

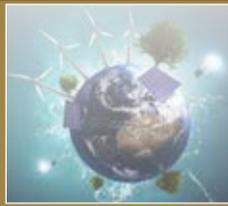
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A work in progress

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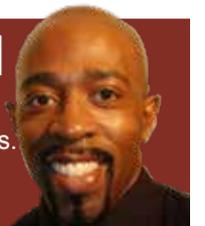
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Hydrogen economy gathers pace

Siemens Australia's Jeff Connolly, says Australia "is a potential giant" in hydrogen production

Earlier this year, the International Energy Agency earmarked 2019 as the year of unprecedented momentum for hydrogen. Several major announcements last month seem to be proving that claim. **Junior Isles**, reports.

Several significant announcements in both Europe and Asia in recent weeks have highlighted the growing belief that hydrogen will play a critical role in achieving global climate change ambitions.

At the Hydrogen for Climate Conference in Brussels last month, the EU unveiled a multi-billion initiative to support the development of hydrogen projects throughout Europe to decarbonise industry, transport and buildings. The projects will seek investment exceeding €60 billion (\$66.5 billion) over the next 5-10 years and once complete are estimated to save 35 million t/y of carbon dioxide.

One notable proposal among the 11

projects is the Silver Frog project proposed for the European Union's Important Projects of Common European Interest (IPCEI). Four companies – Belgium-based firm Hydrogenics Europe, Swiss solar industry supplier Meyer Burger Technology AG, Hungarian solar technology firm Ecosolifer, and renewables developer European Energy of Denmark – are hoping to build a solar production factory to produce high-efficiency modules. The factory, with an annual capacity of 2 GW, would provide over 10 GW of installed PV capacity that will go towards hydrogen production.

The project is estimated to support the production of 800 000 t of green

hydrogen over an eight-year period, offsetting 8 million t of CO₂ emissions per year.

The news came as Germany's Ministry of Education and Research said it intends to inject at least a further €300 million in funding for green hydrogen research by 2023, having already allocated €180 million for the coming years. This latest pledge brings Germany's total investment commitment for hydrogen research to €780 million, including the Federal Ministry for Economic Affairs and Energy's own €300 million pledge that was announced in July.

In a sign that companies are preparing for a potential boom in hydrogen,

industrial gas and engineering group Linde said last month that it has taken a stake in a small British business that manufactures machines to produce hydrogen. Linde has agreed to invest £38 million in return for 20 per cent of Sheffield-based ITM Power, which has a market capitalisation of about £140 million and makes electrolysers that use electricity to produce hydrogen from water.

The announcements followed news at the beginning of the month that a team of energy experts from Tractebel Engineering GmbH and offshore engineers from Tractebel Overdick

Continued on Page 2

Study finds utility industry vulnerabilities to cyber attacks

A report released last month has revealed that the risk of cyber attacks on the utility industry may be worsening.

The study by Siemens and the Ponemon Institute says that as utilities increasingly adopt business models that connect operational technology (OT) power generation, transmission, and distribution assets to information technology (IT) systems, critical infrastructure is more vulnerable to cyber attacks.

The survey of 1726 utility professionals, responsible for securing or overseeing cyber risk in OT environments at electric utilities with gas, solar, wind assets, and water utilities throughout North America, Europe, Middle East, the Asia-Pacific region, and Latin America, show the risk of cyber attacks on the utility industry

may be worsening, with 56 per cent of respondents reporting at least one shutdown or operational data loss per year. Further, 25 per cent had been impacted by mega attacks, which are frequently aided with expertise developed by nation-state actors.

The vulnerability of critical infrastructure to cyber attacks has potential to cause severe financial, environmental and infrastructure damage, and according to all respondents, 64 per cent say sophisticated attacks are a top challenge and 54 per cent expect an attack on critical infrastructure in the next 12 months.

Most of the surveyed global utilities say that cyber threats present a greater risk to critical infrastructure – compared to IT systems – and are concerned with the unique industry

challenges, including ensuring availability, reliability and safety of electricity delivery.

Industry-wide, readiness to address cyber attacks is uneven and has common blind spots, especially with regards to the unique cyber security requirements for OT, and the importance of distinguishing between security for OT and security for IT. This remains a major challenge for many organisations across the industry. Only 42 per cent rated their cyber readiness as high, and only 31 per cent rated readiness to respond to or contain a breach as high.

"The utility industry has woken up to the industrial cyber threat and is taking important steps to shore up defenses," said Leo Simonovich, Siemens VP & Global Head, Industrial

Cyber & Digital Security. "We hope this report helps utilities benchmark their readiness and leverage best practices to stay ahead of attackers."

The report – 'Caught in the Crosshairs: Are Utilities Keeping Up with the Industrial Cyber Threat?' – details the utility industry's vulnerability to cyber risk, readiness to address future attacks, and provides solutions to help industry executives and managers better secure critical infrastructure.

It identifies key vulnerabilities in energy infrastructure that malicious actors seek to exploit, including common security gaps that are created as utilities rely on digitalisation to leverage data analytics, artificial intelligence, and balance the grid with intermittent renewable energy and distributed power generation.

Continued from Page 1

GmbH has developed a unique concept for an offshore platform. According to Tractebel, the development makes it possible to produce hydrogen from offshore wind energy at an industrial scale using electrolysis. Delivering up to 400 MW, this kind of plant exceeds the output of previous technologies many times over.

Tractebel says it already has a suitable concept today and is in "a perfect position" to deliver and operate offshore H₂ platforms as an EPC supplier and to offer solutions for large-scale storage. Dr. Hubert Schillings, Business Development Manager at Tractebel, said: "We anticipate that it could be possible for offshore H₂ platforms to be constructed and put into operation starting in 2025. Individual demonstration plants could even be built before then."

Siemens also sees hydrogen as an important part of its strategic technologies. In October Siemens Australia, the local arm of the German power engineering giant, signed on as technology partner for a potential 5 GW wind and solar power project on the Western Australian coast that aims to produce hydrogen for the transport sector.

Siemens Australia Chairman and Chief Executive, Jeff Connolly, said that its range of electrolyzers are "particularly well suited" to the intermittent nature of renewables. He added: "Australia is a potential giant in hydrogen production and the opportunities are enormous."

Hydrogen from the project would be transported to Asian countries like Japan and South Korea, which are planning a big role for hydrogen in transport in particular. Just weeks ago, South Korea's Ministry of Land, Infrastructure and Transport said the government plans to build three pilot hydrogen-powered cities by 2022.

A government statement said it is planning to select three cities by the end of this year after obtaining approval for the construction of the cities from local residents. Related infrastructure, such as 9.9 MW fuel cells, 670 hydrogen fuel cell-electric passenger vehicles and 30 hydrogen buses, will be available in the planned cities, the statement said.

These recent developments lend weight to the International Energy Agency's (IEA's) statement earlier this year that described 2019 as a year of "unprecedented momentum" for hydrogen. In a report published in June, the IEA said that the two previous major cycles of enthusiasm for hydrogen focused largely on the use of fuel cells in the transport sector. "What is new today," it said, is "both the breadth of possibilities for hydrogen use being discussed and the depth of political enthusiasm for those possibilities around the world."

Today, almost all hydrogen produced globally comes from natural gas (76 per cent) and coal (23 per cent). Electrolysis currently accounts for 2 per cent of production, but as costs come down there is significant scope for electrolysis to provide more low-carbon hydrogen. IEA analysis finds that the cost of producing hydrogen from renewable electricity could fall 30 per cent by 2030 as a result of declining costs of renewables and the scaling up of hydrogen production.

The Hydrogen Council expects the gas will account for about 20 per cent of world energy demand by 2050. This will cut global carbon emissions by 6 Gt, accounting for a big portion of worldwide efforts to limit global warming.

Tremendous growth in renewables but still not enough to halt climate change

- Total capacity to grow by 50 per cent between 2019 and 2024
- Solar PV to account for 60 per cent of renewables growth

Junior Isles

Two recent International Energy Agency (IEA) reports forecast strong growth for renewables, but the Paris-based organisation warns that deployment at the current pace is insufficient to meet climate goals.

In its 'Renewables 2019' market report, the IEA projects that the world's total renewable-based power capacity will grow by 50 per cent between 2019 and 2024 – an increase of 1200 GW – driven by cost reductions and concerted government policy efforts (see page 11 for key data).

According to the IEA, the share of renewables in global power generation is set to rise from 26 per cent today to 30 per cent in 2024. The expected growth comes after renewable capacity additions stalled last year for the first time in almost two decades.

Launching the report, Paolo Frankl, head of the IEA's renewables division, said the stall was largely due to policies that caused solar PV capacity growth in China, the largest global market, to fall from 53 per cent to 44 per cent. "This caused [global] solar PV additions to be flat," he said. "However, after the stalling, in 2019 we saw a double digit rebound [in renewables growth] driven by better policies and further cost reductions."

The renewed expansion remains well

below what is needed to meet global sustainable energy targets, however. "Renewables are already the world's second largest source of electricity, but their deployment still needs to accelerate if we are to achieve long-term climate, air quality and energy access goals," said Dr Fatih Birol, the IEA's Executive Director. "There is a growing disconnect between the government targets and discussions in the climate summits, etc., and what is happening in real life."

Distributed solar PV was a main focus of the report, with the IEA saying the installation of solar PV systems on homes, commercial buildings and industrial facilities is set to take-off over the next five years. Solar PV accounts for 60 per cent of the total rise in renewables, and distributed solar PV accounts for almost half of the growth in the overall solar PV market through 2024, says the report.

"As costs continue to fall, we have a growing incentive to ramp up the deployment of solar PV," said Dr Birol. The cost of generating electricity from distributed solar PV systems is already below retail electricity prices in most countries. The IEA forecasts that these costs will decline by a further 15 per cent to 35 per cent by 2024, making the technology more attractive and spurring adoption worldwide.

The agency cautioned, however, that

important policy and tariff reforms are needed to ensure distributed PV's growth is sustainable. Unmanaged growth could disrupt electricity markets by raising system costs, challenging the grid integration of renewables and reducing the revenues of network operators, it said.

In a separate report issued just days later, the IEA forecast that offshore wind power will also "expand impressively" over the next two decades. Its 'Offshore Wind Outlook 2019' is an excerpt from the agency's flagship 'World Energy Outlook 2019', which will be published in full on November 13th.

The IEA finds that global offshore wind capacity may increase 15-fold and attract around \$1 trillion of cumulative investment by 2040. This is driven by falling costs, supportive government policies and technological progress, such as larger turbines and floating foundations.

Today, offshore wind capacity in the EU stands at almost 20 GW. Under current policies, that is set to rise to nearly 130 GW by 2040. However, if the EU reaches its carbon-neutrality aims, offshore wind capacity would jump to around 180 GW by 2040 and become the region's largest single source of electricity.

An even more ambitious vision – in which policies drive a big increase in

demand for clean hydrogen produced by offshore wind – could push European offshore wind capacity dramatically higher, according to the report. It also noted that China was set to play a major role in the sector.

Yet a massive gap still remains in what is needed. According to the International Panel on Climate Change (IPCC), investment in renewables needs to increase to \$2.4 trillion per year by 2050 if the world is to have a hope of heading off the dangerous effects of climate change.

The Global World Energy Council (GWEC) recently called on governments to work together to ensure open investment environments and refrain from creating new tariff barriers for the wind industry.

Ben Backwell, CEO of GWEC, said last month: "It is vitally important for countries, governments, companies and communities to be working together to scale up the deployment of technologies like wind energy that we need to decarbonise. And yet, every week we are hearing talk about new trade barriers and new restrictions on badly needed investments being introduced. Whether we are in Beijing, Brussels or Washington, we all face a common problem and need to cooperate to replace fossil fuels with renewables as fast as possible and at the lowest cost."

Coal plants must close by 2030, says report

Governments will need to close most of the world's coal fired power stations by 2030, and halt the construction of new coal plants, to have any hope of successfully limiting global warming to around 1.5°C, according to new research.

Looking at individual plants, a research team from the Center for Global Sustainability based at the University of Maryland said 320 GW or 16 per cent of global installed capacity is expected to shut down by 2030, counting both announced retirements and plants whose lifetimes would exceed 50 years. However, achieving the 2°C goal requires a 720 GW or 36 per cent reduction in capacity by 2030, and achieving the 1.5°C goal requires a 1890 GW or 94 per cent reduction.

The research published in *Nature Communications* finds that the global coal generation fleet would need to close when plants reach an operating age of 35 years in order to meet the Paris 2°C target.

This deadline gets even shorter in a scenario that limits warming to no more than 1.5°C, and shorter still if coal fired power stations currently under development are allowed to be constructed.

According to the researchers, even if no new plants are built, the lifetimes of existing units are reduced to approximately 35 years in a well-below 2°C scenario or 20 years in a 1.5°C scenario. The lifetime limits for both 2°C and 1.5°C are reduced by five years if plants under construction

come online and 10 years if all proposed projects are built.

"We find that, while many countries are still actively planning, authorising, and constructing new coal power plants, this additional capacity is inconsistent with the long-term Paris goal," said the research paper.

Last month Singapore-based sustainability consulting firm Asia Research and Engagement noted that China's coal giants have no clear strategies in transitioning to clean energy, despite government mandates on capping coal use.

The report, 'Tracking the Transition', reviewed six leading Chinese energy companies to assess how the firms are adjusting their businesses to climate risks.

It examined 13 disclosure items including actual targets for renewable capacity, concrete timelines for a complete halt of coal fired capacity growth, and reporting of current emissions. The number of items that each company discloses is tracked and an average score is computed.

The average score of 2.5 among Chinese power companies was significantly lower than the score of 4.2 for other Asian companies and 7.4 for international leaders.

The report noted China's aggressive investment in renewable energy. Its total wind and solar power generation for 2018 represented 7.8 per cent of the world's total but renewables averaged only 3.7 per cent in the six companies' energy portfolio.

EU prioritises infrastructure

EU Member States have agreed on a Commission proposal to invest €556 million in key European energy infrastructure projects with major cross-border benefits.

The EU funding, which comes from the energy segment of the Connecting Europe Facility (CEF-Energy), go to Projects of Common Interest that increase competitiveness, enhance the EU's security of energy supply, and contribute to sustainable develop-

ment and the protection of the environment, as well as the promotion of safe, secure and efficient network operation.

Financial aid will go to studies and works for eight projects – six for electricity and two for gas. Of the overall funding to be granted, €550 million will be for electricity and €6 million allocated to gas.

In the electricity sector, a €530 million grant was awarded for work on

the Celtic Interconnector between France and Ireland which will for the first time connect Ireland directly with the continent. Construction of the proposed €1 billion link could start as early as 2022 and be completed by 2026.

Funding was also given for studies to support electricity storage projects in the Netherlands, Estonia, and Lithuania as well as the Baltic electricity Synchronisation Project.

The vote to fund natural gas infrastructure projects comes ahead of a decision expected in November by the European Investment Bank (EIB) on whether to stop financing natural gas projects.

If the proposal to cease financing is approved, the EIB would be the first multilateral bank to kick natural gas out of its portfolio for new loans. The bank has already stopped all coal lending.



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Connecticut attracts key players for 2 GW tender

■ Bidders line up for Connecticut developments
■ EDF, Shell start Atlantic Shores work

Siân Crampsie

Connecticut's offshore wind energy sector is set for growth after a 2 GW tender attracted bids from three major development companies.

The US state's Department of Energy and Environmental Protection said that it had received bids from Constitution Wind, Vineyard Wind and Mayflower in response to a request for proposals (RFP) issued in August 2019.

The RFP was the state's first solicitation dedicated specifically to offshore wind development and was issued in the wake of legislation passed by the state's Senate aimed at boosting offshore wind commitments.

Constitution Wind, a joint venture between Eversource and Ørsted, has offered Connecticut a number of project proposals that the developer

believes gives the state flexibility in selecting its next offshore project.

Its proposals are based around a development site located 90 km off the coast of New London that has been in development since 2015, and includes a 400 MW wind farm

The project is the most shovel-ready offshore wind proposal along the US east coast, according to Constitution.

Mayflower Wind, a joint venture between Shell New Energies US and EDPR Offshore North America, included proposals for one 408 MW scheme and one 804 MW wind farm located around 30 km south of Martha's Vineyard.

The projects would be built in waters leased by the federal government to Mayflower Wind last year that can support up to 1600 MW of offshore wind.

Vineyard Wind, a joint venture set up

between Iberdrola-owned Avangrid Renewables and Denmark's Copenhagen Infrastructure Partners (CIP), have proposed the Park City Wind project, which includes proposals for the development of 408 MW wind farm and options for 800 MW, 1000 MW and 1200 MW projects.

The projects would be built in one of the two lease areas assigned to Vineyard.

The companies were required to include environmental and fisheries mitigation plans in their bids, and have outlined the key benefits that their projects will bring to the state.

Lars Pedersen, CEO of the New Bedford, Massachusetts-based Vineyard Wind, said its proposal is "an opportunity for Connecticut to develop a world-class offshore wind industry in Bridgeport and solidify its

role as a high value industry hub in the US for years to come".

Constitution Wind says it will invest "hundreds of millions" directly into Connecticut through local jobs and training programmes, as well as through plans to upgrade New London State Pier to create an offshore wind industry hub.

In September, Atlantic Shores Offshore Wind, a joint venture between EDF Renewables North America and Shell New Energies, kicked off ocean survey operations within the Atlantic Shores lease area off the coast of New Jersey.

The work will help Atlantic Shores to design its up to 2500 MW offshore wind farm in the 74 200 ha lease area that it holds.

Atlantic Shores will use the Geosea survey vessel to characterise the sea-

bed, gather samples and determine placement of data collection buoys, which should be deployed later in 2019. The survey operations are expected to be completed by the end of October 2019.

EDF and Shell plan to participate in the next New Jersey Board of Public Utilities (NJBP) solicitation for offshore wind power through Atlantic Shores.

■ A coalition of wind energy companies has launched Offshore Wind California (OWC), calling on the state to set a goal of reaching a minimum of 10 GW of offshore wind by 2040. Founding member companies include Equinor, Ørsted, Northland Power, Principle Power, Aker Solutions, Magellan Wind and Mainstream Renewable Power, as well as the non-profit Pacific Ocean Energy Trust.

Honda seals renewable PPA

Car maker Honda has signed one of the largest renewable energy power purchase deals in the USA.

The company has committed to buying the energy from 120 MW of E.On's Boiling Springs wind farm in Oklahoma and 200 MW of solar power generated from a solar farm under construction in Texas.

The two virtual power purchase agreements (VPPAs) mean that Honda will buy 1.012 million MWh of electricity per year, enough to cover more than 60 per cent of its North America electricity needs.

Purchase of wind energy from E.On will start in late 2020, and from the Texas solar facility in late 2021, it said.

The deal is the largest renewable energy procurement commitment for an automaker and one of the largest

VPPA commitments in the US power market. It includes an innovative 'collar' price structure to limit Honda's exposure to energy price risk, the company said.

The collar structure sets upper and lower bounds on Honda's exposure to energy market price fluctuations in any given quarter, and could encourage more corporate PPA deals in the US market.

Honda will continue to purchase electricity from the local utility for each of its manufacturing facilities, but will receive and retire renewable energy certificates (RECs) equal to the power produced through the VPPAs, resulting in net zero CO₂e emissions from electricity use within Honda's Ohio, Indiana, and Alabama manufacturing operations.

Cubico stakes claim in Colombia

Cubico Sustainable Investments has launched operations in Colombia with plans to create a platform of up to 400 MW of solar PV in partnership with Latin American energy company Celsia, an affiliate of Grupo Argos.

The new partnership follows Cubico's recent opening of a local office in Bogota. The portfolio will be developed over the next two years and will be the largest of its kind in the country when completed.

Ricardo Díaz, Head of Americas at Cubico, said: "We are proud to have built this alliance in Colombia with Celsia, with whom we share an innovative spirit, strong support for clean energy and a long-term strategy. This milestone consolidates Cubico as a leader in the Americas and will serve as a platform to continue with our growth strategy and value creation in Colombia."

Earlier in October, Cubico announced the completion of a 600 MW renewable energy portfolio in Mexico and said that it is preparing to start construction on an additional 400 MW

wind energy portfolio there.

Under the partnership in Colombia, Cubico will provide expertise and best practices in asset management, as well as a multi-disciplinary team with expertise in identifying business opportunities to create long-term value, while Celsia will offer essential knowledge on the local power sector.

Francisco Moya, Head of Brazil & Latam at Cubico, added: "Celsia is one of the most important power companies in Colombia and undoubtedly the pioneer of the development of renewables in the country. We hope to continue developing renewable projects in the region through this exciting strategic partnership."

In Mexico, Cubico has completed the 250 MW Mezquite wind farm in Nuevo León and the 350 MWp Solem solar PV project in Aguascalientes, one of the largest of its kind to reach commercial operations in Latin America.

The two projects won power purchase agreements (PPAs) in Mexico's second long-term electricity auction that was held in September 2016.



US utility Duke Energy is planning to maintain operations at its six nuclear energy plants in order to help it maintain reliability and meet carbon emission reduction goals.

Duke has outlined plans to apply for license renewals for the 11 nuclear reactors it operates across six sites in the Carolinas.

The plants' current operating licenses are due to expire in the early 2030s and Duke wants to extend them by 20 years, it said. The company expects to submit the license renewal application for Oconee Nuclear Station in 2021, followed by its other nuclear stations.

Oconee is the company's largest nuclear power station, with three generating units that produce more than 2500 MW.

Duke Energy's 10.6 GW nuclear fleet

plays an important role in the company's efforts to lower carbon emissions. In 2018, it generated more than 72 TWh of electricity and avoided the release of about 54 million tons of carbon dioxide – equivalent to keeping more than 10 million passenger cars off the road.

The company has set aggressive carbon reduction goals of at least 50 per cent by 2030 and net-zero by 2050, and keeping its nuclear fleet operating is key to achieving these goals, it said in a statement.

"Our nuclear power plants have safely and reliably provided electricity to our Carolinas customers for decades," said Preston Gillespie, Duke Energy's chief nuclear officer. "These plants generate clean and cost-effective power, provide thousands of well-

paying jobs, and produce substantial economic benefits for the Carolinas. Renewing the licenses of these plants is important for our customers, communities and environment."

Nuclear sites are given initial 40-year approvals to operate and Duke's sites have each been given a previous 20-year renewal.

The process to renew licenses for a second 20-year period requires a comprehensive analysis and evaluation to ensure the units can safely operate for the extended operation period, Duke said. The review process begins with an acceptance review of the application by the US Nuclear Regulatory Commission (NRC), with a goal to complete the subsequent license renewal application review within 18 months of docketing.

China on track to meet 2020 ultra-low emissions targets

■ Air pollution from power plants falls dramatically ■ Construction starts on 6 GW wind farm

Syed Ali

Emissions from thermal power plants have declined significantly between 2014 and 2017, according to research carried out by a team of experts from the UK and China.

The group analysed emissions from coal, oil, natural gas and biomass powerplants, with a focus on coal fired power plants as the major contributors to ambient air pollution.

The study, published in *Nature Energy*, analysed data from 2014, when China introduced the ambitious Ultra-Low Emissions (ULE) Standards Policy for renovating coal fired power stations to limit air pollutant emissions, to 2017.

The team found that between 2014 and 2017, China's annual power plant emissions of sulphur dioxide, nitrogen oxide and particulate matter

dropped by 65 per cent, 60 per cent and 72 per cent each year, respectively from 2.21, 3.11 and 0.52 million tonnes in 2014 to 0.77, 1.26 and 0.14 million tonnes in 2017, which is in compliance with ULE standards.

This means that China looks to be on track to further reduce its emissions if all thermal power plants meet the ULE standards by 2020. These standards aim to limit the sulphur dioxide, nitrogen oxide and particulate matter emissions to 35, 50 and 10 mg/m³, respectively.

Co-author, Dr Zhifu Mi at University College London (UCL Bartlett School of Construction and Project Management), said: "This is encouraging news for China, as well as other countries wishing to reduce their power emissions. Thermal power plants combusting coal, oil, natural gas and biomass are one of the major

contributors to global air pollution.

"These significant emission reductions demonstrate the technical and economic feasibility of controlling emissions from power plants to reach ultra-low levels, which is an important step towards reducing the number of deaths attributable to air pollution."

The team constructed a nationwide emissions data-set – the China Emissions Accounts for Power Plants (CEAP) – based on data collected from the CEMS network between 2014 and 2017.

The research is the first to use data on emission concentrations collected by China's Continuous Emission Monitoring Systems network (CEMS), which covers 96-98 per cent of the country's thermal power capacity.

China has been making a concerted effort to reduce pollution and cut

carbon emissions from its power sector. In late September the State Power Investment Corp. Ltd. (SPIC) announced the start of construction on a wind power project with a power generating capacity of 6 GW in north China's Inner Mongolia Autonomous Region.

Qian Zhimin, SPIC's chairman, said the project involves an investment of Yuan40 billion (\$5.6 billion) from the company. After being put into operation, it is expected to supply nearly 20 TWh of electricity to Beijing, Tianjin and Hebei every year and provide green energy for the Beijing Winter Olympics in 2022.

The project could replace 6 million tonnes of standard coal and reduce the emissions of carbon dioxide by 16 million tonnes a year, said Qian.

The news came as the State Council of China said it will replace the existing

benchmark coal fired power tariffs with a new base price-plus-floating mechanism as of 1 January 2020. This new market-based price system is expected to lead to more flexible power prices but also to lower profits for coal fired power generators.

The benchmark price is determined according to the on-grid electricity price of the current coal fired power generation.

Under the new system, prices will be determined by the power generation company, the electricity sales company and the power user through negotiations or bidding. Prices may be raised by up to 10 per cent and reduced by up to 15 per cent.

The upward price revision will be allowed only as of 2021 to ensure that the average electricity price of general industry and commerce will not rise in 2020.

South Korea moves to curb pollution



The National Council on Climate and Air Quality has suggested implementing a seasonal dust management system that will operate from December to March next year.

The plan would see a crackdown on illegal emissions, the shut down of 27 coal power plants and the restriction of over 1 million diesel vehicles from cities during the four-month period.

The council, which expects the related bill to pass before December, says the policy initiative is aimed at reducing domestic emissions of PM 2.5 (ultrafine particles smaller than 2.5 micrometres in diameter) by 20 per cent.

Among other proposals covering industry and transport, the council has suggested that nine to 14 coal power plants be shut down from December to February, and 22 to 27 plants be suspended in March. Coal power plants generate 12 per cent of the country's ultra-fine dust.

The closures could lead to an average Won1200 (\$1) hike in the monthly electricity bill for a four-member

household over the period, the council said.

A long-term comprehensive plan to combat particulate pollution will be announced in the first half of next year, according to the council.

A significant project was recently announced that will help curb emissions from electricity consumed in the industrial sector.

South Korea's SK Hynix Inc. said it will spend Won800 billion (\$668 million) to build a 585 MW liquefied natural gas (LNG)-based thermal power plant in Cheongju, North Chungcheong Province, by 2022 for electricity self-sufficiency to run its chip lines in the region.

SK Hynix recently presented a blueprint of its plan to construct the LNG-based thermal power plant, dubbed Smart Energy Center, in Cheongju, at its third semiconductor plant in the city in North Chungcheong Province.

The power plant located on a 54 860 m² development area, will supply half of the power consumed by the semiconductor facility.

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FORWARD

Australia poised for clean energy exports

- Solar power exports planned to Singapore
- Hydrogen Action Plan unveiled

Syed Ali

Australia could soon become a world leader in exporting renewable energy, with the recent announcement of plans to export solar power and hydrogen to neighbouring countries.

Last month Sun Cable said it aims to build a solar farm at a 15 000 ha site at Tennant Creek in the Northern Territory and transmit the power produced to Singapore via an underwater cable from Darwin.

David Griffin, Chief Executive of Sun Cable, said the market was there in Singapore and he was confident the project would be able to deliver clean energy to the City-State in the near future, while providing huge benefits to Australia. At present, 95 per cent of Singapore's electricity is generated from liquid natural gas, which is imported mainly from Malaysia and Indonesia.

The solar export project has already been granted major project status by the Northern Territory Government

and environment approvals are pending. It is hoped construction can begin in 2023.

Australia has traditionally been a global exporter of coal and gas but the project looks to be the start of a trend to export green energy to countries in the region.

In late September the South Australian government unveiled a plan to become a leading global exporter of certified green hydrogen. South Australian Premier Steven Marshall used his opening address at the International Conference on Hydrogen Safety in Adelaide to launch its Hydrogen Action Plan.

He said while other jurisdictions were looking at non-renewable hydrogen as a stepping-stone to renewable hydrogen, South Australia was well placed to move straight to certified renewable hydrogen. Four key hydrogen projects are already underway in South Australia, utilising \$17 million in government grants and \$25 million in loans.

The state is already a world leader in wind, solar and battery storage, to the point where excess renewable energy is often shed during peak production periods.

"In this scenario, storage technologies such as hydrogen are extremely attractive to our state and as a large state in an area with remote communities, prospective mineral regions and long transport routes, hydrogen is an exciting, flexible fuel for the future," said Marshall.

Marshall said South Australia was on track to reach 90 per cent renewable energy generation in the mid-2020s and become a net renewable energy exporter in the 2030s.

South Australia was the first Australian jurisdiction to develop a plan to accelerate a hydrogen economy with the release in 2017 of a Hydrogen Roadmap. Last year, Australia's national science research agency CSIRO released its National Hydrogen Roadmap and several other states have also since released their own plans.

India set to miss renewables target

Global analytical company CRISIL says it expects India to miss its goal of having 175 GW of renewables generation capacity in 2022 by around 42 per cent amid policy uncertainty and low interest in tender rounds.

The firm predicts the country's installed renewables capacity at the end of fiscal 2022 will be just 104 GW, including 59 GW of solar and 45 GW of wind.

In its 'REturn to Uncertainty' report, CRISIL said there has been a significant drop in developer interest as tariff ceilings are being lowered. This, it says, is constraining project viability and causing renegotiation of tenders. The fact that some local governments have tried reducing the tariffs in signed contracts is not helping, it added.

CRISIL's report shows that around 26 per cent of the 64 GW of projects auctioned by the central government and state agencies in the fiscal year ended March 2019 attracted no, or lukewarm, interest, while 31 per cent faced delays in allocation. As a result, the ratio of auctioned or awarded projects to tendered projects fell to 34 per cent in fiscal 2019 from 77 per cent over fiscals 2015-16 and 2016-2017.

In order to restore developers' confidence, India needs to relax tariff caps and provide a consistent and stable

policy environment, CRISIL said. Besides, some policies such as renewable purchase obligations and penalties for delays in payments should be officially included in the Electricity Act, it added.

India's renewable energy programme is the world's most ambitious and is central to meeting its climate commitments. The programme, however, has also faced problems related to the use of agricultural land for renewable projects.

In a move to address the issue, last month a top government official said India would set up solar and wind projects on fallow land along its international border with Pakistan. A 30 km long, 20 km wide plot of land has been identified along the border in Kutch district of Gujarat and stretches along the border in Bikaner, Barmer and Jaisalmer districts of Rajasthan.

The government has proposed that state-run companies build massive clean energy parks at a cost of around \$2 billion each with built-in incentives to ensure states and operators are invested in the success of the parks.

The proposed renewable energy power parks of 2000 MW each will help developers achieve economies of scale and further bring down solar and wind power tariffs

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GREENCOM NETWORKS



■ Industry concern over distance rules ■ Climate Package cuts onshore target

Siân Crampsie

Germany's government has presented proposals to boost growth in the country's onshore wind energy sector.

The Federal Ministry of Economy has devised an 18-point 'Wind Plan' aimed at speeding up licensing procedures and overcoming growing levels of opposition to onshore wind from citizens groups.

The plan will help to unlock the 11 GW backlog of onshore wind farm projects caught up in Germany's planning process and will be implemented over the next 12-18 months by various local, state and federal government departments.

Wind installations in the first half of

2019 fell by 82 per cent to 287 MW, the lowest level in two decades, according to the German Wind Energy Association (BWE). In Germany's latest onshore wind energy auction, just 187 MW of capacity was awarded out of 500 MW available.

"The flawed auction design and difficulties in obtaining licences for turbine construction have discouraged investors, resulting in a lacklustre performance of the auction mechanism," said Mohit Prasad, Project Manager at GlobalData.

According to GlobalData, Germany is expected to have onshore wind installations of 54.6 GW at the end of 2019, an increase of 1.9 GW over 2018, considerably less than the 4 GW averaged in 2014 and 2015.

The new Wind Plan includes measures to simplify appeals processes and species protection regulations as well as the introduction of regional plans for wind energy growth.

It also includes a commitment to introducing a minimum distance rule for new wind farm developments, as outlined in the new Climate Package drawn up by Germany's coalition government in time for September's international climate meeting in New York, USA.

BWE welcomed the Wind Plan as a "major improvement" but expressed concerns over the minimum distance rule, which could lead to a large percentage of land for wind development being lost.

It has also expressed concern over

the possibility of Germany's onshore wind targets being reduced in the latest draft of the Climate Package.

Early versions of the Package indicated that a 2030 target of 80 GW would be set for onshore wind, but this has been reduced to 67-71 GW in the latest draft.

BWE called the new targets "incomprehensible" and said they would affect Germany's ability to meet its 2030 climate goals.

Germany says that it intends to reach a 65 per cent share of renewable energies in electricity consumption by 2030.

Germany and the Netherlands have signed a Joint Declaration of Intent on the energy transition, which includes cooperation on the development of

cross-border offshore wind projects. The two countries say that they see great potential in the development of

offshore wind projects and infrastructure in the North Seas region to accelerate the deployment of renewable energy, and have identified a number of potential cross-border projects that could benefit from cooperation.

Last month Dutch-German offshore grid operator TenneT TSO issued a tender for two high voltage direct current (HVDC) systems, and offshore and onshore converters for the 4 GW IJmuiden Ver offshore wind zone.

TenneT will develop two 2 GW offshore HVDC grid connections for integrating IJmuiden Ver wind farms into the Dutch power grid from 2024-2030.

Stalled CM scheme gets European approval

The UK government says that capacity market payments will resume following approval of the capacity market (CM) scheme by European regulators.

The European Commission has been assessing the CM scheme, which supports security of supply objectives in Great Britain, and ruled last month that it is compatible with State Aid rules.

The CM scheme has been in operation since 2014 but was halted in late 2018 when a company operating in the market appealed against the European Commission's original approval of it.

The latest ruling not only means that the market can resume, but that CM payments owing to generators operating in the GB market over the last 12

months can be released.

The government said that the "vast majority" of the £1.04 billion owed to generators would be paid in January 2020.

According to Moody's InterGen NV will receive £39 million with the restoration of the market, while EDF is owed over £300 million. SSE and RWE are also owed CM revenues.

Industry trade body Energy UK said that it was "delighted" with the European Commission's ruling as the suspension of the market had "threatened serious consequences".

"The CM can now continue to do the job it has done successfully for a number of years, ensuring security of

supply at the lowest cost to customers in times of high demand," said Lawrence Slade, chief executive at Energy UK. "The Capacity Market has been rightly evolving to reflect a different mix of energy generation with newer technologies gaining a greater share in recent auctions. With the inclusion of renewables in future auctions – something we have long called for – a technology-neutral CM will continue along this path and drive progress towards a net-zero economy bringing benefits for both the environment and the economy, while reducing costs for customers."

The Commission's investigation confirmed that the CM scheme complies with EU State aid rules, in

particular with the 2014 Guidelines on State Aid for Environmental Protection and Energy. "In particular, the investigation confirmed that the scheme is necessary to guarantee security of electricity supply in Great Britain, is in line with EU energy policy objectives, and does not distort competition in the Single Market," the Commission said in a statement.

The Commission said it did not find any evidence that the scheme would put demand response operators or any other capacity providers at a disadvantage with respect to their participation in the scheme.

Cornwall Insight noted that electricity suppliers in GB are now required

to make payments to the Electricity Settlements Company to repay generators, which provided capacity during the 2018-19 delivery year. Suppliers were allowed to keep collecting this money under Ofgem's price cap regulation and payments. The payments are likely to be expected by December 2019 and are estimated to be in the region of £1 billion.

Tom Edwards Senior Modeller at Cornwall Insight, said: "While this is undoubtedly good news for generators, this could potentially cause problems for suppliers at a time when they are already facing large payments for other bills such as their Renewables Obligation and Feed-in Tariff."

Enel completes Kafireas

Enel Green Power says that the completion of the largest onshore wind farm in Greece marks a milestone in the company's history.

Enel has completed construction of the 154 MW Kafireas wind farm, which consists of 67 Enercon wind turbines installed across seven locations on the island of Evia.

The €300 million project is significant because Greece is one of the first countries where Enel started its renewable journey more than a decade ago. "Kafireas underscores our global commitment to renewable energy and decarbonisation, in line with our pursuit of the United Nations Sustainable

Development Goals, as well as our commitment to a diversified generation mix at country level," said Antonio Cammisecra, Enel Green Power CEO.

Kafireas spent almost 14 years in Greece's planning system, according to the country's wind energy association (Eletan), which has welcomed recent moves by the government to speed up planning procedures and cut red tape for developers.

There is an estimated 20 GW of onshore wind energy projects held up in Greece's planning system. In September Greece's Ministry of Environment and Energy set up a working group to find ways of simplifying complex

planning procedures, while the Energy Regulatory Authority (RAE) held a consultation to gather views on the permitting system.

The government's committee is aiming to introduce new legislation by the end of the year to update procedures for wind farm production licences, and has targeted the spring of 2020 for new legislation on environmental licences. RAE has proposed simplified application procedures as well as a mechanism to cancel permit applications for projects that do not reach key milestones.

Wind farm projects take an average of eight years to obtain all their permits, Eletan says.

TIGER drives tidal growth

Plans for large-scale deployment of tidal stream technology in Europe took a step forward last month with the approval of a €46.8 million project to support tidal stream energy developments in and around the Channel region.

The EU-funded Interreg VA France (Channel) England Programme has approved €28 million of financing for the Tidal Stream Industry Energiser Project (TIGER), which aims to install up to 8 MW of capacity at sites in and around the Channel region. The region has around 4GW of economically exploitable resource.

TIGER is led by the UK's Offshore Renewable Energy (ORE) Catapult

and includes a total of 19 partners from across the UK and France, including Edinburgh-based Orbital Marine Power, the European Marine Energy Centre (EMEC), France's EDF, Minesto AB of Sweden, and SIMEC Atlantis Energy Ltd.

Programme Manager Carolyn Reid stated that the long-term objective is to help the sector cut generating costs to about €150 per MWh by 2025 from the current €300/MWh. There is also an EU-set target to achieve €100/MWh by 2030.

SIMEC Atlantis says the programme will help it develop a tidal energy project planned for the Raz Blanchard site off the coast of Normandy, France.

South Africa unveils power plan as blackouts persist

South Africa has unveiled a 10-year plan for its electricity sector, but is unable to tackle immediate problems causing regular blackouts.

South Africa has been hit by a new wave of rolling blackouts as the government put forward plans for developing its power sector for the next decade.

National utility Eskom last month imposed the cuts – the first for several months – due to high levels of unplanned breakdowns at its coal fired power plants.

The rolling blackouts were imposed just days before South Africa's cabinet gave its approval to the Integrated Resource Plan (IRP), a policy blueprint for the electricity sector.

The IRP spells out a proposed energy mix for the country until 2030

and includes measures to diversify energy resources and “ensure the country responds to the energy needs for the next decade”, according to a statement from the cabinet.

The IRP plans around 32.5 GW of new capacity additions to 2030, including 1500 MW of coal fired capacity, 6000 MW of solar PV capacity, 14 400 MW of wind energy, 2500 MW of hydropower and 8100 MW of gas fired capacity.

By 2030, South Africa's coal based generation will have fallen to 33 847 MW from its current 39 16 MW, while clean energy such as solar, wind and

gas will have increased by a total of 330 per cent.

Plans to add more coal fired capacity have been criticised by environmental groups, but South Africa's Chamber of Commerce welcomed the IRP as a blueprint for future investments in the country's energy system.

“No progress is small and the taking of such pro-active steps by the government of South Africa is saluted by the entire energy community,” said NJ Ayuk, Executive Chairman at the African Energy Chamber and CEO of the Centurion Law Group. “We encourage our global partners to start reaching out

and get involved in South Africa's new era of energy development.”

Eskom's rolling blackouts had eased by the end of October, but the company's financial problems remain an issue for the government, which is desperate to attract investment to the country's energy sector to underpin economic growth and development.

Eskom said in mid-October that the electricity system was “under severe pressure” because several generating units were out of service and because of problems with coal handling at the Medupi power plant.

“We unreservedly apologise to South

Africans for the negative impact this may have and want to assure the nation that we continue to work tirelessly to ensure security of energy supply,” Eskom said.

Years of financial mismanagement have left Eskom with spiralling debts and an inability to make the investments needed in its power plant portfolio and electricity network.

President Cyril Ramaphosa has backed a plan to split Eskom into three state-owned businesses that would be easier to finance. But trade unions have resisted the restructuring, saying it would lead to wholesale privatisation.



Two key gas-to-power projects in Afghanistan will be supported by finance from the World Bank.

The Sheberghan and Mazar-e-Sharif projects aim to increase the amount of domestically generated electricity while leveraging private financing for the country's energy sector. The World Bank has agreed a financing package of \$98.8 million consisting of guarantees, a loan and swaps, it said.

The financing package supporting the Sheberghan gas-to-power Project entails a \$12.8 million guarantee from the International Development Association (IDA), the World Bank Group's fund for poorest countries.

For the Mazar-e-Sharif gas-to-power project, the World Bank will provide a \$12 million guarantee from IDA to backstop the ongoing payment obligation of Afghanistan's power utility, Da Afghanistan Breshna Sherkat (DABS), and a \$23.8 million senior loan and \$1.5 million in client risk-management swap from the International Finance Corporation (IFC).

IFC will also be mobilising \$43.8

million in parallel loans for the project as mandated lead arranger.

The Mazar-e-Sharif gas-to-power project will also benefit from political risk insurance amounting to \$48.7 million from the Multilateral Investment Guarantee Agency (MIGA), provided to two private shareholders and a senior lender. The guarantees will provide protection against the risks of breach of contract, expropriation, transfer restriction and currency inconvertibility, and war and civil disturbance for up to 15 years.

“Afghanistan's energy needs are enormous, and the new package will support a great step forward for the country's development. Investing in the energy sector is key for the country to achieve its full growth potential, said Henry Kerali, World Bank Country Director for Afghanistan.

“Diversifying sources of electricity supply can help more Afghans benefit from reliable grid connections, improve employment generation and economic growth of the country, and reduce poverty. The World Bank

Group stands with the Government of Afghanistan throughout the implementation of the projects to ensure their timely and effective completion,” he added.

The Sheberghan gas-to-power Project will support the construction and operation of a greenfield 40 MW gas-to-power plant utilising indigenous gas from the nearby Sheberghan gas fields in northwestern Afghanistan. The project will be implemented by the privately owned Bayat Power Electricity Services Distributor Company, which was established by Bayat Group.

The Mazar-e-Sharif gas-to-power project is a greenfield 58.6 MW reciprocating engine power plant also utilising gas from the Sheberghan gas fields. The plant is expected to account for the equivalent of nearly 28 per cent of the country's 2019 domestic power generation and 6 per cent of total electricity supplied to Afghanistan in 2019. The project will be implemented by Afghan Power Plant Company, which was established by Ghazanfar Group.

AfDB backs green bank idea

The African Development Bank (AfDB) is investigating whether investment in clean energy could be mobilised and accelerated through the creation of national climate change funds and green banks.

The AfDB, in partnership with the Climate Investment Funds (CIF), has commissioned the Coalition for Green Capital (CGC) to prepare a study on the creation of national climate change funds and green banks in Africa.

The moves came as the AfDB said it would no longer support coal fired power projects.

Speaking at the UN Climate Action Summit in New York, bank president Akinwumi Adesina confirmed an end to financial support for coal, a move that brings it in line with other multilateral lending agencies.

The bank has also committed to doubling its climate financing to \$25 billion by 2025, nearly half of which will be devoted to climate adaptation.

AfDB said that when paired with effective grant programmes through National Climate Change Funds and strong enabling environments and

policies, locally-based green banks are powerful tools to address market needs, understand local risk and drive private investment.

CGC will identify and work with six African countries to conduct feasibility studies. Andrea Colnes, Director of Global Green Bank Development at the CGC noted: “For countries to better access climate finance and fully engage the private sector, the climate finance system must re-orient toward national financial capacity that is able to channel capital to projects and markets where it is needed most.”

Dr. Anthony Nyong, the AfDB's Director for Climate Change and Green Growth, commented: “Green financing vehicles are increasingly recognised as a powerful instrument to mobilise private sector capital for low carbon and climate resilient development.

“Their ability to access even limited amounts of local currency finance presents significant opportunities to manage risk, attract concessional finance from climate funds and crowd in private sector finance.”

Zimbabwe approves PVs

Zimbabwe's energy regulator has approved plans to build 39 solar photovoltaic (PV) projects in an effort to boost power generation capacity.

The Zimbabwe Energy Regulatory Authority (ZERA) says that the 39 projects have a combined capacity of 1152 MW and will require investments of \$2.3 billion. Six of the projects, representing 7.5 MW of capacity, are already operational, and a further two are under construction, it said.

Three projects totalling 111 MW are at concept or pre-feasibility stage, 22 projects totalling 885 MW are at feasibility and technical studies level and three projects totalling 70 MW are at feasibility or proof of bankability stage. Another three projects totalling 53 MW are at funding stage, while two projects totalling 25 MW are at

construction stage.

Zimbabwe has an installed solar PV capacity of 12 MW and is targeting a capacity of 1575 MW by 2030.

The projects will provide a substantial boost to the power generating sector in Zimbabwe, which is suffering from crippling power shortages and shortages of fuel.

Hyperinflation forced ZERA to quadruple the price of electricity in early October to about Z\$1.62/ kWh (11¢/ kWh). It was the second tariff hike in two months. The latest increase should result in “a significantly improved electricity supply, reduced load-shedding hours and improved reliability of supply,” ZERA said. President Emmerson Mnangagwa has promised to revive the economy and end its international isolation.

Senvion seals SGRE deal

■ SGRE acquires 8.9 GW service portfolio ■ Acciona launches Nordex takeover

Siân Crampsie

Senvion is starting to wind down parts of its business after securing a deal with Siemens for the sale of its European onshore wind services unit.

The troubled German wind turbine manufacturer says that the wind-down process will enable it to secure “socially acceptable solutions” for remaining employees as well as the orderly liquidation of remaining assets.

Senvion has reached a deal to sell a “large part” of its European onshore services business and a blade production factory in Portugal to Siemens Gamesa.

The proposed deal has been approved by Senvion’s creditors’ committee and is expected to close by the end of the year. The deal is “a good solution” for Senvion’s service customers, Yves Rannou, CEO of Senvion, said.

“We are pleased that we have been able to give our colleagues in a large part of the European Onshore Services business and in our blade production facility in Portugal positive news today, securing close to 60 per cent of all jobs for now,” Rannou said.

Senvion said that it is in explorative talks with potential buyers for some other parts of its business, including its Indian operations and non-European service operations. It is thought to be winding down its offshore wind business.

“I sincerely thank everyone who made Senvion what it was for decades: a pioneer in the provision of clean power to the world,” added Rannou. “We will now continue our efforts to pursue potential options for other business parts to find solutions for as many employees as possible.”

The purchase of Senvion’s European

business will strengthen the competitive position of Siemens Gamesa in key European onshore markets, and enable it to service an even broader range of wind turbine technologies, the company said.

The assets included in the transaction include all the intellectual property of Senvion and access to a service fleet of 8.9 GW.

“The addition of these assets helps to diversify Siemens Gamesa’s business mix and geographical exposure with contracts that offer long-term visibility and renewal rates that have historically been very high,” Siemens Gamesa said in a statement.

In addition, the Vagos plant will help to strengthen Siemens Gamesa’s industrial value chain and reduce dependency on supplier sourcing from Asia, mitigating volatility amid the uncertainties brought about by current trade

issues.

“This transaction is an important step forward for Siemens Gamesa,” said Markus Tacke, its Chief Executive Officer. “Bringing Senvion’s service assets on board will help us to drive growth in a key market segment and add important capacity in Germany and other important European markets, while the blade factory helps us mitigate the risk in the difficult trade environment. We’re bringing good people and good business into the company and that’s a win for all parties.”

As part of the acquisition, approximately 2000 Senvion employees are expected to join Siemens Gamesa.

Senvion filed for self-administration in April 2019. In July, the turbine manufacturer revealed plans to sell the company as a whole, or substantial parts of it.

Earlier in October Acciona launched a 100 per cent takeover of German manufacturer Nordex after increasing its majority share in the wind turbine maker to 36.27 per cent.

The proposed deal will help counter the market dominance of the “big three” turbine makers, according to analysts.

“The leading three western wind turbine OEMs – Vestas, SGRE, GE – are dominating the global turbine market share,” said Shashi Barla, Wood Mackenzie Principal Analyst. “As such, it’s imperative for pure-play companies such as Nordex to strengthen their global market position.”

“With strong backing from the current largest shareholder and one of the leading Independent Power Producers (IPPs), Acciona Energy, Nordex’s commercial market share position will be solidified.”

Equinor develops strategy with CPIH deal

Equinor is looking to a new partnership to help it break into the Chinese renewable energy market.

The Norwegian energy firm has signed a memorandum of understanding with China Power International Holding (CPIH) to cooperate on offshore wind in China and Europe. The deal could potentially be expanded in the future, Equinor said.

“China is rapidly increasing its use of renewables and natural gas. The country is set to become the world’s biggest offshore wind market by 2030. As an offshore wind major, Equinor is excited to collaborate with CPIH to develop offshore wind,” said executive vice president New Energy Solutions, Pål Eitrheim.

The deal will give Equinor access to the Chinese renewable energy market, and will also give CPIH a pathway for international expansion as well as experience in the offshore wind energy sector.

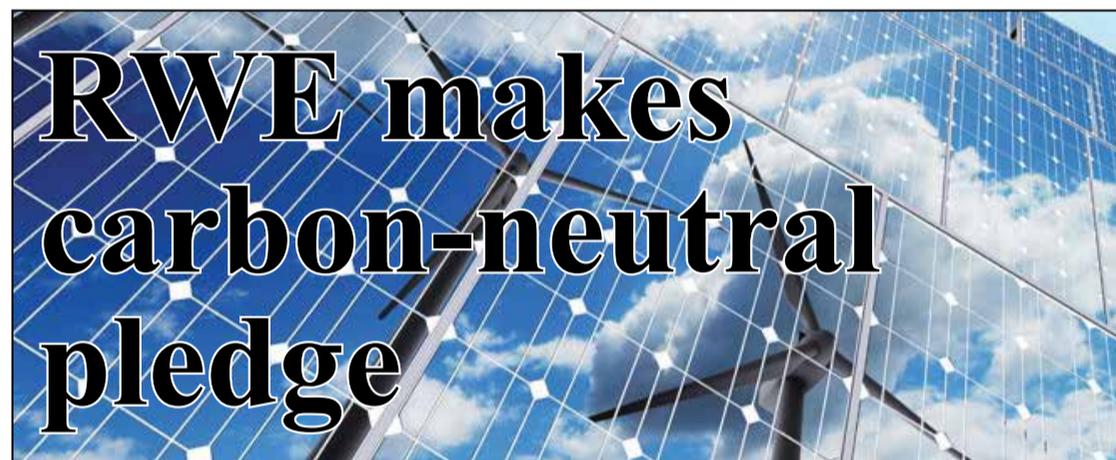
It also cements Equinor’s position as a leading player in the growing global offshore wind energy market following recent major project deals in the UK and USA.

The company is also moving forward with plans to develop an 88 MW floating offshore wind energy project in Norway.

“In order to realise their offshore ambitions, we are seeing offshore wind developers aggressively push to position themselves in new markets through greenfield projects, pipeline acquisitions and alliances,” said Søren Lassen, Wood Mackenzie Senior Research Analyst.

He added: “Equinor has, in 2019, cemented its strong position in offshore wind – not only through its tender victories but also through its ability to position itself in fledgling offshore wind markets such as Poland, South Korea, the Canary Islands and now China.”

“Equinor is only the second European developer to break into the Chinese offshore wind market. The other European developer, EDF, only managed to do so earlier this year. Both of players have leveraged existing relationships with state-owned Chinese companies to enter the market, proving that relationships are key to enter the Chinese market.”



RWE is realigning its business in the wake of its asset-swap deal with German counterpart E.ON.

The group has outlined an ambitious CO₂ reduction plan that includes phasing out fossil fuels and “massive investments” in renewable energy and storage technologies.

The move comes just weeks after European regulators signed off on a €43 billion asset swap deal between RWE and its E.ON that has made RWE the third-largest renewables group in Europe, and the second-largest in the market for offshore wind power.

RWE said that it will become carbon neutral by 2040 through a three-stage plan to shutter all of its coal and gas fired power plants. “Lignite and nuclear energy have laid the foundations we are building the new RWE on,” said Dr. Rolf Martin Schmitz, CEO of RWE AG. “But every form of energy has its

time. Now we are opening a new chapter of our corporate history, which looks back on over 120 years.”

RWE announced plans earlier this year to close its last remaining coal-fired power plant in the UK – Aberthaw B – by 2020. In Germany, it will gradually close coal fired capacity in line with the recommendations of Germany’s Commission for Structural Change. In the Netherlands, where the government wants coal-based electricity generation to end by 2030, RWE is already converting two coal plants to biomass firing.

“This presents RWE with a huge task. But we have a very clear idea of how to achieve our goal: we will phase out fossil energy sources both consistently and responsibly,” said Dr. Schmitz. “We will make huge investments in wind and solar power as well as in high-capacity storage technologies. The

new RWE is and will remain one of the major players in the electricity generation business.”

RWE earlier announced plans to invest €1.5 billion per year in renewable energy and storage capacity. It recently purchased a 100 per cent stake in four offshore wind energy projects in Poland, construction of which could start in 2023.

“As one of the world’s leading renewable energy companies RWE sees great potential for offshore wind parks on the central Polish Baltic Sea,” said Anja-Isabel Dotzenrath, CEO, RWE Renewables. “Our strategy is to develop the projects, build them and drive the growth of offshore wind energy in Poland with our operations forward.”

Following its asset swap with E.ON, RWE Renewables now has more than 9 GW of installed capacity and 2.6 GW under construction.

Eni signs Mainstream collaboration

Eni and Mainstream Renewable Power will target strategically important and high growth markets through a new renewable energy venture.

The two companies have signed a cooperation agreement to develop large-scale renewable assets, collaborating on potential projects across Africa and Southeast Asia, with an initial focus on the UK.

“Eni has defined an integrated business model, which draws on specific

areas of expertise and competitive advantages, such as Eni’s technical competences and global presence,” said Luca Cosentino, Executive Vice President of Energy Solutions department at Eni. “We believe that this new partnership with Mainstream will bring additional value to our renewable business, especially in the area of offshore wind.”

The joint venture will participate in the UK’s Round 4 CFD auction –

scheduled for 2021 – and will combine Mainstream’s “leadership position, expertise and unrivalled track record in the global offshore wind sector with Eni’s pre-eminence and experience in offshore energy infrastructure”, said Andy Kinsella, Mainstream’s Group Chief Executive.

Italy-based Eni targeting installation of 1.6 GW of new solar, wind and storage capacity by 2022 and 5 GW by 2025. Mainstream has developed, con-

sent and brought to the ‘ready to build’ stage 35 per cent of the UK’s 2020 offshore wind capacity, including the 3000 MW Hornsea offshore wind farms, which it sold to Ørsted in 2016, and the 450 MW Nearth na Gaoithe offshore wind farm in Scotland, which it sold to EDF Renewables in 2018.

Mainstream is also developing the 800 MW Phu Cuong Soc Trang offshore wind farm in Vietnam and has prequalified for the 1000 MW offshore

wind tender in Gujarat, India. The company wholly-owns 1.3 GW of fully contracted wind and solar assets in Chile, which are on track to reach commercial operation starting in 2021.

Mainstream has put 600 MW of wind and solar into commercial operation in South Africa and has 250 MW of wind assets in construction there. Through its Lekela Power joint venture in Africa it has 410 MW of wind assets in construction in Senegal and Egypt.

10 | Tenders, Bids & Contracts

Americas

SGRE boosts Chile orders

Siemens Gamesa Renewable Energy (SGRE) has signed new orders for 359 MW of onshore wind in Chile.

The contracts take Siemens Gamesa's order entry in the country to 640 MW for the fiscal year 2019, a record high for the company.

The latest three contracts cover the installation and commissioning of 82 SG 4.5-145 turbines with flexible power rating, as well as provide long-term operation and maintenance services of up to 15 years to some of the projects. Installation of the wind turbines is scheduled for next year.

Engie Chile contracts GES

Spain's Global Energy Services (GES) has been hired by Engie Energia Chile to build a solar park and wind farm in Chile's Antofagasta region.

GES has said it will work on the 162 MW Calama onshore wind park and the 97 MW Capricornio solar photovoltaic (PV) project under a single engineering, procurement and construction (EPC) contract, which it secured on the back of its work on wind farms in Mexico for Engie.

For the Calama project, GES will provide the full scope of EPC services. The wind farm will feature 36 turbines of 4.5 MW each with a hub height of 94 m. The scope of services for Capricornio will be narrowed as it will not include the supply of the main equipment.

Construction of both projects will be concluded in late 2020.

Vestas wins 641 MW in US

Vestas has secured orders for unnamed customers in the USA for two wind projects totalling 641 MW.

The company is to provide 230 MW of its V136-3.45 MW turbines delivered in 3.6-MW Power Optimised Mode for one project, and 359 MW of V120-2.2 MW turbines for a second.

The order includes supply and commissioning of the turbines as well as service agreements. Turbine deliveries and commissioning will take place in 2020.

EDF orders GE units for Brazil

EDF Renewables has placed an order with GE for the supply of 132.5 MW of wind turbines for a project in Brazil.

GE Renewable Energy will deliver 25 of its 5.3 MW Cypress platform machines, its largest onshore wind turbine, as part of the company's first contract with the renewables arm of EDF in the Latin American country.

The equipment will be installed as part of the Ventos da Bahia wind farm, currently operating with a 182 MW capacity near the cities of Bonito and Mulungu do Morro, Bahia state.

GE will also provide operation and maintenance (O&M) services for a 20-year period.

Asia-Pacific

Blades go large in Taiwan

Wpd has placed an order with Vestas for key equipment for two wind farms in Taiwan.

The Chuangwei and Leadway wind farms will consist of 17 Vestas V117-3.45 MW wind turbines delivered in 3.6 MW Power Optimised Mode. The turbines will feature Taiwan's largest onshore rotors to optimise energy production at the sites' medium to high wind conditions.

The order marks the first deal

confirmed under a strategic frame agreement signed between Vestas and Wpd for over 400 MW of onshore wind projects in Taiwan.

The order includes a 15-year Active Output Management 4000 (AOM 4000) service agreement, designed to maximise uptime and ensure optimised performance for both sites. Commercial operations at both Chuangwei and Leadway are expected to commence in the last quarter of 2020.

Toshiba wins Dieng geothermal contract

Toshiba Energy Systems & Solutions Corporation has won a contract with PT Inti Karya Persada Teknik (IKPT) to supply a steam turbine and generator set for the Dieng small scale geothermal power plant located in Central Java, Indonesia.

Toshiba ESS has carried out design and engineering work for the project, which is being developed by PT Geo Dipa Energi (Persero), Indonesia's state-owned geothermal energy company. It is scheduled to start operating in March 2021.

The 10 MW project will be constructed in the Dieng plateau and located near the existing Dieng geothermal power plant Unit 1, which has been operating since 2002.

BHEL wins Khurja order

THDC India Ltd. has placed an order with Bharat Heavy Electricals Limited (BHEL) for the turbine generator and associated equipment for the greenfield 2x660 MW Khurja super thermal power project in Bulandshahr district of Uttar Pradesh, India.

BHEL's scope of work includes the design, engineering, manufacture, supply, erection, testing and commissioning of the turbine generator and associated packages for THDC India, a joint venture between the government of India and the government of Uttar Pradesh.

SGRE wins first contract in China

Siemens Gamesa Renewable Energy (SGRE) has won its first contract in China for its 4.X wind turbine platform.

The company will install 42 units with unit rating reaching 4.8 MW, as well as provide operation and maintenance services for five years at a 200 MW project developed by local independent power producer Xinjiang TBEA Group.

The 200 MW wind farm is located in the city of Changji, in the region of Xinjiang, northwest China. The Siemens Gamesa 4.X platform, with its 145 m rotor variant, is a good fit for the project site conditions with medium wind, sandy and dusty weather, and low temperatures during winter time. Commissioning is expected before the end of 2020.

Europe

GE wins Dogger Bank bid

GE Renewable Energy has been selected as preferred supplier to provide wind turbines for SSE and Equinor's Dogger Bank offshore wind project.

The three 1.2 GW Dogger Bank wind farms in the North Sea will use GE's 10 MW Haliade-X turbine platform. The exact number of turbines to be deployed will be confirmed "in due course", GE said.

The Dogger Bank projects were successful in the UK's latest Contracts for Difference (CFD) auction. Construction is expected to start in 2020, with first power delivered in 2023.

SSE Renewables will lead the development and construction phases of Dogger Bank and Equinor will lead on operations once completed. The projects are expected to trigger approximately £9 billion of capital investment between 2020 and 2026.

Vestas on point in Piiparinmaki

Glennmont Partners and Finnish developer Ilmatar Energy have placed an order with Vestas for the 211 MW Piiparinmaki wind project in Finland's Pyhanta and Kajaani municipalities.

The Piiparinmaki project will be the largest wind park in Finland and will feature 13 Vestas V150-4.2 MW and 28 of its V150-5.6 MW turbines with 155 m steel towers. An anti-icing system will also be deployed, Vestas said.

The contract includes the supply, installation and commissioning of the 41 wind turbines, as well as a 30-year Active Output Management 5000 (AOM 5000) service agreement. The project will also feature a Vestas Online Business SCADA solution to lower turbine downtime and optimise the energy output.

The order marks the first use of an anti-icing system on the EnVentus platform.

The turbines will be delivered in sections from mid-2020 onwards with commissioning of those sections to follow in late 2020 and 2021. Google will purchase the output from the wind farm under a corporate Power Purchase Agreement.

Valmet optimises Helen in Helsinki

Valmet will supply an optimisation solution for Helen Ltd's district heat production and network in Helsinki, Finland, it has announced.

The system will enable Helen to improve the energy efficiency of its district heating network, reduce emissions and lower costs, and is due to start up in spring 2021.

Valmet's delivery includes a Valmet DNA District Heat Manager, a district heat production and network optimisation solution that enables the management of district heat production, consumption and transfer through a single solution.

The system optimises the temperature of the district heating network flow, pressure differences and pumping, and coordinates the capacity of heating plants and district heat accumulators. It also automates the operations of district heating networks and plants.

MHI Vestas sees Seagreen

MHI Vestas has entered into a preferred supplier agreement with Seagreen Wind Energy Limited to supply and service up to 114 wind turbines for the Seagreen wind farm off the coast of Scotland.

Seagreen Wind Energy Ltd., a wholly-owned subsidiary of SSE Renewables, was awarded exclusive development rights by the Crown Estate for the Firth of Forth Zone of the UK's Round 3 offshore wind farm development programme in 2010. Its phase 1 development – a 454 MW development located 27 km off the Angus coast – secured a 15-year contracts for difference (CFD) contract in the UK's latest renewable auction.

Vestas repowers Italian merchants

E2i Energie Speciali has placed a 43 MW order with Vestas for two merchant repowering projects in the province of Chieti, Italy.

For the Roccaspinaveti wind park,

24 V47-660 kW wind turbines will be replaced by nine V112-3.3 MW turbines, while the Castiglione Messer Marino will include four V112-3.3 MW wind turbines to replace third-party turbines.

The two companies say they examined operational data from the two wind farms to create a custom repowering solution that doubles energy production, reduces the number of turbines by 70 per cent, and will enable them to operate on a purely merchant basis. Turbine delivery is expected to begin in the 2Q 2020 while commissioning is planned for the 4Q 2020.

MHI floaters set for France

Wind turbine manufacturer MHI Vestas Offshore Wind will deliver turbines for the 28.5 MW Groix & Belle-Ile pilot floating wind project off the French coast, replacing GE as a preferred turbine supplier.

MHI Vestas will provide three of its V164-9.5 MW machines for the project, which is due to be installed off the coast of Brittany in 2022, at water depths of between 55 m and 70 m. The turbines will be installed on floating platforms developed by Naval Energies.

Oostpolder boost for Enercon

The developers behind the Oostpolder wind farm in the Netherlands have signed a contract with Enercon for the supply of turbines.

Enercon will deliver 13 of its 4.65 MW E-136 EP5 wind turbines with 136 m rotor diameters and 155 m hub heights.

The project co-developer Waddenwind BV will receive 12 units for its section of the Oostpolder onshore park, while Gijzenberg Windenergie BV will install one turbine. Another section of the wind farm is in the planning stage and will feature eight Enercon E-136 EP5 machines.

First power from Oostpolder is expected in the second half of 2020, while full commissioning is planned for 2021.

International

Lekela orders SGRE for West Bakr

Renewable energy developer Lekela has placed an order with Siemens Gamesa for construction of the 250 MW West Bakr wind project in Egypt.

Siemens Gamesa will install 96 SG 2.6-114 turbines through a turnkey EPC contract and will provide long term maintenance through a 15-year service agreement. The first wind turbines will be delivered in mid-2020 and the project is set to be fully operational in 2021.

The West Bakr wind project, situated 30 km northwest of Ras el Ghareb in the Gulf of Suez, will increase the country's installed wind energy capacity by 18 per cent to 1650 MW.

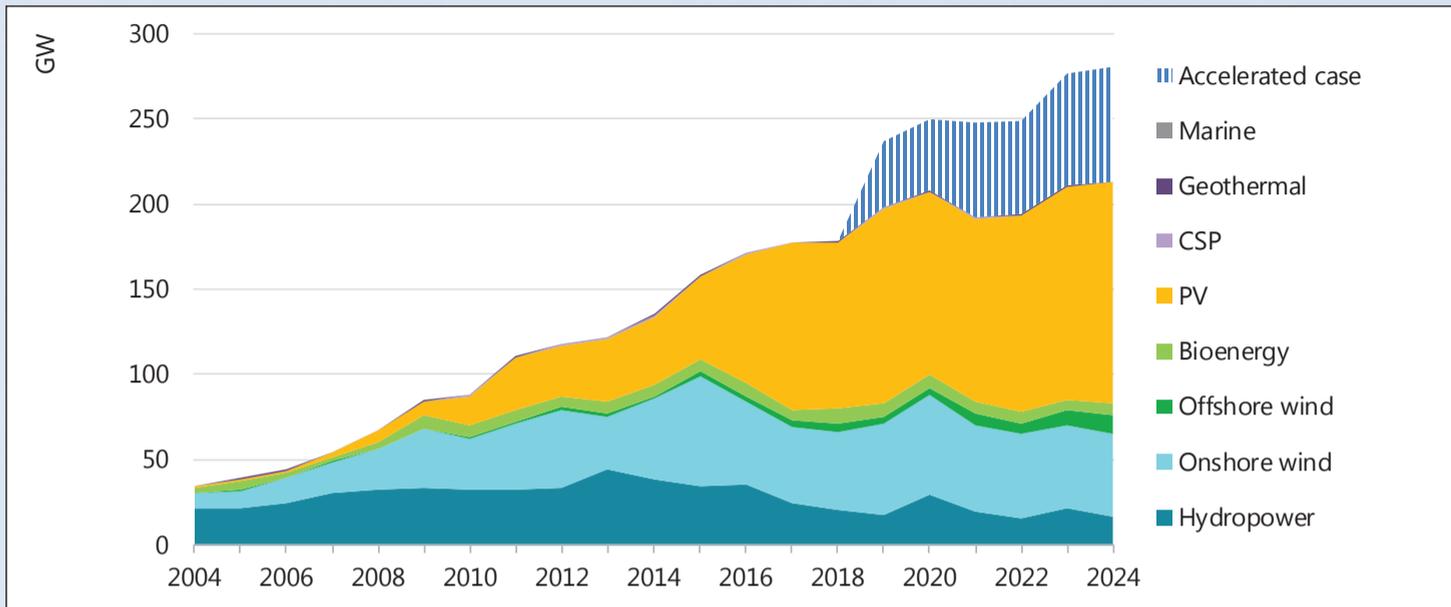
Tatarstan industrial CCGT contract signed

Siemens Gas and Power and PJSC Kazanorgsintez, one of Russia's largest chemical companies, has signed a turnkey contract to build a 250 MW combined cycle power plant in Tatarstan. Commercial operation is planned for 2023. Siemens also signed two service contracts, one with Kazanorgsintez for the new plant and one for a 495 MW power plant with Siemens equipment owned by PJSC Nizhnekamskneftekhim.

The total value of all three contracts is about €290 million.



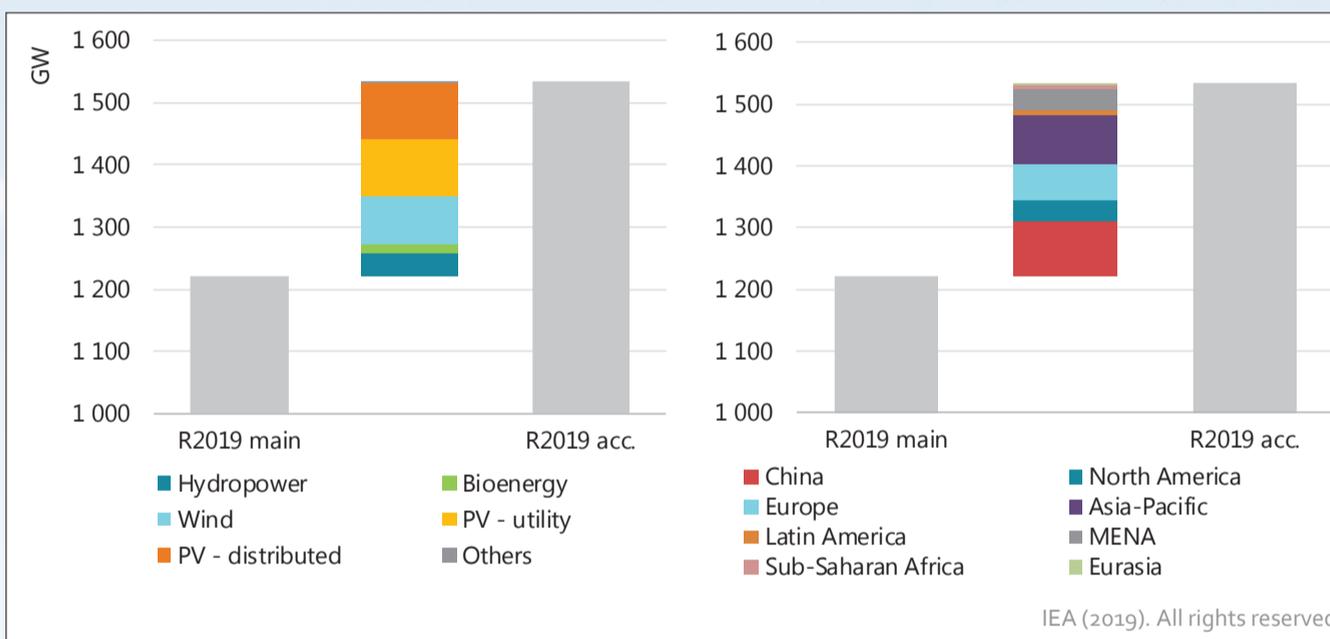
Annual renewable capacity additions by technology, main and accelerated cases



For more information, please contact:
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Renewable Energy 2019, © IEA, Figure 1.3 , page 19

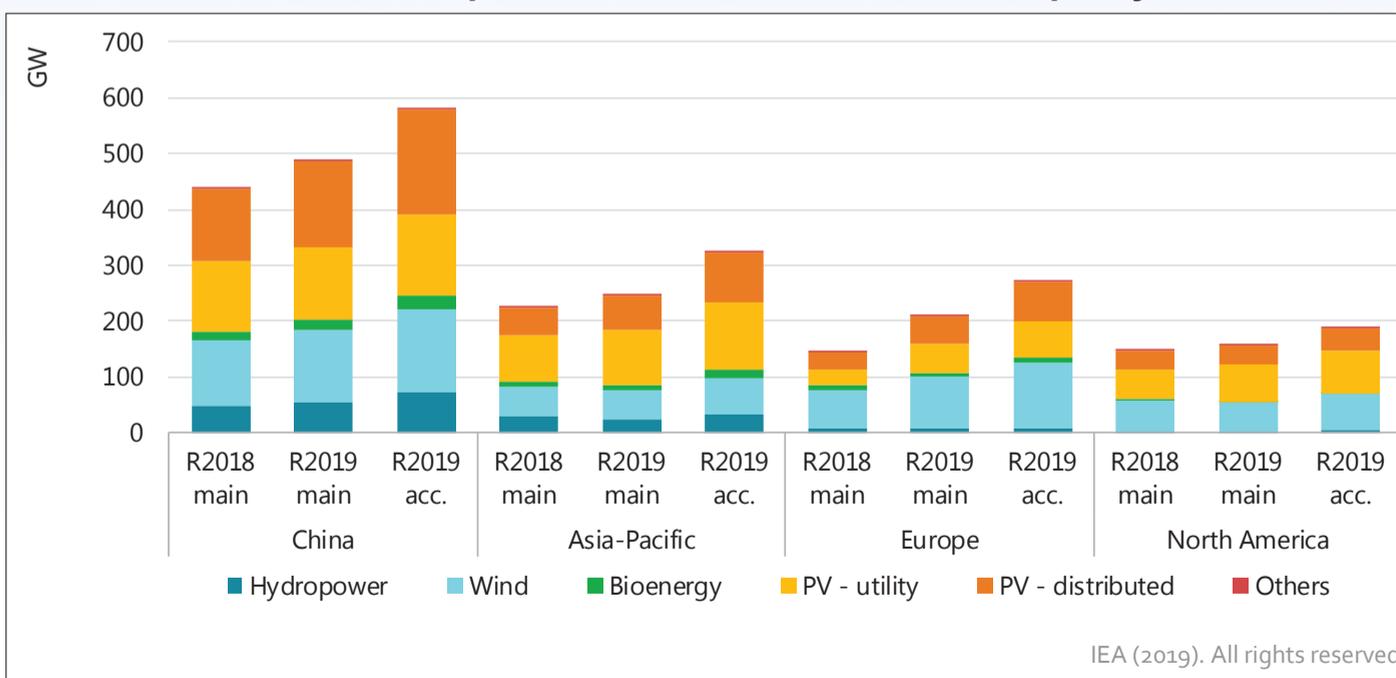
Accelerated case expansion above main case, by technology and region



Notes: R2019 main = Renewables 2019 main case forecast for 2019-24. R2019 acc. = Renewables 2019 accelerated case forecast for 2019-24.

Renewable Energy 2019, © IEA, Figure 1.3 , page 21

China, North America, Europe and Asia-Pacific: Renewable capacity forecast summary



Notes: Acc. = accelerated case. R2018 = Renewables 2018 forecast for 2018-23 (IEA, 2018). R2019 = Renewables 2019 forecast for 2019-24.

Renewable Energy 2019, © IEA, Figure 1.3 , page 23

Oil

Oil business “back to normal” but Saudis still have plenty to think about

- Saudi Aramco IPO delayed
- Ties grow between Saudi Arabia and Russia

Mark Goetz

The oil business is back to normal, according to the International Energy Agency (IEA), now that Saudi Arabia has restored output to its usual volume following the attacks on its oil installations in Abqaiq and Khurais in mid-September. But the norm is an oil market where demand is sluggish for a number of reasons: concerns that the world economy is heading for a slump, spurred by the continuing US-China trade war; worries over Brexit; and ample stocks around the globe. It is worth asking if the continual fighting in the Middle East is a factor in the oil price anymore.

At this point there seems little that will inspire markets and push the price of Brent over \$60/b. According to analysts, a meaningful US-China trade agreement and more cuts in Opec production is what it will take. If that is the case, perhaps the Saudis should have not been so quick to restore production, but they have the

Saudi Aramco IPO to think about.

Saudi Aramco has delayed the launch of its IPO again, primarily because of concern over the valuation of the state-owned company. Saudi Crown Prince Mohammed Bin Salman is hoping that it be set at \$2 trillion, which will provide Riyadh with the money it wants for domestic investment to expand the country's business focus beyond petroleum. However, events like the attack on Abqaiq and Khurais, plus investors' concerns about taking stock in a company where decisions are usually opaque and directed by the ruling clique have given rise to questions over transparency within Aramco.

A valuation of \$1.5-\$2 trillion would make the IPO a success, but the current circumstances – in the market and geopolitically – call the launch into question at this price.

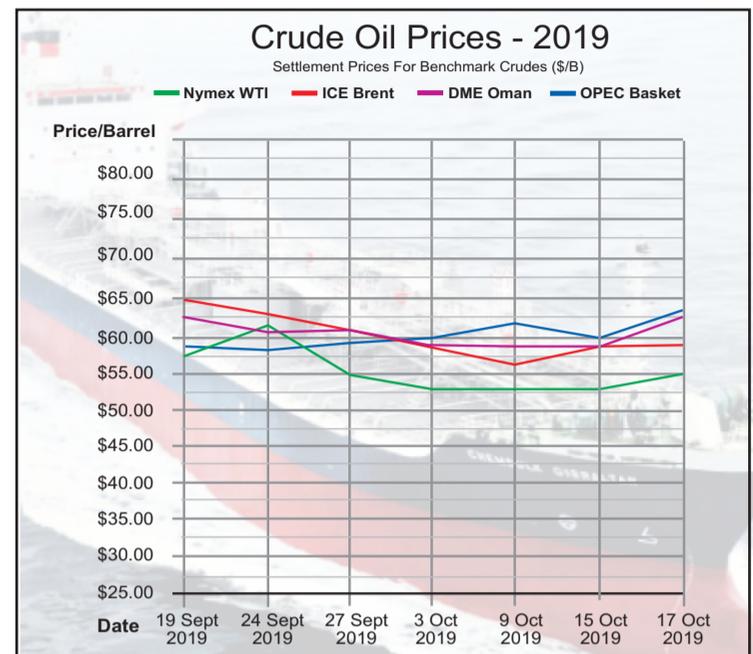
Aramco is reported to be waiting for third-quarter results, hoping the attacks on oil installations made no dent in performance. A launch date of December or January 2020 is now being

considered, media reports state.

But there are numerous investors out there who will very likely reach for a slice of the oil giant. Ties between Saudi Arabia and Russia are said to have grown since the two big oil producers began to cooperate on oil production through Opec+, although Russia doesn't always adhere to target output figures that the group has set. Its September output was 11.25 million b/d.

In early October Russia President Vladimir Putin visited Saudi Arabia and signed a number of oil industry related agreements, among them one that makes cooperation between Opec and other non-Opec countries more official. Saudi entities also made investments in several Russian companies and projects. Russian investors are expected to be keen investors in the Aramco IPO.

Meanwhile, Opec is gearing up for its next ministerial meeting in December. According to Opec Secretary General Mohammad Barkindo, the group



and its non-Opec allies may decide to make further production cuts in what has so far been an unsuccessful attempt to balance the market. Speaking at a London conference in early October, Barkindo said the real data for 2020 would be available for the group and it would probably make a decision covering the entire year.

According to the October *Oil Market Report* from the International Energy Agency (IEA), the organisation forecast reductions in demand growth for 2019 and 2020 to 1 million b/d and 1.2 million, respectively.

Non-Opec supply during 2020 is seen as growing from 1.8 million b/d in 2019 to 2.2 million b/d in 2020 and this will be led by the US, Brazil and Norway, the IEA said, adding that this would reduce the call on Opec oil to 29 million b/d.

In the latest market report from the US Department of Energy, the *Short-*

Term Energy Outlook (STEO), the EIA said Opec output averaged 28.2 million b/d in September 2019, down by 1.6 million b/d from August due to the attack on Saudi Arabia. But the September average was 4 million b/d down from the September 2018 figure. It attributed the decrease in Opec production to falling output in Venezuela and Iran, plus the Saudi disruption. It forecast that Opec output would average 29.6 million in 2020 and that the price of Brent crude would average \$60/b next year.

The US remains the world's biggest oil producer, although it will have its ups and downs with oil prices and declines in well productivity. The EIA forecasts that US output will average 12.3 million b/d in 2019 and hit 13.2 million b/d in 2020.

Barring grim unforeseen circumstances, the oil market will likely be well supplied for some time to come.

Gas

LNG continues to cast potential over future markets

For decades, natural gas has been promoted as a cleaner, safer, cheaper bridge fuel that would take us to a world in which renewable energy rules. But increasingly, the argument is appearing that natural gas is every bit as problematic to global warming as coal and crude.

David Gregory

Research carried out by the IEA shows that LNG will continue to make strides in the energy markets as more countries begin to turn to it for power generation.

The US and Canada have been the main drivers in a record \$50 billion in investment in LNG during 2019, the head of the International Energy Agency (IEA), Fatih Birol, told the LNG Producer-Consumer conference in Tokyo in September.

This year broke the highest amount of final investment decisions (FIDs) for the first time ever, said Birol, who added that the biggest growth in demand forecast for the years ahead is coming from China.

FIDs covering more than 170 billion m³ (bcm) are due to be made before the end of 2019, according to the IEA, breaking the 2005 record of 70 bcm.

“In the next five years, about one-third of global LNG demand will come from China alone,” Birol said, adding

that the industrial sector is Asia's biggest driver for LNG.

Research carried out by the IEA shows that LNG will continue to make strides in the energy markets as more countries begin to turn to it for power generation.

Japan and South Korea, which are currently the two main global markets for LNG, will eventually slip into second and third place, respectively, as top consumers, while China moves into the number one spot. India, Pakistan, Bangladesh are among other Asian markets that will see growth in demand for LNG, Birol said. The European market will also see a rise in demand for LNG as natural gas resources there begin to slip, he said.

The US will supply two-thirds of growth in LNG exports, Birol said, a factor that could impact the way prices are set for LNG in the future. The IEA chief said pricing dynamics could shift to be gas-linked and change pricing away from being based on the price of

oil to more of a 50-50 mix. Long-term contracting, usually the norm for LNG sales and purchase agreements, are giving way to equity offtake marketing which gives buyers access to LNG volumes according to their stake in the LNG project – another step that indicates evolution in the LNG business.

As many as 50 countries will import LNG by 2025 compared to eight in 2000, Birol told the conference. But whether they (especially developing Southeast Asia countries) become regular buyers of LNG will depend largely on price. While the price of LNG might be considered low in some locations, developing countries will continue to rely on coal or their locally produced gas if LNG is beyond their means.

“If prices go up very high, for the gas industry here [Asia], the opportunistic buyers may look at different options and therefore the price levels are important [in order] to have healthy demand growth [for LNG],” Birol said.

Judging by the volumes of LNG that are due to come on-stream in the next few years, prices should be at a level that will encourage Asian buyers, many of which calculate a steady increase in demand for LNG over the next decade and beyond.

Several countries will see huge increases in their LNG export industries. Australia, Qatar and now Mozambique have plans to export large quantities in the early 2020s, but the US remains the one source that continues to attract attention when considering future output. This is attributed to the country's aggressive work in shale oil and gas development. While other countries are reported to have large potentials for shale gas production, only the US has pursued that sector so aggressively.

Meeting with US Energy Secretary Rick Perry in Washington in September to present a new IEA in-depth review of US energy policies, Birol remarked on US leadership in innovation

and the impact of the US shale revolution. Birol told Perry that US policy had reshaped energy markets in the US and around the world. He commended the US for reducing regulatory obstacles, enabling US energy production to expand and increasing its competitiveness.

The abundance of low-cost natural gas has resulted in gas fired power generation to displace coal, and thus reduce the country's carbon emissions, the IEA pointed out.

US gas production will see ups and downs but can be expected to grow. There are now several dozen LNG export plants waiting to be constructed in the US, with total production capacity at around 300 million tons. US gas reserves over the last decade have increased by 85 per cent to some 450 trillion cubic feet.

In October the EIA forecast that US dry gas production will average 91.6 billion cubic feet per day (bn cfd) this year, and reach 93.5 bn cfd in 2020.

Still working towards a decarbonised and secure electricity system

After several years of work on the Clean Energy For all Europeans Package and its legislative proposals, many could think that they are done with the power sector but the energy transition still requires massive investments from the electricity sector for generation, storage, demand side management and network developments. **Hélène Lavray**

The next 25 years will bring tremendous transformations in the way electricity is generated, as the share of renewables (wind, hydro, solar, biomass) in the electricity mix reaches 80 per cent towards mid-century. As ambitious as it may seem, this objective can be attained as intermediary targets are set to ensure the process keeps on track. This implies that by 2030 the share of renewables in the electricity mix doubles and reaches almost 60 per cent.

Renewables will form the backbone of electricity generation, with solar and wind accounting for about 15 per cent and 50 per cent of supply, respectively. These impressive figures show the strength of the power sector's commitment to decarbonise electricity generation by 2045, and at the same time highlight the need to increase the pace and scale of renewables deployment.

Yearly build-out rates in the EU fluctuated between 8 GW and 13 GW for wind and between 3 GW and 20 GW for solar over the last eight years. In the context of increased electrification, these build-out rates would need to double or triple so that electricity is fully decarbonised before mid-century.

Recent data by Frankfurt School-UNEP Centre/BNEF, 'Global Trends in Renewable Energy Investment 2019' point to an increase in the level of investments for renewables capacity, with strong commitments to wind and solar. These shifts could be attributed both to the pressure exerted on the European Member States to reach their 2020 renewables targets, but also to other national developments, such as the fall in capital

costs, or the end of retroactive cuts to tariff support, which slowed down the deployment in Spain. The picture is mixed in Germany, where capacity investment is the lowest since 2004, or in the UK, where the government has not held any auctions for on-shore wind and solar photovoltaics since 2015.

By the end of this year, Member States have to finalise their integrated National Energy and Climate Plans. This process requires setting realistic, quantifiable and achievable ambition levels of renewables build-out, coupled with the provision of concrete analyses on the means to reach them. For instance, such evaluation should motivate the choice to opt for fully market-based investments or supporting measures.

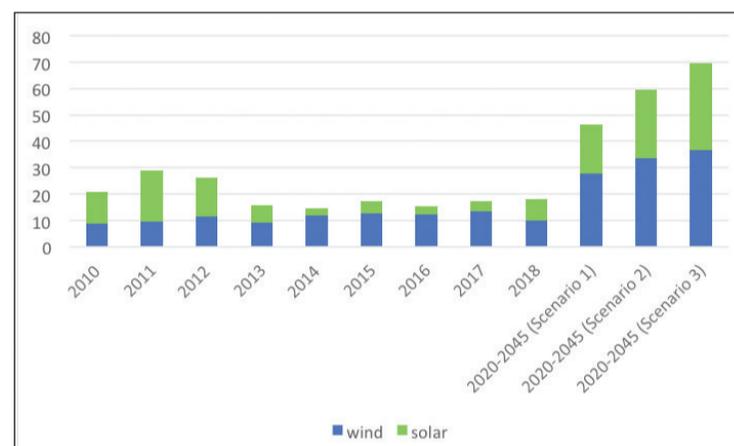
Ensuring that money flows into renewables projects is of crucial importance. However, in many countries, the electricity industry has voiced concerns with regards to various aspects of the national regulatory frameworks that can hinder this objective. They include complex permitting procedures, the coordination of renewables and grid development, taxation, licensing and public acceptance.

With the massive growth foreseen in the share of variable renewables, being able to rely on firm capacity to balance the system will become a key issue in many EU countries. Overcapacity will soon be a thing of the past. By 2025, many Member States could face security of supply issues due to the retirement of traditional capacity. For instance, the Central Western European coal capacity is set to decrease by 40 GW by 2025: this is 68 per cent of the current installed capacity.

A mix of technologies, including storage, demand-side response and power-to-x, in addition to hydro and nuclear, should deliver the new carbon-neutral firm and flexible capacity needed to ensure that demand is met at any time. The development of this new capacity is certainly a major technical and economic challenge, and there is a surprising lack of awareness about it.

Solutions for ensuring the short-term, daily flexibility needs, are already available, but some promising technologies, such as batteries, are still making their way through the market.

The situation is considerably more challenging in the case of the long-term flexibility needed for extended periods of low wind generation or for seasonal balancing. Hydro resources are often used as a remedy, but they are not available everywhere. In some regions, nuclear and



Yearly capacity installations (2010-2018) and yearly average capacity expected evolution 2020-2045 (GW). Scenario 1: 80 per cent EU economy decarbonisation; Scenario 2: 90 per cent EU economy decarbonisation; Scenario 3: 95 per cent EU economy decarbonisation with cost breakthrough. *Eurelectric, Decarbonisation pathways.* Source: Eurostat, Solar Power Europe, Wind Europe and Eurelectric, Decarbonisation pathways.

off-shore wind can contribute efficiently. However, the technical and economic cases for other solutions, such as hydrogen and power-to-gas or power-to-liquids, are not established yet. In this regard, it is important to create an efficient market-based investment framework and an adequate electricity market design to trigger investments in a high renewables-based system, including carbon-neutral back-up capacity.

There is no time to rest on our collective laurels: after several years of intense work on the jumbo Clean Energy For all Europeans Package and its eight legislative proposals, many could think that they are "done" with the power sector. Not so fast. The energy transition will require massive investments from the electricity sector to cover for generation, storage, demand side management and network developments but also from customers, to the tune of over €100 billion a year. Crucially, electrification, coupled with full decarbonisation of the power sector is a direct, effective and efficient way of reaching decarbonisation objectives for society as a whole.

The Governance of the Energy Union will be crucial to deliver on the Paris objectives and ensure that National Energy and Climate Plans include the necessary concrete measures. First things first, the Commission and Member States must implement the Clean Energy Package and continue to work towards an integrated European market through a better coordination of national and EU energy policies. Markets must be allowed to work, as much as possible unhindered by

distortions and interventions.

The implementation of the Clean Energy Package is a priority, but continued work towards a European market is necessary to provide risk-hedging instruments with long-term price signals, improve the power system planning tools for system adequacy, and consider capacity markets to deliver carbon-neutral firmness. The regulatory framework must stop penalising electricity with taxes and levies and facilitate investments in electrification to decarbonise other sectors (energy efficiency, standards). Network regulation must also be improved to incentivise renewables integration, innovation and smart grid technologies; smart meters must be used to introduce smart network tariffs. It is also essential to address social acceptance for RES and network projects.

The upcoming EU legislation will need to rise to the challenge of its own targets and possibly those of a net zero economy by 2050, in order to deploy electrification solutions in the transport, building and industrial sectors. This includes, among others, reviewing the Ambient Air Quality Directive to support electrification solutions in transport and heating; reviewing the Alternative Fuels Directive to support the shift to zero-emission mobility, the future framework for sustainable finance and the upcoming decarbonisation package, but also the much anticipated Commission's overarching Green Deal initiative.

Hélène Lavray is Senior Advisor Renewables & Environment and Public Affairs Coordination.



Lavray: upcoming EU legislation will need to rise to the challenge of its own targets and possibly those of a net zero economy by 2050

What's in store?

The energy industry is transforming. More renewables are coming on to the grid, electricity consumers are also generators, and electric vehicles will not only consume energy but will also feed it back into the grid. This means changes in the grid are needed to allow electricity to flow both ways. **Junior Isles** speaks to ABB's Maxine Ghavi about battery energy storage and the key technologies affecting utilities in their transformation.

Ghavi: the next main trend we are seeing is in system integration



The need to integrate renewables has been one of the main drivers behind the transformation of the energy sector and the technologies associated with enabling that transformation – the key among them being battery energy storage systems (BESS). Without storage, the effective use of intermittent renewables will be severely limited.

“Storage is really a key enabler for maximising renewables, having a stronger, greener, grid and maximising the value of physical assets,” said Maxine Ghavi, Head of Grid Edge Solutions within ABB. And commenting on what she sees as the key trends in this critical technology, Ghavi said: “Probably the biggest single trend in battery storage has been the cost reduction.”

According to BloombergNEF (BNEF) the volume weighted average of an automotive battery pack fell 85 per cent from 2010-18, reaching an average of \$176/kWh. It notes that currently, lithium ion batteries are getting 18 per cent cheaper with every doubling of cumulative volume.

BNEF's ‘Energy Storage Outlook 2019’ predicts a further halving of lithium-ion battery costs per kilowatt-hour by 2030, as demand takes off in both the stationary storage and electric vehicles markets. Based on this observation, and its battery demand forecast, it expects the price of an average EV battery pack to be around \$94/kWh by 2024 and \$62/kWh by 2030.

This dramatic reduction fall is also being reflected in the power sector. In its ‘2H 2019 LCOE Update’, released at the BNEF Summit in London in October, the global levelised cost of capacity benchmark for short duration battery sits at \$112/kW/yr, down 4 per cent from 1H 2019. It said that for up to 1 hr storage duration, batteries are already cheaper than new build gas fired open cycle plants everywhere except in the US.

This is increasing the business cases where storage can be applied. Ghavi commented: “The cost reduction is not as much technology related but really comes from scale and [manufacturing] efficiencies. This means we are starting to see them deployed in distributed networks as well as for utility scale.”

Beyond the battery itself, she notes that there are also some interesting trends with regards to other components such as the power conversion and overall system integration. “The

next main trend we are seeing,” she says, “is in system integration – from the integration of cells into modules and then into large stationary systems – together with thermal management and protection equipment etc.”

System integration is a trend that has seen ABB bring its expertise from power grids together into its grid edge business.

“We are looking at how you can build the most efficient system,” said Ghavi. “And how we have evolved, reflects how the industry has evolved. As a grid edge solution provider, we see that it is increasingly important to look at storage from a holistic perspective – focusing on system integration and the entire solution including automation and control. We will see more of this, as customers become more demanding.”

According to ABB, data driven concepts and services, aggregation of distributed energy resources, optimisation and energy management, are all becoming part of the bigger picture.

Ghavi noted: “These all impact your overall economics because they allow you to provide more value-stacking from your assets and also reduce costs through energy management and improving operational performance – by leveraging things like forecasting, artificial intelligence and machine learning – over the life of the asset.”

Certainly the life and performance of a battery is a concern in the industry. One of the major challenges facing batteries is “absolute safety” at an acceptable cost. “This is really key, along with how the risks are mitigated. It's a key challenge that all the battery suppliers are looking at today,” said Ghavi. “From a systems integrator's perspective, you want the batteries to be safe.”

This, adds Ghavi, is where data analytics, etc., can help in terms of the safety, operational performance and lifetime. Here, automation is a huge enabler. “The more we are able to incorporate data analytics, machine learning and AI into the automation, the more we are actually able to look at things related to reliability, lifetime and safety.”

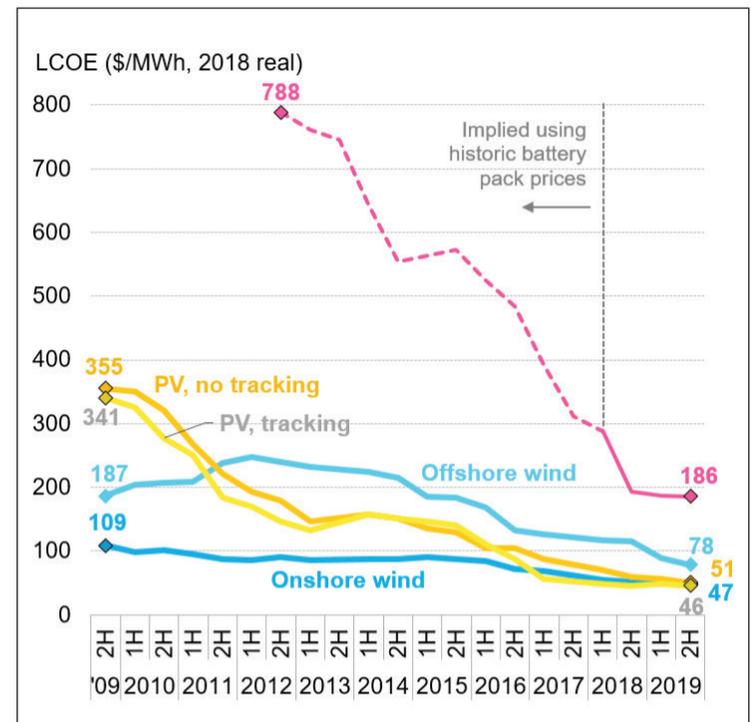
Cost, performance, density, safety, etc., will all drive which battery technology gains greater acceptance. Deployment will also be impacted by collaborations with manufacturers of car batteries, and the potential for using second-life batteries.

Although separate industries, the EV and stationary battery storage markets are closely intertwined.

“You can't decouple the stationary battery storage and EV battery markets. From the battery suppliers' perspective, they try to leverage from the same technology. In the stationary storage business, we're benefitting from growth in the EV sector. We can benefit from the economies of scale as the EV production capacity continues to increase.”

In terms of technology, Ghavi notes that battery suppliers from both sectors also try to leverage from the same technology. “They would have a portion of their business that goes to EVs and a portion that goes to the stationary market because it also balances their portfolio.

“From our perspective, clearly we're looking at second-life [EV] batteries – what it takes to integrate them, what performance we expect, etc. There is a lot of discussion around



Global benchmarks – PV, wind and batteries

Note: The global benchmark is a country-weighted average using the latest capacity additions. The storage LCOE is reflective of a utility-scale Li-ion battery storage system with four-hour duration running at a daily cycle and includes charging costs, assumed to be 60 per cent of wholesale average power price. Source: BNEF Summit in London.

second-life batteries and of course it all depends on the cost of integration and how to maximise their remaining life, as well as how to mitigate the risk of integrating these second-life packs.”

Using second life batteries has the obvious benefit of providing a way of recycling old EV batteries but there are also risks. “When we get the batteries for large stationary systems, the racks are all tested. But when you get one based on second life batteries, you might have 50 batteries from an EV and there's the question of how do you put them together and test them. They will all be at different levels in terms of capacity, for example. There are a lot more variables to deal with.”

She added: “It doesn't mean the challenges can't be overcome; it just means there has to be a lot more collaboration between battery suppliers and system integrators.”

Another challenge is regulation. This has a big part to play in recognising and rewarding the value of storage in the network. For example a battery can act as a synchronous generator but respond much faster. It is therefore useful for applications such as flexible peaking, frequency control, reserve capacity, etc, or relieving transmission congestion. Meanwhile, behind the meter it enables time-of-use bill management or demand charge reduction; increased self-consumption or act as an uninterruptible power supply.

Speaking at the recent BNEF Summit, Donald Joyce, Chief Financial Officer at RES (Renewable Energy Systems), the world's largest independent renewable energy company, said: “From an investor's point of view, if storage is structured in the right way, with the right partners that understand the contractors, etc., it can be a star performer.

“A lot of the projects we have done are more around ancillary services, such as frequency response. Some of those have longer-term contracts, so

are more attractive to financial investors in particular. Going forward that will change and we will be going into the arbitrage opportunity; so in markets like California where storage and solar are co-located, it's a different investment proposition.

“Solar and storage are a good thing to co-locate in California, where there's peak sun at midday and peak demand in the evening; it is the perfect application for Li-ion batteries. But it doesn't work on a lot of projects yet. The costs coming down will change that. We see this accelerating over the next couple of years as evidenced by the 2 GW of solar plus storage PPAs signed in the recent past in the US.”

The pace of deployment, however, varies from country to country, according to regulatory development and market structure.

Ghavi said: “Australia has started well, as has the US. And we are starting to see more in Europe. It's also about open markets versus closed markets. The value of storage as an asset can vary significantly, depending on whether it's in an open or closed market.”

Looking to the future, with the battery still being the biggest cost in an energy storage solution, ongoing cost reduction of the battery along with performance improvement, will be key. With regards to the entire system, Ghavi says that further enabling cost reduction through optimisation will also be important, adding that “the next thing will be how to take the system to the next level through digitalisation”.

She concluded: “It has been an amazing journey and there's so much more we can do from a digitalisation and system level perspective, from a practical deployment perspective and also in terms of business models. It's about how we can help our customers manage energy more efficiently, enable new business models and revenue streams, and really help them to evolve.”

Cloud-based systems take stock of energy use

A live-streaming business energy monitoring and costing platform that allows real-time, deep analytics, takes energy management to a new level. **David Appleyard** reports.

New internet-enabled energy management technology has been developed by energy and technology consultancy Global Procurement Group (GPG), to help businesses monitor and control their energy usage more effectively. According to GPG, the ground-breaking new technology has emerged on the back of similar internet-enabled transformations that have taken place in other industry verticals such as retail, gaming and finance. Now, advances in technologies such as artificial intelligence (AI) and machine learning are providing new opportunities for improved future energy management, reducing waste and cutting CO₂ emissions.

Indeed, GPG notes that a lack of innovation in the energy sector has been costly in both financial and environmental terms and aims to address this deficit with its novel approach to energy management. As Fokhrul Islam, Chief Executive Officer and founder of GPG's Northern Gas and Power, explains: "We stand on the edge of a period of significant change, heralding ideas and innovations that will transform the way energy is used for future generations. We recognise there is a real demand for change. The energy industry

needs not only a change of attitude; it needs a change of technology."

The current generation of energy management technology and monitoring and targeting systems were largely built on technologies that are now out-dated. As a result, over time these technologies have become limiting, inflexible, costly and difficult to use. Recognising that the energy sector needed new technology that is agile, powerful, accessible, scalable and cost-effective, GPG looked to develop an innovative solution through its ClearVUE Systems and Energy Lab technology units, which are based in Malta and India, respectively. This technology arm comprises up to 100 senior developers and engineers who are rigorously testing and developing new innovative technology in a bid to ensure that GPG remains ahead of the curve. The cloud-based, low-cost monitoring and targeting platform which emerged from this programme is, according to GPG, the first of its kind.

ClearVUE's Alpha.Lite energy software as a service (e-SaaS) and Alpha.PRO platforms provide real-time data to help companies determine how much energy their assets use at any given point in time. Installation requires no hardware or even site visits but nonetheless provides detailed insights into energy consumption. As a result, it enables enterprises to identify any inefficiencies and thus reduce energy costs, minimise waste and cut carbon emissions. The IoT hardware devices and software solutions are cloud-based, giving users the ability to instantly run deeper analysis to reduce energy waste, for example.

Islam explains: "This development emerged from a combination of our customers' desires and our own perception of what the future drivers were and the way the IoT revolution could impact on the energy sector. From talking to our customers, we understand there's a real demand for change. Businesses tell us they want to become more eco-friendly, but technology and a lack of useable data has limited their ability."

Claimed as the world's first live-streaming business energy monitoring and costing platform, ClearVUE's next generation Internet of Things (IoT) metering and monitoring devices provide real-time and deep analytics by measuring up to 35 vital energy fundamentals simultaneously and in real-time and by the second. The data is granular down to circuit level and can therefore provide the basis for equipment performance improvements potentially right down to individual machines.

In addition, it is possible to combine the cloud-based and secure system with modular IoT sensors to get a full view of other factors such as how changes in the ambient environment can affect energy performance. Scalable from one to up to 50 individual business sites, the platforms all break down bill data including distribution, transmission and any government charges, which may have been levied.

The energy management IoT products allow deep energy analytics with full consumption data available from the previous day. Automatic warnings and alerts can also be applied at key set points to enable users to take action within seconds if energy usage issues are flagged. Furthermore, all data may be exported for further analysis. The systems offer immediate access to historical data, so businesses can understand areas where energy is being wasted within minutes of sign up. Although there is no specific requirement for any hardware such as disruptive wiring or costly server installation, consumption metrics such as kWh, kW, kVA, reactive power and more are available from the platforms.

Islam says: "Our platforms and technology has been developed and designed from the ground up. They provide incredible power to customers and the technology is constantly evolving and improving with their needs. Both operational and behavioural attributes impact on cost savings. We provide dedicated energy management support and a virtual energy manager; either one-to-one or group based. We ensure full staff inclusion to aid our customers on their way to a positive energy future in terms of reduced cost and environmental impact."

With simple pricing, which the company describes as "low-cost", signing up for energy software as a service (eSaaS) takes only a few minutes on-line and, being cloud-based, can be accessed from anywhere in the world with an internet connection.

In addition to new technology, the company has also launched two energy price comparison sites – Business Energy Quotes and Energie SuperMarché, which are targeted at the UK and French markets, respectively. Requiring just a business name and a post code, the sites are able to generate a comprehensive range of competitive tariffs from a variety of suppliers. Northern Gas and Power contracts around 6 TWh of energy annually and cites growth of some 20 per cent per annum.

According to Islam, the benefits of

the platforms in terms of energy costs and control are expected to attract a strong customer base with some 5000 customers on its Alpha.Lite eSaaS platform expected in the first year. "The power of the technology speaks for itself. We can't find anything matching what ClearVUE's technology does for this price point for the energy-customer," he says.

Looking further ahead, new breakthroughs based on AI and machine learning are anticipated to yield additional benefits for industrial and commercial energy consumers, which will translate into environmental and financial gains.

As Islam says: "ClearVUE Systems in Malta is developing an AI and deep learning framework for our non-intrusive monitoring meter. These developments will allow us to deliver analysis of energy data that could not even be comprehended before now, and will transform not only energy monitoring but the energy market. We knew that if we could make a meter that could gather that much data, we could apply the new technology of machine learning, deep learning and AI onto that data, analyse it... and get information that's never been available for customers before, improving not only costs, but also the global impact of carbon emissions."

He adds: "People want change – businesses want to become more eco-friendly and find better ways to manage their energy but technology has been very limiting. There is a real demand. People want to improve their behaviour with energy. We must meet this opportunity and drive it with innovation and technology. There is huge potential for new industries to emerge from the opportunity technology offers us and we feel this will drive the future economy to great new heights."

Since the birth of the internet, the technology has revolutionised and vastly improved many industries, even creating many e-commerce sectors. Companies such as GPG are now looking to harness those same breakthroughs to benefit the energy sector. As Islam concludes: "If you look at other industry verticals such as medicine and finance, technology has had a huge impact over the last decade. Yet there has not been the same technological impact seen within the energy sector, and we have seen very little innovation in this space. New Technology needs to be applied in the energy sector that is agile, powerful, scalable and cost effective, changing the way we view, control and use our energy bringing about positive change."

Islam: People want change – businesses want to become more eco-friendly and find better ways to manage their energy





Junior Isles

Time for joined up thinking

Although electricity is my beat, so to speak, I find it increasingly difficult to write solely about the industry, as the lines between different sectors continue to blur. And while most of us like to remain in our comfort zone, plying our trade in a field where we know the boundaries, a little cross-pollination is no bad thing. After all, the electricity sector alone cannot meet the challenge of cutting global carbon emissions at the required pace – and we can always learn from other industries.

Diego Pavia, CEO, EIT InnoEnergy recently noted the European Commission's decision to use "what has been done around electric-mobility and the battery value chain, as the blueprint" for European industrial strategies. Speaking at The Business Booster in Paris, an annual gathering aimed at supporting start-ups and promoting innovation, Pavia said: "It has been decided by the Commission to be taken as the blueprint for any future industrial strategy in Europe. And then we will find PV, we will find hydrogen, and many other industrial strategies; but that will be the blueprint to be followed."

Innovation will certainly be key to the industrial strategies that will sit at the heart of the individual National

Energy and Climate Plans (NECPs), which will define how each country will contribute to Europe's 2030 goals. EU countries are required to develop integrated NECPs that cover the five dimensions of the energy union for the period 2021 to 2030 (and every subsequent ten-year period) based on a common template. These will be approved in December. Pavia noted: "They provide a perfect roadmap of where innovation will fit."

In 2017 the EU's primary energy demand was 1621 Mtoe, according to the International Energy Agency (IEA). This will fall to 1274 Mtoe by 2040 under its New Policies Scenario. Notably, however, the share of electricity in meeting overall energy demand is predicted to increase significantly due to the electrification of transport, heat, industry, and increasing digitalisation.

As electricity spreads its tentacles, so too do energy companies, car and battery manufacturers and those involved in building the charging infrastructure, players in the building sector, fuel suppliers such as oil and gas majors, heating specialists, not to mention us as journalists.

Keeping an eye on what is happening in those other sectors traditionally outside of electricity is becoming

increasingly important as we move forward. Avoiding irreversible climate change not only requires joined up thinking but calls for keeping your finger on the pulse of what is happening outside of your patch.

Clearly the energy sector is leading the way in combatting climate change. In the IEA's Sustainable Development Scenario, energy-related CO₂ emissions are reduced by more than 45 per cent to 17.6 Gt by 2040. The power sector witnesses the most dramatic change, with the share of low-carbon technologies reaching 85 per cent in 2040 (up from 35 per cent today). Emissions from the power sector comprise nearly 20 per cent of total CO₂ emissions in 2040 (down from 42 per cent today). Although emissions from passenger cars halve, despite the number of cars nearly doubling, transport is the largest emitting sector in 2040 in this scenario, followed by industry, where emissions rise to nearly 30 per cent (up from 19 per cent today).

Clearly transport, industry, buildings and others need to do more. An idea of what is needed at the country level to meet net zero emission ambitions was highlighted in a recent report. The London-based consultancy Capital Economics said the UK will have to spend £240 billion installing an average of 4000 electric vehicle charging points and heat pumps a day if the government is to meet its target of cutting greenhouse gas emissions to net zero by 2050.

This may sound like mission impossible but technology companies often have a way of making the impossible possible.

Last month US-based EV Connect announced that it had closed a \$12 million Series B round of funding to support the global expansion of its flexible, open, cloud-based solutions.

The EV Connect Network, and the EV Cloud platform on which it runs, delivers an innovative cloud-based software platform for managing networks of EV charging stations, their interaction with utilities, and the overall driver experience. As part of a collaboration with General Motors, EV Connect will help GM improve Chevrolet Bolt EV drivers' charging experience with dynamic charge station data, including insights on station status.

Real-time charge station data received from EV Connect will enhance future versions of the myChevrolet app. As the charging network provides new information, real-time data on charge station health will indicate if a charging station is working, available, and compatible with the Chevrolet Bolt EV, offering a one-stop shop for all range and charging data before or during a trip.

Doug Parks, General Motors Vice President of Autonomous and Electric Vehicle Programs, said: "By collaborating with EV Connect, we are continuing our efforts to remove obstacles for drivers looking to charge their EV on the go."

Jordan Ramer, founder and CEO of EV Connect, added: "The only thing more powerful than having many EV charging stations available is having them networked together. For society

to fully realise all the benefits of EVs, we have to reduce range and charging anxiety by giving drivers access to charging and information about chargers, no matter where they travel."

With range anxiety and charging speed probably being the main drag on the uptake of EVs, another important recent announcement was news that StoreDot and its strategic partner BP had demonstrated a live full-charge of a two-wheel electric vehicle (EV) in just five minutes. The demonstration with its "first generation" fast charging battery is the precursor to tests with a second generation battery that will be used in electric cars.

Erez Lorber, StoreDot's Chief Operating Officer said: "The second generation battery, which we have been developing for the last two years, will be more suitable for EVs, since it will be lower cost." With more than 18 000 fuelling stations worldwide that could site fast charging stations, the tie-up with BP is significant.

"It eliminates the range anxiety over whether you can reach the next charging station, and wait for 40 minutes, or not, and [the need for] all sorts of apps. If you know you can charge fast, you won't worry about it like you do today," said Lorber.

The technology is based on the use of nano-particles in materials, such as the coating on electrodes, and unique processes that enable faster movement of lithium ions in the battery. This fast movement of ions, he says, is achieved while maintaining very low internal resistance – something that is critical in reducing heat in EV battery pack configurations.

"This means you don't need a vast amount of energy to remove the heat that's generated. Cooling is the major headache that the automotive industry is facing," said Lorber. He adds that such batteries could be on the road by around 2024. To this end, StoreDot has already started working with Daimler on how to incorporate the battery into one of its future full-electric models. It is also in close contact with 10-15 other leading car manufacturers such as VW to understand their specifications and needs, says Lorber.

Certainly there is plenty going on in the EV battery space. Two start-ups, NanoOne and Innolith, both pitched battery developments at the recent BloombergNEF Summit in London outlining technologies that improve cycling and reduce the risk of fire. Such developments will not only eventually see applications in the stationary battery storage space but will also increase the uptake of EVs thus cutting carbon emissions in transport.

Progress in decarbonising industries such as steel and cement, however, is painfully slow. Options are limited and carbon capture and storage, although seen as essential, continues to be a white elephant.

Here, hydrogen and power-to-X could be the answer. And having been forced to broaden my journalistic beat, I feel tempted to extend myself still further to a bit of marketing copywriting. Here's a slogan for hydrogen proponents, inspired by Heineken: "Hydrogen refreshes the parts that electricity cannot reach".

