) solutions. Additionally, GE will be providing maintenance and repair services for the gas turbine and generator over a period of 22 years.

More than 1,100 workers have been part of the Meghnaghat II site that is under different stages of construction works. GE has a robust installed base of gas turbines in Bangladesh that is generating approximately 3 gigawatts of electricity. ■

MAN installs over 225 MW generation capacity in West Africa

Two power projects in West Africa have received MAN engines, and the German manufacturer handed over two further plants in Gambia and Guinea. Eight MAN 14V51/60 engines drive a 110 MW plant in Mali, while six 9L51/60 engines supply a cement factory with 54 MW electricity in Senegal.

Construction progresses at the 110 MW project in Sirakoro, a rural community in southwest Mali with a population of around 10,000 inhabitants. In Mali, electricity demand is rising around 10% annually, and the new plant in Sirakoro will boost the country's installed capacity by 25%.

In Senegal, the delivered six MAN 9L51/60 engines will replace existing equipment at a 54 MW onsite power plant of the 'Les Ciments du Sahel' factory. Situated near Dakar, the cement factory has been using four MAN 18V32/40 engines since 2009 as a source of electricity and some process heat.

The start of a second cement production line has increased the customer's energy requirement, hence he chose to build a second power plant. ■



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Germany spends €8 billion on over 60 EU-backed hydrogen projects

The German energy and transport ministries have chosen 62 large hydrogen projects that will be funded under a joint European investment scheme. To reach its 2045 climate target, Germany needs some 60 TWh of hydrogen by 2030 but domestic production can cover just a third of that demand.

The 62 hydrogen production ventures will be realised as Important Projects of Common European Interest (IPCEI) and will be backed by more than €8 billion in German federal and state funding. Among the projects are generation plants with a combined electrolysis capacity of more than 2 GW, capable to produce 40% of Germany's total hydrogen goal of 5 GW by 2030.

First movers in producing green hydrogen in Germany will be supported by lower electricity prices and a wide definition of "green" hydrogen, energy minister Peter Altmaier promised. By creating "clear and pragmatic" rules, the government wants to ensure a rapid market penetration of electrolyzers based on wind and solar power.

Using excess renewable energy to produce green hydrogen helps balance the grid. "Electrolysis plants should be installed in particular at locations where a high renewable energy potential and geological storage facilities can be used for hydrogen storage and where access to a hydrogen infrastructure is possible. That way, electricity bottlenecks and the need of grid

expansions can be reduced," the ministry writes. The final decision on such location rules was however postponed "until a later date".

Decarbonising transport and steel making

Steel and chemical industries are in focus of the 62 selected projects, given that hydrogen is meant to help these energy-intensive industries save several million tons of CO₂ annually, and to that end, 1,700 kilometres of hydrogen pipelines are in planning. German gas grid operators had said an initial hydrogen grid could be established at "justifiable cost" of around €660 million, largely by converting current gas pipelines.

Aside from heavy industry, hydrogen will also be utilised as to power hybrid vehicles and fuel cells to produce electricity.

"Green hydrogen and fuel cells are -- across all modes of transport -- a great addition to pure battery electric vehicles," transport minister Andreas Scheuer said, stressing the German transport should shift away from its current 95% dependency on fossil fuels and rely more on green energies. ■

NEWS NUDGES

AEG equips Swedish hydrogen plant

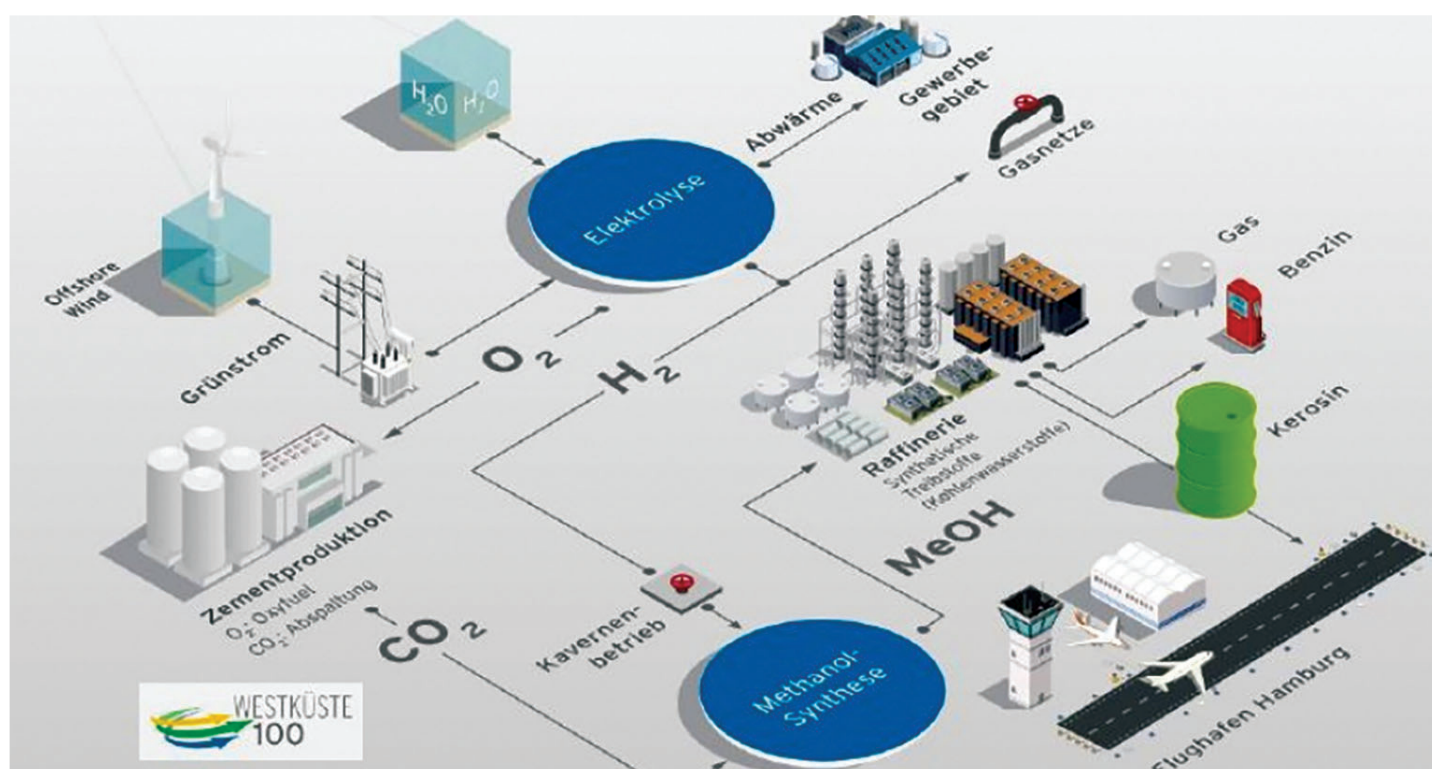
Amsterdam-based AEG Power Solutions has supplied components for a high-pressure electrolysis process at a pilot plant, built by Hydrogen Pro on behalf of the metal research institute Swerim. The electrolysis process selected by Swerim is an alkaline electrolyser with a high level of dynamics driven by Thyrobox DC2, industrial DC power supply.

CNE sets up Houston offices

Carbon Neutral Energy (CNE) is setting up in Houston due to the huge demand for mobile energy storage systems to mitigate the risk of emergencies like the Texas blackout earlier this year. CNE raised \$420 million funding in the UK and is now seeking to strengthen its foothold in the US.

Li-ion batteries lose their lead

Li-ion batteries have dominated the energy storage field, but are expected to lose their leading role in stationary applications. According to IDTechEx findings, Redox flow batteries are gaining traction and likely to overtake the installed Li-ion battery energy capacity before the end of 2030.



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