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EU 'can build 450GW offshore by 2050'

DARIUS SNieckus

Offshore wind power could carry Europe to carbon-neutrality by mid-century, expanding to an installed base of 450GW and meeting 30% of the continent's power demand — but to do so at lowest cost needs a “visionary” rethink of marine spatial planning, says a landmark report published today by WindEurope.

The study, *Our Energy, Our Future*, shows that 85% of this capacity — around 380GW — could be built in the North, Irish and Baltic Seas, with the remaining 70GW generated in Southern European waters.

“The EU says Europe needs at least ten times as much offshore wind as we have today to meet the 2050 goal of decarbonising energy. The IEA [International Energy Agency] believes offshore wind could become the number-one source of power generation in Europe in the early



A fishing vessel sails past an offshore wind farm

2040s,” stated WindEurope chief executive Giles Dickson.

“The report shows that it is doable and affordable. But three things need to happen: one, the offshore wind supply chain keeps growing; two, we build the grid connections; and three,

we get the maritime spatial planning right.”

Marine usage rights will be “crucial” to the industry's rapid development, the report found, as shipping, fisheries and military activity currently rule out

CONTINUED on Page 3

Ørsted plans 'world first' 5GW offshore wind energy island

ANDREW LEE

Ørsted has unveiled plans for a 5GW offshore wind hub connecting Denmark, Poland, Sweden and Germany, supporting large-scale production of green hydrogen and creating what it called “the world's first energy island” on Bornholm in the Baltic Sea.

The global offshore wind leader wants to kick-start the massive cluster with a 1GW wind farm in the Rønne Banke zone southwest of Bornholm, one of the areas already earmarked by Denmark for possible

CONTINUED on Page 3

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SGRE digitally upscales turbine to 11MW

DARIUS SNieckus

Siemens Gamesa Renewable Energy (SGRE) has unveiled a digitally souped-up version of its recently launched 10MW SG10.0-193DD turbine, a 11MW model that uses the OEM's 'DD Flex' technology suite to squeeze another 6-7% annual energy production (AEP) out of the ultra-large nameplate machine.

The higher-rated unit, SG11.0-193DD Flex, upscaled using 'digital twin' modelling of forerunning SGRE concepts, will employ intelligent control systems to tailor everything from rotor-yaw and blade-pitch to "using the whole turbine structure more efficiently" to run the turbine "closer to its limits", SGRE chief technology officer Morten Pilgaard Rasmussen told *Recharge*.

"This is a case of getting an extra 10% [bigger nameplate] for minor improvements that we could see in our scoping out of this product, using readily available technologies for new model 'in the making'.

"Some of the digital technologies that have made 'Flex' possible have been in the works since



Morten Pilgaard Rasmussen

before we engineered the 10MW."

The 11MW, like the 10MW, will fly new-look carbon-reinforced 94-metre B94 blades powering a direct-drive transmission system with beefed-up permanent magnet generator. The 10MW prototype is about to be erected in Osterild, Denmark, to begin a programme of final tests before starting serial production.

"Using digital twins allows us to collect a huge amount of data from our existing offshore fleet and feed back design improvements that are a response to the actual conditions

out there [at sea], not just what is written in an IEC [International Electrotechnical Commission] standard somewhere," said Rasmussen. "That gives a much better understanding of how well we are utilising the technology by better predicting loads today and into the future, over a machine's lifetime, in a safe way."

Rasmussen noted that the bringing the 11MW to market "doesn't change our ambitions to move toward substantially higher ratings out into the mid-2020s".

10MW TURBINE: Page 6

'Rethink exclusion zones' to hit 450GW offshore by 2050

CONTINUED from Page 1
60% of Europe's northern seas to offshore wind.

Without these "exclusion zones", the region's full potential of wind resource offshore could be developed at a much lower overall levelised cost of energy (LCOE), says the report, which was commissioned by WindEurope and written by UK-based renewables consultant BVG Associates.

Opening these zones to offshore wind could lead to 248GW being built in the North Sea for less than €50/MWh by 2050, with a further 130MW at €50-65/MWh and 2GW for €65-80. However, if the zones remain in place, these figures fall to 112GW below €50/MWh; 264GW at €50-65; and 4GW at €65-80.

"With the current exclusion zones, almost three quarters of the future capacity cannot be built at a 'very low' LCOE," said BVG Associates managing consultant Kate Freeman. "This report should be a wake-up call for policymakers and marine planners: the cheapest and most space-efficient way to build the 450GW is through the multiple use of the same maritime space by different sectors."

Dickson added: "On maritime spatial planning, we need a long-term approach with climate priorities at its heart. And more multiple use, for example, allowing fishing in offshore wind farms."

The rate of build-out of offshore wind needed to reach the 2050 target would, in any scenario, require a "wartime campaign", Freeman said. Accelerating from the annual 3GW being installed now to over 20GW per year from 2030 would need an ever-larger supply chain and a capital spending rise from €6bn in 2020 to €45bn per year by 2030.

There will also need to be heavy investment in grids to support Europe's offshore wind expansion — by BVG Associates' calculations climbing from €2bn next year to €8bn annually by 2030, requiring EU-wide co-operation and the development of meshed grids.

Energy island will connect Denmark and Poland

CONTINUED from Page 1
future development.

On Monday, Ørsted urged the Danish government to hold a tender for developing Rønne Banke as the next stage of its offshore wind expansion programme, after the awarding of the Thor project, tendering for which is currently under way.

Ørsted said such a tender, in conjunction with new interconnectors between Denmark and Poland — as previously proposed by Danish grid operator Energinet — would shift the agenda for offshore wind to one based around clusters serving multiple countries.

The initial 1GW could later be expanded to 3-5GW, with interconnection extended to Sweden and Germany, said Ørsted, which offered no specific timeline



for the Bornholm vision, but said it could help Denmark meet 2030 emissions goals.

Martin Neubert, chief executive of Ørsted Offshore, said: "Offshore wind clusters with transmission to several countries are a necessity if we're to realise offshore wind's enormous potential in making Europe green."

The Bornholm cluster would help produce the vast levels of power

needed to electrify transport and heating in Denmark and the other nations it serves, said Ørsted, citing EU estimates that 450GW of capacity will be needed.

Integrating the cluster with green hydrogen production would bring a further dimension by supplying clean fuel to help green hard-to-decarbonise sectors such as heavy transport and aviation, it added.



Floating wind joins 10MW turbine era with MHI Vestas' French win

ANDREW LEE

Floating wind joined the 10MW-turbine era in another milestone for the fast-emerging sector, as MHI Vestas was named preferred supplier to a key pilot project off France.

Three of the OEM's V164-10.0MW machines — mated to semi-submersible WindFloat platforms from floating pioneer Principle Power — are lined up to equip the 30MW Gulf of Lion

project, which is planned for deployment in 2022.

The Gulf of Lion project, also known as Leucate and led by European power giants Engie and EDPR, is one of four sanctioned by the French government off its coasts as it seeks to establish a leading position in floating wind.

The deal comes after MHI Vestas was named preferred supplier to another of the four, the Groix & Belle-Ile project, which will use the 9.5MW version of the V164.

Three 8.3MW V164 models are

also due to be commissioned at the EDPR-led WindFloat Atlantic project off Portugal later this year.

WindEurope says 350MW of floating capacity will be switched on in Europe by 2021, led by a raft of projects off the UK, France, Portugal and Norway.

Analyst estimates for the deployment of floating wind by 2030 ranges from as little as 6GW up to almost 19GW, all influenced by how quickly the sector can become cost-competitive with bottom-fixed offshore wind. ☐

MHI Vestas set for Japan's first large-scale offshore project

ANDREW LEE

MHI Vestas has confirmed it will supply its top-of-the-range V174-9.5MW turbines for the 220MW Hibikinada project being developed off Kitakyushu city, southwest Japan, by a consortium led by J-Power and regional utility Kyuden Mirai.

Hibikinada is due for construction and operation as early as 2022, and is the first project to advance under Japanese reforms of regulations governing offshore wind operation off the country's ports.

Kitakyushu municipal authorities in 2017 selected a consortium including utilities J-Power and Kyuden Mirai to develop the near-shore project. J-Power has said that Hibikinada will be "the first commercial scale offshore wind power project in Japan".

Selection for Hibikinada — slated to be in operation as early as 2022 — is a breakthrough for the Danish-Japanese OEM in Japan, home of Mitsubishi Heavy Industries, one of the two joint venture partners in the offshore turbine maker, alongside Vestas.

J-Power and MHI Vestas have an existing relationship via the former's investment in the Triton Knoll project, one of the largest wind farms under construction off the UK, which will use the OEM's 9.5MW turbines.

MHI Vestas rival Siemens Gamesa stated in June that it had won the first large-scale deal for a major Japanese offshore wind project, with a preferred supplier nod for a 455MW project due to enter service in 2024.

Early this year, Japan's parliament passed long-awaited legislation clearing the way for long-term offshore wind development in the island nation, which is seen as among the next wave of key growth markets for both fixed-bottom and floating wind power. The government is set to hold national tenders next year. ☐

Trump offshore wind fight ends in \$290,000 payout

ANDREW LEE

Donald Trump's business empire has agreed a £225,000 (\$290,000) settlement to cover the Scottish government's legal costs after the US president's long, unsuccessful court battle to stop an offshore wind project in the North Sea.

The agreement marks a full stop to the saga of Trump's fight against the Vattenfall-led European Offshore Wind Deployment Centre (EOWDC).

Trump International Golf Links claimed the 11-turbine project would ruin the views of golfers

playing at the luxury resort, near Aberdeen, but finally lost its legal battle in late 2015.

Trump's business empire heavily delayed the project as it challenged consent for the project right through the Scottish legal system and up to the UK Supreme Court.

The EOWDC finally opened in summer 2018, with Scottish First Minister Nicola Sturgeon formally inaugurating the project in September — and saying the project showed Scotland was "in the mainstream" over fighting climate change. ☐





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SGRE plans 600 white-collar job cuts amid 'tough market'

ANDREW LEE

Siemens Gamesa Renewable Energy (SGRE) unveiled plans to cut 600 further jobs to protect profitability in a "tough market", but said it is well placed to benefit from the sector's strong long-term outlook after record commercial activity last year.

SGRE said the staff reductions, affecting white collar workers, will help it stay competitive following a "transitional year" in 2020 for the industry, which is still experiencing the impact of "adverse factors" such as ongoing price pressures, rising costs and regulatory uncertainty in some key markets.

The job reductions will be spread across a number of markets, including Germany, Spain, Denmark, the US and UK.

The manufacturer had previously announced 600 job losses in Denmark in September, as it discontinued some legacy turbine production.

The latest announcement came as Siemens Gamesa unveiled full-year financial results for the 12 months ending in September and expectations for the current year.

Offshore order intake was up 11%, largely due to Taiwan, which delivered 1.5GW, with onshore order intake up 5% to 9.4GW. The company ended its financial year with a record order book of €25.5bn (\$28.25) and net profit doubling to €140m. ☐



SGRE boss Markus Tacke



Siemens Gamesa's first 10MW offshore wind turbine unveiled

DARIUS SNIIECKUS

Turbine maker Siemens Gamesa has completed the prototype nacelle for its 10MW offshore model, the SG10.0-193DD, at its factory in Brande, Denmark.

The direct-drive design, first revealed in *Recharge* in January, is a sizeable step up from the OEM's 8MW model, with longer 94-metre blades sweeping an area of 29,300 square metres to generate 30% more annual energy production than its forerunner.

The prototype of the machine, which Siemens Gamesa chief executive Markus Tacke said would "bridge market demand" until the OEM's the as-yet-unnamed "1X" platform, is available in 2024-25 — will be erected at a test site in Østerild, Denmark, with trials to "begin shortly".

The nacelles for the SG10.0-193DD will initially be manufactured at Siemens Gamesa's factory in Cuxhaven, Germany. Commercial market deployment is slated for 2022.

In April, Vattenfall revealed plans to install a first batch of the 10MW turbines at its Hollandse Kust South 1 & 2 project in the Dutch North Sea — in line to be the world's first zero-subsidy offshore wind farm — following the signing of a preferred supplier agreement with the OEM.

Siemens Gamesa main rival, MHI Vestas, also has a 10MW model in the works, while GE has a 12MW prototype that has begun to generate power (*see opposite page*). ☐

11MW UPGRADE: Page 3

SGRE wins deal for 300MW Hai Long 2 off Taiwan

DARIUS SNIIECKUS

Siemens Gamesa Renewable Energy (SGRE) has landed a preferred supplier agreement to supply turbines for Taiwan's 300MW Hai Long 2 offshore project, pressing the button on plans to build a nacelle assembly facility at the port of Taichung.

The deal, which is subject to the final investment decision of the

offshore wind farm's development partners, Canada's Northland Power and Taiwan's Yushan Energy, could see construction begin as early as 2023.

Andreas Nauen, SGRE's offshore chief executive, said the order "represented a stepping stone for our long-term presence in the region and will enable the expansion of our own local footprint".

The Taichung facility — which will be used for offshore nacelle assembly, testing, warehousing, office buildings and outdoor storage — is expected to be operational in 2021, and will help developers meet the nation's growing local-content stipulations.

The deal for the project, 50km off the coast of Changhua County, brings SGRE's order book to close to 2GW off Taiwan. ☐

First power flows from world's biggest offshore wind turbine

DARIUS SНИЕCKUS

GE Renewable Energy's 12MW Haliade-X prototype, the biggest wind turbine ever built, has generated first power, moving the giant machine into the testing phase at its site in the Dutch port of Rotterdam.

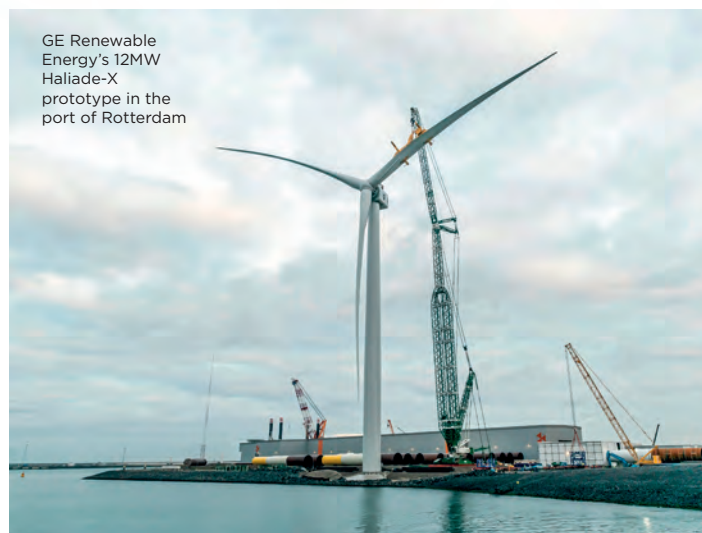
Production of the first kWh from the prototype, which is on track for crucial "type certification" to anoint it market-ready next year, was called a "critical achievement" for the technology and its project team by GE's offshore wind chief executive John Lavelle.

"This [milestone] brings to fruition our vision and all the hard work put in place," he said.

"There are more than 500 GE women and men behind this great success, who have been working for a year and a half to make this possible."

The Haliade-X, the launch of which in March 2018 was reported exclusively in *Recharge*, is engineered to generate up to 67GWh of gross annual energy production, enough to supply power to over 16,000 European households and save up to 42,000 metric tonnes of CO₂.

The turbine, which flies an LM Wind Power-designed 220-metre-diameter rotor powering a direct-drive transmission with permanent-magnet generator, overtakes the 10MW models of rival OEMs MHI Vestas and



GE Renewable Energy's 12MW Haliade-X prototype in the port of Rotterdam

Siemens Gamesa, though both have larger-nameplate designs in development.

The Rotterdam unit's performance will be quality-checked against a second 12MW nacelle that is being life-cycle tested at the Offshore Renewable Energy Catapult in the UK, where one of the 107-metre-long blades is already being trialled. A second blade has arrived for testing at

the Massachusetts Clean Energy Centre in Boston.

GE is racing to get the Haliade-X into serial production, with orders for the Equinor-SSE 3.6GW Dogger Bank mega-project off the UK and Ørsted's Skipjack and Ocean Wind developments in the US in line for first deliveries between 2022-25. The turbines will be built at GE's Saint-Nazaire and Cherbourg factories in France. ☐



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If you have any questions, feel free to contact Thomas Schöbel, Global Customer Coordination Manager, Wind Power, on +45 2118 0096 or via thomas.schoebel@roxtec.com.

HIGHLIGHTS OF THE DAY

TUESDAY, 26 NOVEMBER

 #offshore2019

- Individual session tickets are available at the registration desk!
- Ministerial session and Official inauguration are **open to all registered participants!**

Programme overview

CONFERENCE

09:00 **Opening Ministerial Session**
10:45 A10-11-12

10:45 **Break**
11:15

11:15 **How to deliver 450 GW by 2050**
12:30 A10-11-12

12:30 **Lunch**
14:00 Hall B

14:00 **Sharing the maritime space**
15:30 **with other sectors & interests**
A10

CEO Panel - Delivering the
first 100 GW by 2030
A11

Bottom-fixed foundations
design
A12

15:30 **Poster viewing**
16:15 Auditorium Foyer

16:15 **How to keep the supply chain**
17:45 **competitive**
A10

Workforce bottlenecks
A11

How Chief Technology Officers
see the scale-up
A12

18:00 **Opening reception**
20:00 Iberdrola stand C4-B14

See the programme online:
windeurope.org/programme

Visit the WindEurope Stand E-D21 to meet the WindEurope team, pick up your copy of our industry-leading reports, try out our market intelligence tools and book your stand for WindEurope Electric City 2021.

EVENT AMBASSADORS:



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HIGHLIGHTS OF THE DAY

TUESDAY, 26 NOVEMBER

#offshore2019

Social events



Opening Reception

18:00 – 20:00

Iberdrola stand C4-B14

Enjoy Spanish-themed finger-food, inspired by our sponsor, Iberdrola, along with good music, great company, and a few beers!



BlueInvest Workshop

10:30 – 17:30

Meeting room 20, level 1

Targeted coaching to accelerate your business, pitch training and one-to-one business meetings with potential partners, enablers and investors.



PROMOTiON

Regulation & Financing of a European offshore grid

14:00 – 17:00

Meeting room 18, level 1

Tackling the regulatory and financial hurdles and the deployment plan for a meshed offshore grid up to 2050.

Side events



Offshore wind farm visits

12:15 – 16:00

Departure from Bella Center, Reception Desk

Please note the bus will depart from Bella Center at 12:15, and the boat departs at 13:00.



Future of Offshore Wind in Poland

Press briefing

15:30 – 17:30

WindEurope Stand E-D21

Join us for this press announcement from the Polish Wind Energy Association.

Exhibition halls (HALL E)

Global Markets Theatre

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11:00 – 17:30

What's happening in the key global markets for offshore wind? Our expert presenters will tell you everything you need to know.

windeurope.org/globalmarkets

Innovation Park

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10:00 – 18:00

The Innovation Park is where you'll find the start-ups and innovative projects transforming how wind works.

windeurope.org/innovationpark

Safety, Skills & Training Zone

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10:45 – 16:15

A unique 200m² area showcasing the industry's commitment to an injury-free working environment in offshore wind.

windeurope.org/trainingzone

Poland's draft offshore wind bill ready as big players hover

ANDREW LEE

Poland's government unveiled a long-awaited bill to underpin offshore wind development off its coast, as sector giants Ørsted and RWE lay plans for possible projects in its waters.

The Polish energy minister Krzysztof Tchórzewski said the draft bill, which he hopes will go forward "within weeks" for consultation and further legislative examination, "will significantly contribute to the future creation of a systemically formed offshore wind energy sector in Poland".

The bill has been eagerly awaited by the fledgling sector in Poland and beyond, which hopes it will frame a support scheme for Baltic Sea wind development and the offshore grid connections needed.

Polish offshore wind has received two big boosts in the last few months as global sector heavyweights laid down markers for activity there.

First Ørsted said it will enter talks to buy half of the 2.5GW Elektrownia Wiatrowa Baltica 2 & 3 arrays from state-owned utility Polska Grupa Energetyczna (PGE) that are among the furthest developed in Poland.

Soon after, RWE acquired a pipeline totaling some 1.5GW in potential, and said it plans to accelerate their development.

According to a draft for its long-term energy planning, the government counts on offshore power to feed into the Polish grid in 2025, and foresees 10.3GW of Polish capacity built by 2040. ☐



Krzysztof
Tchórzewski

British Prime Minister Boris Johnson delivering a speech during his Conservative Party general election campaign



Johnson: I'll raise UK offshore wind target to 40GW by 2030

ANDREW LEE

The UK will increase its 2030 offshore wind target to 40GW from the current 30GW if the governing Conservative Party wins the upcoming general election, said Prime Minister Boris Johnson.

Johnson's reference to offshore wind came amid a raft of industrial policy announcements as the Conservative leader attempts to secure a majority in the 12 December poll.

The main opposition Labour Party has already pledged to embark on a massive offshore wind build-out that would see 52GW in the water by 2030, also well ahead of the 30GW envisaged under the 'sector deal' signed between the government and the industry earlier this year.

The UK is currently the world's biggest market for offshore wind, with 8.4GW in service, the world's largest operating project in the 1.2GW Hornsea 1, and a contract-for-difference (CfD) support mechanism that has driven prices down rapidly and awarded 5.5GW

of new capacity in September.

The CEO of SSE, one of the big winners in the CfD round, has called for an increase in the target to help the UK achieve its 2050 net-zero emissions goals.

Johnson's announcement was welcomed by the UK's government-industry group the Offshore Wind Industry Council (OWIC).

OWIC co-chair Benj Sykes, who's also UK manager for offshore wind

to working with whichever party forms the next government to implement the actions we need to deliver an increased target for offshore wind."

Tom Harries, offshore wind senior associate analyst at Bloomberg New Energy Finance, told *Recharge* reaching these higher targets will be "tricky".

"Getting to 40GW by 2030 requires nearly all of the existing pipeline to secure contracts via a

timely CfD schedule but at present there is no transparency on the timing of future CfD rounds," he said. "And prices could rebound if there is insufficient

competition in future rounds, jeopardising the success of future auctions.

"The new UK Crown Estate lease round will boost the pipeline but developing, permitting, financing and commissioning any of that capacity before 2030 will be tight. The same for Crown Estate Scotland leases with the added uncertainty of any dedicated funding for floating projects." ☐

Getting to 40GW by 2030 requires nearly all of the existing pipeline to secure contracts

giant Ørsted, said: "We welcome this commitment to expand offshore wind in the UK, as it will boost our ability to reach net-zero emissions at low cost using a technology which can deliver at scale.

"The announcement contains a key commitment to taking cross-government actions to enable us to reach 40GW by 2030."

Sykes added: "We look forward

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DARIUS SNECKUS

Offshore wind power will mushroom to become a main engine of the transition towards a decarbonised global energy system in the coming decades, with the worldwide fleet expanding 15-fold to reach at least 340GW by 2040, according to a report by the International Energy Agency (IEA).

The IEA's *Offshore Wind Outlook 2019* — which dovetailed industry data with a specially commissioned geospatial analysis that maps out wind speeds along hundreds of thousands of kilometres of coastline around the world — calculates that the resource could in the next 20 years become a “mainstay of the world's power supply” while spurring investment of more than \$1trn.

“We will need a host of low carbon technologies... to meet our global climate and environmental challenges... and although offshore wind [currently] provides only 0.3% of our electricity supply we are witnessing auctions with strike prices falling very steeply and showing offshore wind to be competitive already with certain fossil fuels and [offshore wind] technologies are advancing very rapidly,” said the IEA's chief energy modeler, Laura Cozzi. “Offshore wind has huge untapped potential — it is just mind-blowing.”

The IEA analysis found that offshore wind has a technical power production potential of 36,000TWh a year for installations in water depths of less than 60 metres within 60km from shore, while current global electricity demand stands at 23,000TWh. By moving farther from shore and into deeper waters with floating technology, enough potential could be unlocked to meet the world's total electricity demand 11 times over by 2040.

Europe, the current market pace-setter with 20GW installed, is forecast to continue to lead the global pack for the next two decades, with expectations of 130GW or more turning offshore by this date — though China by this point is foreseen having at least 110GW on line and being on track to outpace Europe's build-



The Bold Tern installation vessel during the construction of the Wikinger project in the German Baltic Sea

IEA: Offshore wind to explode into \$1trn global market by 2040

out by mid-century.

The US, meanwhile, is forecast to be in line for “substantial growth” by 2040, with its fleet swelling to around 40GW, while Korea, India and Japan would all see tens of gigawatts of offshore wind turbines installed.

“In general, this goes from a market that has been concentrated in the European Union to one that is truly worldwide — all feeding in to [lead to] a 15-fold increase [in installed offshore wind power],” said IEA head of power generation analysis Brent Wanner. “The market opportunity is very large here. And there is even greater, longer-term potential.”

Based on current investment plans and policies, the IEA report

projects that the worldwide offshore wind market will expand by 13% a year, by 2030 witnessing more than 20GW of additions annually — though it notes that for global climate and sustainability goals to be met, the

|| This spectacular growth could... potentially [have] an important role in the production of green hydrogen

build-out would need to be “much faster”, around double that rate.

The report highlights the success offshore wind has had in cutting costs from over €200/MWh to below €60/MWh and the prospect

of further “sharp” reductions taking the global levelised cost of energy another 40% lower by 2030 “to between €30-40/MWh”, and nearly 60% by 2040.

“This is related to the falling cost of [turbine] foundations, the higher performance of the turbines, as well as from efforts on the operations and maintenance side. We are seeing the industry really maturing here,” said Wanner. “Capacity factors [for offshore wind farms] are climbing from 43% in

2018 toward over 50% in the years to come.

“This puts [offshore wind] on par with some dispatchable technology such as gas-fired generation — the world average

for which is around 50%,” said Wanner, noting offshore wind’s capacity factors are already “three times as much as solar PV and significantly more than onshore wind”.

The report also spotlights that offshore wind’s high capacity factors and tumbling costs “make it a good match” to produce green hydrogen, which could be used help decarbonise various heavy-emitting industrial sectors such as steel and shipping, as well as in heating and transport.

“This spectacular growth could have impacts beyond the electricity sector,” said Cozzi. “We see it having potentially another important role in the production of green hydrogen. By 2030, we foresee offshore wind being able to supply hydrogen at a cost of \$20/Mbtu [million British thermal units, the traditional unit measure of heat] — comparable to hydrogen being produced by other sources, including natural gas, today.”

The report authors caution that governments and regulators need to “clear the path ahead” for offshore wind’s development “by providing the long-term vision that will encourage industry and investors to undertake the major investments required” to build and link projects on land-based power grids.

This, said Wanner, will call for “careful market design” to ensure low-cost financing and regulations that take into account that the development of onshore grid infrastructure is “essential” to the integration offshore wind power production.

“Industry needs to continue the rapid development of the technology so that wind turbines keep growing in size and power capacity, which in turn delivers the major performance and cost reductions that enables offshore wind to become more competitive with gas-fired power and onshore wind.”

“The growth of offshore wind into a trillion-dollar industry in the coming decades cannot be taken for granted,” said Cozzi.

The International Renewable Energy Agency recently doubled its 2050 forecasts for offshore wind, saying it now expects more than 1,000GW to be installed by mid-century. ☐



Thor — the Marvel comic book character portrayed on the silver screen by Chris Hemsworth — not the offshore wind farm of the same name

Denmark turns to UK-style CfD for 1GW Thor offshore wind

ANDREW LEE

Denmark will back its largest offshore wind farm — the up-to-1GW Thor development — with a UK-style contract-for-difference (CfD), the country’s first use of the mechanism in its build-out programme.

Thor, which will be a minimum of 800MW, will be the first of three large offshore wind projects planned by Denmark by 2030 under its national energy transition

plan, agreed last year by politicians from across the spectrum.

Thor, up to 20km offshore in the North Sea, has to be fully on line by 2027 and will be Denmark’s largest, surpassing the 600MW Kriegers Flak that is due in service in 2021 and the 407MW Horns Rev 3, which began operating this year.

The adoption of the CfD is revealed in draft documents released by the Danish Energy Agency (DEA).

Under a CfD system, bidders

compete on the basis of so-called “strike prices”, with the Danish government topping up the wholesale power price to that figure — or the developer paying Copenhagen the surplus when the power price is higher than the strike price — over the course of the 20-year contract.

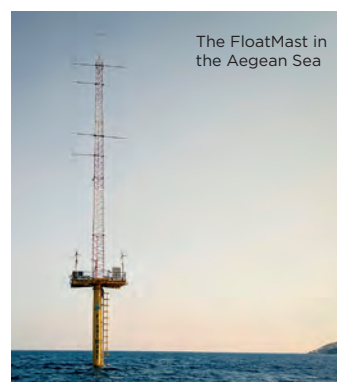
CfDs, and the stability they offer developers and investors, have been widely hailed as a key factor in the huge interest in developing in the UK market, and in helping to drive down prices there. ☐

Med’s first floating met-mast ends trial off Greece

DARIUS SNIIECKUS

The Mediterranean’s first floating meteorological mast has completed a four-month trial in the Aegean Sea off Greece.

FloatMast’s eponymous tension-leg-platform prototype was installed in 65 metres of water off the island of Makronisos, collecting 120 data streams, including wind and wave measurements, weather and ship



The FloatMast in the Aegean Sea

traffic, and recording a maximum wind speed of 27.6 metres per second.

Because of its diesel-dependent island populations and deep water, Greece has emerged as a potential key market for floating wind developers, with Norwegian energy giant Equinor recently confirming that deployment of moored arrays in the Aegean had been discussed at government level by Norway and Greece. ☐

CHRISTOPHER HOPSON

The downward trajectory of prices in UK contract-for-difference (CfD) rounds will put increasing pressure on developers, as Britain's world-leading sector evolves to embrace a variety of scenarios such as merchant and corporate power sales, industry experts tell *Recharge*.

In the third CfD auction in September, in which 5.47GW of offshore wind projects were awarded, strike prices fell as low as £39.65 (\$51.40) per MWh.

Alun Roberts, associate director at renewables consultant BVG Associates, told *Recharge* that such strike prices showed the extraordinary progress the wind industry has made in reducing costs.

"These prices show that developers now see CfDs as a price stabilisation mechanism rather than a subsidy," he said.

"The question now is whether other developers which declined to bid so low prefer to accept merchant risk, probably also with corporate PPAs [power-purchase agreements] — a route the industry has been contemplating for some years."

According to the UK's Renewable Energy Association, the winning prices are below the projected wholesale cost of electricity, meaning that the projects will effectively be "paying back" to consumers on each unit of electricity they produce.

Under the CfD system, if the wholesale power price is higher than the strike price, the

developer has to pay the surplus back to the government. If the wholesale price is lower, the government has to top it up so that the developer always receives the agreed strike price.

"If the CfD price gets too low then it looks less attractive because the generator can get more on the open market," said Roberts. "Potentially all the unsuccessful projects from auctions could go

down this route."

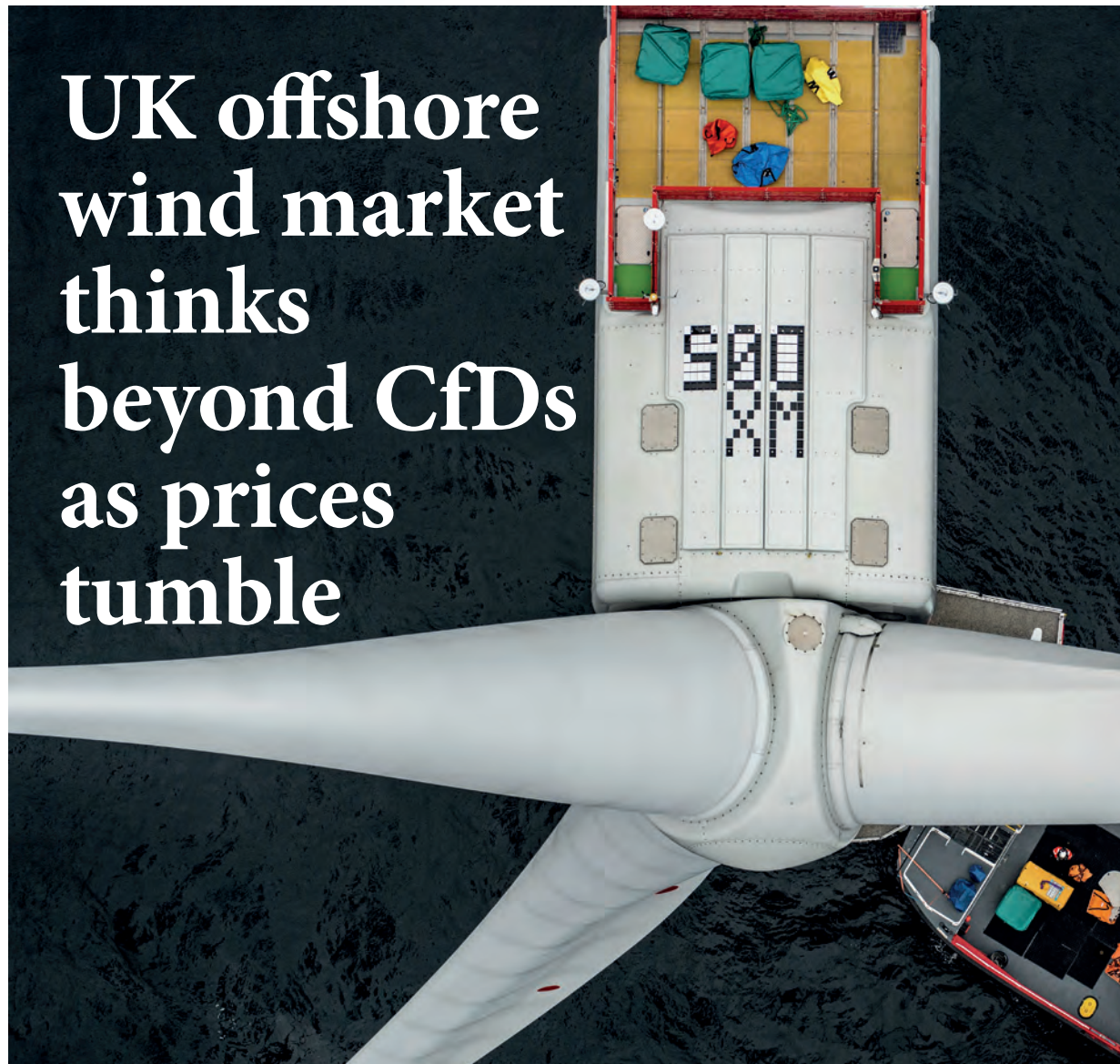
Sources indicated that several developers are considering accepting merchant risk, probably with corporate PPAs, including Iberdrola, and SSE Renewables for their 1.1GW Seagreen mega-development off Scotland.

The current cost-reduction trajectory is unsustainable," said Bridget Beals, director, power & utilities at KPMG.

"What I think is challenging is the degree to which margins have come out of development risk and the supply chain, while at the same time we are still trying to develop an industrial supply chain in the UK for offshore wind," she told *Recharge*, adding that offshore wind players will increasingly look at alternative routes to market, such as PPAs.

"Maybe due to technical progress, such as bigger turbines,

UK offshore wind market thinks beyond CfDs as prices tumble



The Rampion wind farm off Brighton, southern England





An MHI Vestas turbine at the Walney Extension project in the UK Irish Sea

there will be some more project costs which can be squeezed out, but I don't believe that will be enduring," said Beals.

Brent Wanner, senior energy analyst at the International Energy Agency, added: "The cost

connections.

"That said, there is not a one-size-fits-all regulatory mechanism that serves all jurisdictions and offshore wind projects.

A combination of elements will make projects even more competitive in the future, including innovative project-financing schemes and improving technology.

"Manufacturers have signalled [a move] towards even larger turbines

— reaching 15-20MW in size — and digital solutions are expected to drive down O&M costs."

Cost pressure is only likely to increase on existing developers with the arrival of cash-rich oil & gas supermajors such as Shell and BP in the offshore wind sector.

These prices show that developers now see CfDs as a price stabilisation mechanism rather than a subsidy

reductions seen in recent years in the UK have not only come from marginal reductions from developers, but they were enabled in many cases by technology development and proper regulatory guidance — especially when considering offshore

Norwegian oil company Equinor and UK power producer SSE dominated the third CfD auction, with three 1.2GW projects in their Dogger Bank zone given awards, with the remainder going to Innogy's 1.4GW Sofia project (also in the Dogger Bank zone) and SSE's 454MW Seagreen wind farm, off the east coast of Scotland.

About 2.75GW of projects failed to get a deal.

Offshore projects missing out included Iberdrola's giant 1.2GW East Anglia 3 (EA3) off England's east coast; EDPR/Engie's 800MW-plus Moray West in Scotland's outer Moray Firth and the Chinese-owned 700MW Inch Cape project in Scotland's Firth of Forth.

BVG said it was disappointing news for Scotland's offshore wind sector that only 454MW of the 3.1GW sought were successful — likely due to the double whammy of deep water and higher grid charges north of the border. Also while four smaller remote island projects won CfDs, the 475MW Viking wind farm on Shetland was left out in the cold.

Following the awards, Scotland's energy minister Paul Wheelhouse called on the UK government to "urgently review the limitations of the CfD auction system" as 5GW out of the 6GW awarded in the round went to two major offshore wind projects in England.

"Basically it was an auction based on the lowest price so Scotland can't be grumpy," Roberts told *Recharge*. "Obviously you have a huge wind resources off Scotland and the political will, but if you have what are effectively deeper water projects with higher transmission charges it's just a headache. It should

fare better in the next allocation round for which several of the English projects will be in deeper waters than Dogger Bank."

SSE Renewables said Seagreen's CfD provides a 15-year price certainty at £41.61/MWh for over 40% of the project "which we expect to support the projects ability to secure financing for the full 1,075MW".

"Plans are in place to progress financing and an equity stake sell-down to move towards a final investment decision in 2020," an



Shimeng Yang

SSE spokesperson told *Recharge*.

It is understood that Iberdrola believes that corporate PPAs might be a route which will make it possible for projects such as EA3 to be explored, or even built without the support of CfDs.

A spokesperson for Iberdrola unit ScottishPower declined to comment on future financing options for EA3, but confirmed "we will look at how we can further optimise the project".

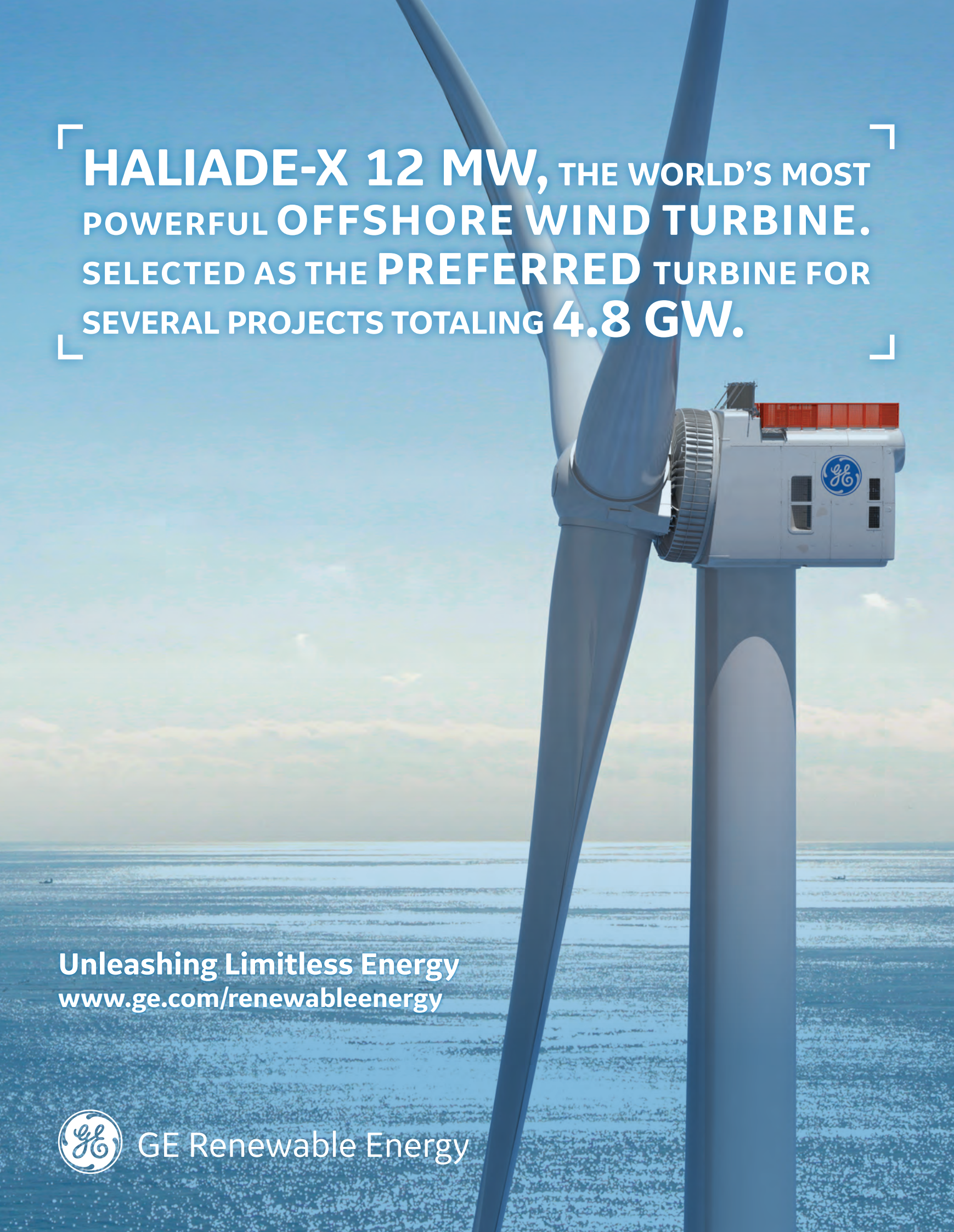
"Whilst we are disappointed not to have secured a contract for EA3 in this round, we still believe [it] is a great project which would bring further benefits to the East Anglia region and the wider UK economy," the company added.

Wood Mackenzie's senior research analyst, Shimeng Yang told *Recharge* that the upcoming fourth round of CfD discussions will now go beyond the budget allocation, focusing on capacity caps to ensure competitiveness, as well as the volumes needed to reach the UK's 30GW offshore wind target by 2030.

"Furthermore, the declining UK offshore wind strike prices will force developers to prepare for bids below current power prices or to follow a pure merchant route to market." ☐



Alun Roberts



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