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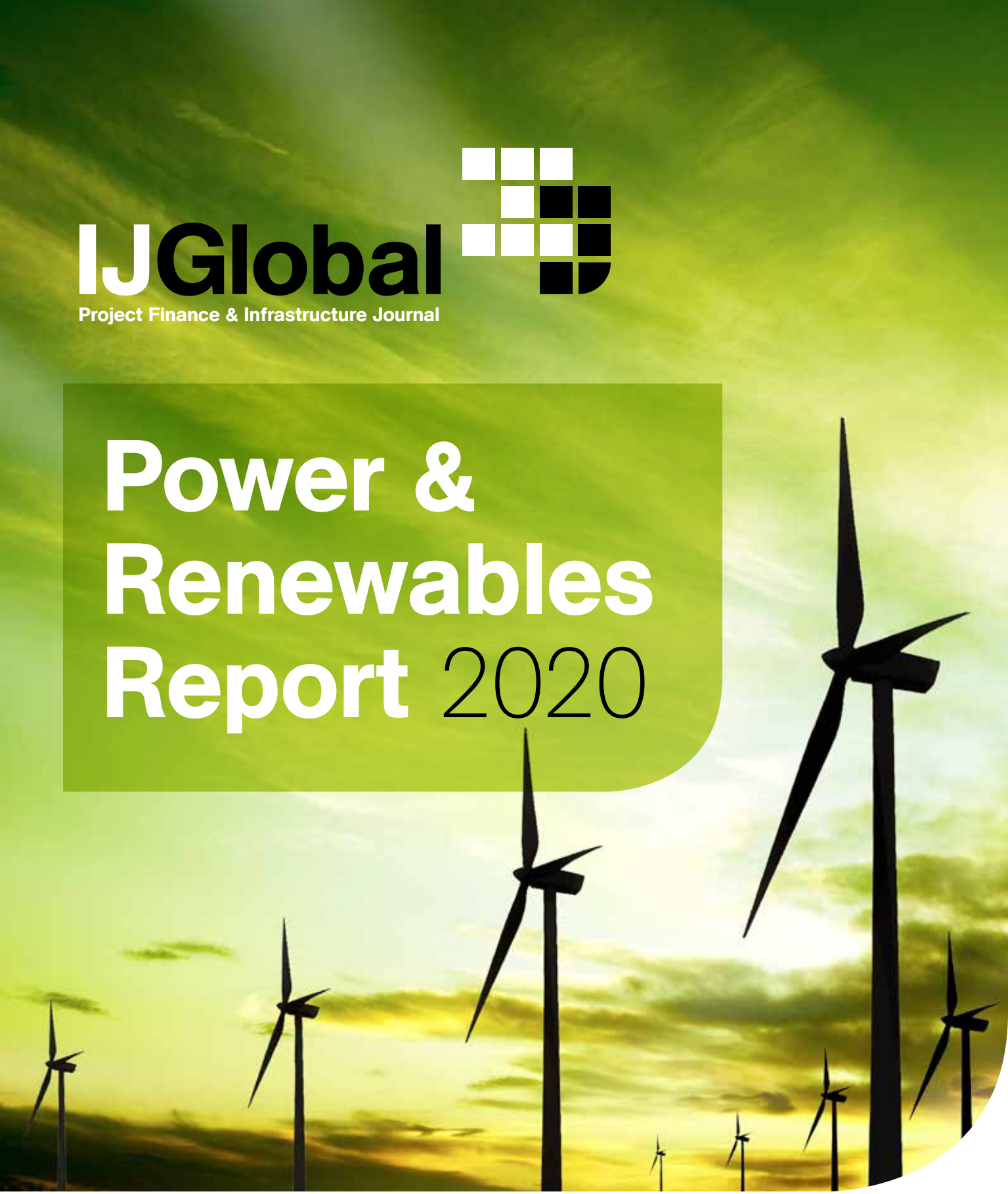
Project Finance & Infrastructure Journal

Power & Renewables Report 2020



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Editorial Director
Angus Leslie Melville
+44 20 7779 8034
angus.lm@ijglobal.com

Assistant Editor
Anna Cole-Bailey
+44 20 7779 8040
anna.colebailey@ijglobal.com

Americas Editor
Ila Patel
+44 20 7779 8629
ila.patel@ijglobal.com

Funds Editor
Ott Tammik
+44 20 7097 3842
ott.tammik@ijglobal.com

Senior Reporter, Asia Pacific
David Doré
+852 2912 8052
Dave.Dore@ijglobal.com

Senior Reporter, Americas
Juliana Ennes
+1 212 224 3430
juliana.ennes@ijglobal.com

Reporter, Energy
Elliot Hayes
+1 212 224 3445
elliot.hayes@ijglobal.com

Reporter, Energy
Sophie Mellor
+44 20 7779 8205
sophie.mellor@ijglobal.com

Reporter, funds and M&A
Arran Brown
+44 20 7779 8441
arran.brown@ijglobal.com

Reporter, European transport and infrastructure
Maya Chavvakula
+44 20 7779 8648
maya.chavvakula@ijglobal.com

Reporter, MEA
James Hebert
+44 20 7779 8181
james.hebert@ijglobal.com

Reporter, APAC
Civi Yapp
+852 2842 6971
civi.yap@ijglobal.com

Data Manager
Nikola Yankulov
+359 2 492 5750
nikola.yankulov@ijglobal.com

Data Analysts
Sophia Radeva, Yavor Guerdjikov, Aleksandar Arsov

BD Manager, EMEA
Doug Roberts
+44 20 7779 8546
doug.roberts@ijglobal.com

BD Manager, Americas
Alexander Siegel
+1 212 224 3465
alexander.siegel@ijglobal.com

Head of Subscription Sales
Dan Sedman
+44 20 7779 8675
dan.sedman@euromoneyplc.com

Production editor
Tim Huxford

Divisional CEO
Jefferey Davis

IJGlobal
Euromoney Institutional Investor PLC,
8 Bouverie Street
London
UK EC4Y 8AX
+44 20 7779 8870

Directors
Leslie Van De Walle (Chair), Andrew Rashbass (CEO), Wendy Pallot (CFO), Sir Patrick Sergeant, Jan Babiak, Colin Day, Imogen Joss, Lorna Tilbian, Tim Pennington

US Renewables and Power – business as usual

IJGlobal Americas Editor **Ila Patel** talks to ING's Thomas Cantello and Ana Carolina Oliveira about the rocky road to stability for power and renewable energy in the US…

At the start of 2020, the US power and renewables market had a strong pipeline of projects with newer sectors providing robust investment opportunities. Covid-19 caused major disruption to the financial markets, impacting several deals and driving pricing up. Fast-forward to Q4 2020 and there is light at the end of the tunnel with the market returning – almost – to normal.

The US federal government's $483 billion stimulus package approved in April went a long way in providing some stability to financial markets – and banks are now playing catch-up after a few months of sitting on the side-lines.

ING's US power and renewable energy team typically closes around 20-30 deals a year. Thomas Cantello, managing director and co-head of renewables and power, believes this year is no different: "I don't think the renewables and power financing and development markets were significantly impacted other than the initial shock.

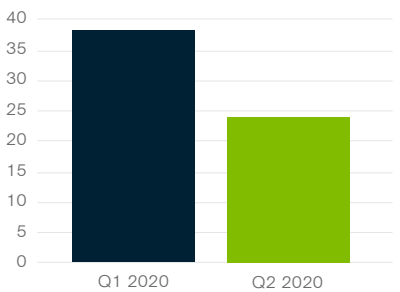
"During the peak of the pandemic, some of the projects we were already engaged in closed. We have closed five deals in the past month. Of course there was some impact on pricing and deals were cancelled but we remain bullish and expect plenty of deal activity this year."

Businesses have begun to adjust their expectations in response to the pandemic but the underlying fundamentals of the market – the demand for renewable power, low interest rates, and cutting costs for renewables projects – will continue.

"Currently, we have a very supportive state-level regulatory regime for renewable power and that will stay in place. All the fundamentals are in place for a strong 2021 and beyond," says Cantello.

According to the US Energy Information Administration (EIA) "renewable energy will be the fastest-growing source of electricity generation in 2020, the effects of the economic slowdown related to Covid-19 are likely to affect new generating capacity builds during the next few months".

Pipeline deals in the US renewables and power market



Source: IJGlobal

Covid and going green

Sustainable financing instruments are attractive to investors worldwide and come in the form of green bonds, social bonds, sustainability bonds, climate bonds and loans.

Sustainable finance is a key part of ING's strategy and renewable energy is a key element of it.

Ana Carolina Oliveira, head of sustainable finance for the Americas, says the bank supports the financing of renewable energy and also supports companies through the incorporation of sustainability into the financing, where renewable energy is a common indicator.

She says: "Renewable energy can be instrumental to corporates that want to use green financing but do not necessarily have the business model or the technology available to be green."

Oliveira believes that 2019 was a record year for sustainable financing with $550 billion in total issuances. "Green bonds made up 50% of the total $550 billion issuance for 2019," she says. "When Covid hit, we did see a drop in the volume of green bonds and green loans in March and April but volumes are rebounding."

In August, Moody's forecasted that the total sustainable bond issuance in 2020 could reach $325 billion to $375 billion.

"With the increased attention from investors and companies trying to improve and disclose their sustainability goals, we now see them trying to tack on green bonds or sustainability-linked facilities where they are setting targets to become more green with, for example, commitments to use 100% energy from renewable sources," says Oliveira.


Thomas Cantello

"All the fundamentals are in place for a strong 2021 and beyond."

Regulatory landscape and upcoming elections

There is strong support from the federal government for renewable project development with two key pieces of legislation that have been in place for many years, the Production Tax Credit (PTC) and the Investment Tax Credit (ITC).

PTC provides a tax credit of 1–2¢ per kilowatt-hour for the first 10 years of electricity generation for utility-scale wind and ITC provides a credit for 12% to 30% of investment costs at the start of the project, particularly for the offshore wind and utility-scale and distributed solar sectors. Both were extended in 2019 but PTC has only been extended until the end of 2020.

Cantello says: "PTC has been around for years and usually gets extended but it is coming to an end. ITC will start stepping down this year over the next 3 years before completely disappearing. If they are not extended, it may hurt the on-going development of renewable energy projects. There is the possibility that after the elections in November, if Joe Biden and the Democrats are in charge then an extension will be provided."

Trade policies in the US have been implemented haphazardly under the Trump regime with a number of tariffs put in place for Chinese imports, such as solar modules. This has made projects more expensive to build in the US.

Cantello believes that if Biden is installed in the White House, many trade tariffs will be regulated with others disappearing.

"Other than PTC and trade policies, there is still enough support at the state-level and corporates who know that we need to be more sustainable and address the ongoing climate crisis," says Cantello. "They will continue to support the market. If there isn't a change during the election, I still believe that the renewables market will continue to grow given the strong support of both the states and the private sector."

Offshore wind in the US?

In 2016, the first commercial offshore wind project – the 30MW Block Island Wind Farm off the coast of Rhode Island – began operations. Since then, the US has not seen many new offshore projects built.

While several projects amounting to 30GW were announced thereafter, there has been a great deal of opposition to those and they are currently tied up in regulatory processes.

Cantello says: "European developers like Avangrid, Orsted and Eversource have active development projects in the US so there is enthusiasm but I don't think it will drive the overall renewable project financing market."

One project that is far advanced is the 800MW Vineyard Wind project off the East Coast. However, an environmental impact statement is currently underway and has halted the project. It is not expected to be completed until the end of the year.

"Many in the market thought the Vineyard Wind project would open the floodgates to more projects but it has moved a lot slower than the market anticipated. I do not think offshore wind will be a significant part of our market in the near future. That isn't to say some won't get built over time because there are several projects in various stages of development and construction," says Cantello.

"There is definitely a lot of support for offshore wind projects but I just don't think there is as large a need for it in the US as in Europe. We have a huge amount of land on which to develop wind farms so it begs the questions whether there is a need to build offshore given that it is more expensive."


Ana Carolina Oliveira

"Data centres will continue to demand more and more energy over time, and the pandemic will only accelerate the trend."

Microgrids and distributed energy (Solar and storage)

The US is prone to hurricanes, floods, wildfires which cause power outages. This has emphasised the need for resilient renewable infrastructure. Utilities are now turning their attention to microgrids (including solar and battery storage) and distributed energy systems to provide customers with flexibility, cost management and reliability.

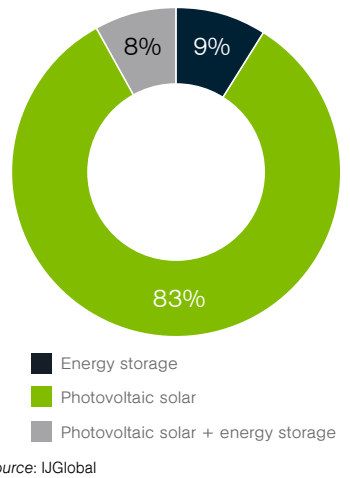
"We financed a distributed microgrid battery storage project in 2019 in Los Angeles – to install batteries at 100 different sites including universities, hospitals, and corporate centres. They are expensive projects but have a stable revenue stream and the projects provide energy savings and resiliency the host sites as well as congestion relief to the grid during peak demand periods," says Cantello.

There has also been a great deal of interest in residential rooftop solar with customers requesting batteries so they are independent and have a reliable electricity stream in the event of blackouts.

Cantello says: "We are seeing huge growth in this market, especially with battery prices decreasing and solar panel prices coming down, it has become more competitive. California is a huge economy and renewables is a big market there. Of course it has its fair share of problems with blackouts and wildfires which has led to a surge in utility-scale battery storage projects with a number of projects underway."

ING is currently working on a few project financings that feature battery storage.

Pipeline deals in the US - solar and battery storage



Source: IJGlobal

Data Centres and renewable energy

In the last few years, data centre providers have stepped up efforts to procure renewable energy sustainably to meet customer demands. European data centres have utilised renewable energy for a number of years but it is a relatively new phenomenon in the US, having only come into play from 2014 onwards.

Oliveira says that there has been a surge in data centres using green financing to finance their development which has led to more power purchase agreements (PPAs). "Data centres will continue to demand more and more energy over time, and the pandemic will only accelerate the trend – if investors are looking for a continually-growing sector, with falling costs – this is it."

The forecast for renewable energy remains a growth area for the foreseeable future buoyed by innovative, sustainable financial instruments and growing sub-sectors providing steady revenue streams. While we may not see a surge in operational projects in the offshore wind market, microgrids and battery storage projects will continue to attract investors and developers.

Projects that have been delayed due to the pandemic are expected to come online in 2021 as businesses continue to adapt to market conditions.

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Floatovoltaics:

A portmanteau with pizzazz

From the world's first pilot system in Aichi, Japan, some 13 years ago to Maurbeni's 181MW project in western Taiwan that closed in April 2020 with a NT$7.2 billion ($239 million) debt package, it is not surprising Asia dominates the market for floating solar, or floatovoltaics. *IJGlobal* reporter **David Doré** explains.

High population density, coupled with the perennial challenges of land availability and long-lost titles, drive the growth of floatovoltaics in developed and emerging markets in Asia. Another reason is the opportunity cost of developing ground-mounted solar PV projects in countries with land scarcity.

"An Asian conglomerate with a successful record developing coal-fired power plants bought land to expand an existing power plant complex in Indonesia," a banker tells *IJGlobal*. The new tract would have been for 2GW of additional coal-fired power plants.

The banker adds: "The developer tried to solve the problem of land availability ahead of time. Now the Government of Indonesia doesn't want to develop coal anymore. That's fine and commendable. But for the same amount of land the developer can only install 100MW ground-mounted PV. That's 5% of the installed capacity of the coal-fired. No one talks about that little issue."

Killing the business case

The floatovoltaic industry (or *IJGlobal*'s sources) classifies projects into 4 tiers in order of system complexity, based on the project's location:

- **tier 1** – water supply reservoirs or mine subsidence areas
- **tier 2** – hydropower dam reservoirs
- **tier 3** – nearshore or marine basins
- **tier 4** – offshore

Tier 1 normally has the lowest capital cost per MW and debt pricing while tier 4 has the highest. However, no 2 projects are the same and it depends on the project dynamics, as everyone in project finance loves to say.

Regulators, developers, financiers and advisers are grappling with floatovoltaic's technical risk and lack of standards across the tiers.

Asian Development Bank (ADB) senior energy specialist David Elzinga leads the bank's technical assistance on a

David Elzinga

"The dominant issue for financiers is the perceived technical risk, and by deploying pilots we are addressing this."

floatovoltaic programme in Afghanistan, Azerbaijan and Kyrgyzstan. "The dominant issue for financiers is the perceived technical risk, and by deploying pilots we are addressing this" he says.

Five local and international bidders submitted their proposals on the first 100kW pilot project in Azerbaijan, where more than 90% of power is from oil- and gas-fired power plants. Elzinga anticipates the government's selecting the preferred bidder this month (September 2020).

DNV GL is Singapore water agency PUB's technical adviser on the 60MWp Tengeh Reservoir floatovoltaic, and lenders' technical adviser on Masdar's 145MWp Cirata Dam floatovoltaic in Indonesia.

Sembcorp Industries in August 2020 had closed a S$40 million ($29.3 million) project finance loan from DBS for the former project. Société Générale, SMBC and Standard Chartered are to be lenders on the latter project, a deal watcher whispers, though the transaction is in due diligence and has yet to go before credit committees.

The Norwegian firm is facilitating a floatovoltaic industry group with 20 members across the value chain to develop standards in 5 areas – site conditions assessment, energy yield forecast, mooring & anchoring systems, floating structures, permitting and environmental impact – to increase the quality and reliability of floating PV installations, according to Silpa Babu of DNV GL.


Silpa Babu

"Too often, standards, codes and requirements are used that are not specific for floating solar but rather adapted from other industry fields, for example, offshore structures, building codes and ground-mounted solar," Babu comments. "This can lead to either too strict requirements – hence killing the business case – or too soft or irrelevant requirements, hence leading to increased risk of failures."

Learning as we go

Sources *IJGlobal* talked with agree that independent power producers and bankers lack reliable comparables of large-scale floatovoltaics to brief boards of directors and investment committees.

When Marubeni's 181MW Changhua Coastal Industrial Park floatovoltaic in Changbin Lunwei East, Taiwan, starts operations later this year (2020) – if it meets the commercial operations schedule – the project would (however briefly) be the world's largest floating solar.

Commercial lenders on the 6-year, non-recourse debt package were:

- Bank SinoPac
- DBS
- E Sun Commercial
- First Commercial
- KGI
- SMBC
- Société Générale

Kelvin Wong, a banker at DBS, remembers the novelty of the Taiwan project: "I was surprised when our adviser Mott MacDonald said they couldn't find relevant benchmarks anywhere in the world at the scale we were looking at."


Kelvin Wong

The DBS managing director of project finance adds: "The lack of benchmarks on construction costs, warranties and O&M costs, in particular, put some international banks off."

"This new asset class doesn't have a long-term track record yet," Société Générale managing director Daniel Mallo tells *IJGlobal*. "Long-term costs, performance and cash flows have yet to be fully validated. There are expectations and assumptions about the economic and environmental benefits of higher energy yield, reduced evaporation and improved water quality. But the evidence is not yet in for large-scale projects and for longer periods of time. It's not dissimilar to what happened a dozen or so years ago with the ground-mounted solar asset class. We tend to also learn as we go."


Daniel Mallo

"The evidence is not yet in for large-scale projects and for longer periods of time."

Market insiders underscore that the project financing of the floatovoltaics subsector, though a relatively new technology, still competes for liquidity in the project finance market.

The debt-to-equity ratio and tenor are "not so different from what you see in the market," says a Singapore-based banker. The tenor on the Taiwan deal was 6 years. This length was not due to the subsector's novelty but because that is the "sweet spot for local lenders and it's more customary to do medium-term and refinance in year 4 or 5 in that particular market", according to SocGen's Mallo. Bankers anticipate a long-term tenor on Cirata in Indonesia, as only international lenders with appetites for long tenors are on the deal.

While sources were reluctant to confirm a specific debt-pricing premium over other solar PVs, "in a year or two that premium will go away", predicts Wong.

An early mover's fall back is to structure and finance floatovoltaics as they would ground-mounted PV projects.

"The financial model getting through to financial close is not going to be significantly different for a ground-mounted versus a floating versus a concentrator – or any other PV," remarks Brett Crockett, director of energy and infrastructure at modelling specialist Mazars. "It's all pretty similar."


Brett Crockett

"The financial model getting through to financial close is not going to be significantly different for a ground-mounted versus a floating versus a concentrator – or any other PV."

Obviously, decision-makers are approving the financing of the large-scale projects.

"Though there are not many comparables, there are ways to get comfortable with these projects," a banker experienced in floatovoltaics confides to *IJGlobal*. "Technical due diligence may take longer than other PVs but it's well worth it. A solid sponsor is crucial with the financial and technical bandwidth to take care of these more innovative structures and keep on top of the operations and maintenance contractor."

The project finance veteran adds: "A strong risk mitigation plan is critical, requiring cash-flow buffers and co-financing with other early-mover banks helps settle nerves."

Mallo stresses the sizing of the debt, including beefing up contingencies, and running sensitivity analyses on the projected cash flows to allay concerns by credit committee members.

Marching through the fog of war

Market participants emphasise several ways to accelerate the uptake of floating solar. These include designing a regulatory framework, mapping a pipeline of potential floatovoltaic IPP projects and agreeing on industry standards. The overarching theme among the recommendations is enhanced visibility.

"We need governments, complemented by dialogue with industry, to establish a sensible regulatory framework not just for renewables but for the power sector, in general," says Cindy Cisneros-Tiangco, ADB principal energy specialist. Elzinga's predecessor on the Central and West Asia floatovoltaics programme has shifted to the bank's Pacific department, where she works with small island states to deploy larger scale floatovoltaic projects.

"Tonga is at the forefront of involving the private sector in ground-mounted solar," Cisneros-Tiangco tells *IJGlobal*. "Nearshore and marine floating solar is a good fit for the Pacific Islands and could become the game-changer for these markets. We expect energy storage to play an increasingly important role to address uncertainty around grid absorption to attract more private sector investments."

Implementing agencies could also take a programmatic approach to floatovoltaics by working with advisers to develop a list of water bodies that are suitable for the subsector.


Cindy Cisneros-Tiangco

"Private sector would then have visibility into the pipeline of projects in each market," says Wong at DBS.

The Dutch Water Authorities, or Unie van Waterschappen, have identified many sites for floating solar, and India's Ministry of New and Renewable Energy has conducted feasibility studies, prioritising some reservoirs, according to DNV GL's Babu.

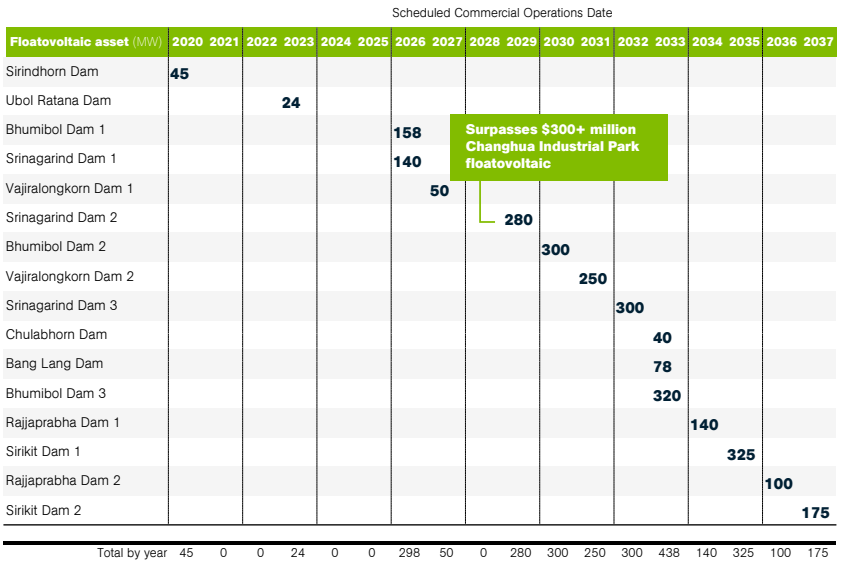
Indonesia is considering plans for installing floating solar PV on a further 60 reservoirs, while the Electricity Generating Authority of Thailand (EGAT) has a floatovoltaics programme that stretches into 2037.

A Thai-Chinese consortium of B Grimm Power and Energy China had signed in January (2020) a contract with EGAT to develop the Bt1.87 billion ($60 million) Sirindhorn Dam floatovoltaic in Ubon Ratchathani province – the first of 16 planned projects with a total of 2,725MW of generation capacity across 9 dam reservoirs.

The joint floatovoltaic industry project anticipates releasing its draft guideline for industry consultation at the end of January 2021, with the final recommended practice guidance published 1 or 2 months later. The consortium recently welcomed 2 Asia-headquartered members: QuantSolar in India and Sun Rise E&T in Taiwan. The project would welcome a PV module supplier.

"It is in the interest of bankers to finance and invest in performing and long-lasting FPV projects, which will not sink or catch fire after 5-10 years of operation or after a mild gust of wind," DNV GL's head of section for solar in India emphasises. "It is also interesting to see the approaches of different participants and how there is a real mismatch between sound engineering practices for FPV and what is normally asked as a requirement for FPV projects."

EGAT plans 2,725MW of floating solar staggered to 2037



Source: *IJGlobal*

The future of renewables in MENA

IJGlobal reporter **James Hebert** trawls the Middle East and North Africa to analyse market appetite for renewable energy, revealing it remains lively…

Six months after the World Health Organisation's announcement of a pandemic, the MENA market has soldiered on with a number of huge projects hurdling the economic difficulties produced by the Covid-19 pandemic to reach financial close – including three more in just the first week of September 2020.

However, the rumblings that could be felt in a mysterious land further west – i.e. Portugal – have revealed that MENA is no longer home to the world record tariff for solar PV, despite new projects in Abu Dhabi and Qatar setting new records this summer (late July 2020.)

The Portuguese Directorate General for Energy & Geology announced on 27 August that its 670MW solar tender drew a bid as low as $0.0131 per kilowatt hour which now holds the record, albeit in an aspirational context, which nonetheless beats the $0.0135 tariff offered by EDF/Jinko Power for the 2GW Al Dhafra… which is also aspirational at this stage.

Nonetheless, how can the MENA market respond to this latest challenge? Or to broaden the question further, what lies in store for the renewables sector in the region?

IJGlobal spoke to developers, advisers, and bankers about what opportunities they foresee and anticipate the most in MENA renewables in the coming 'post-Covid' – or perhaps even the 'with-Covid' – era.

Developers

Perhaps unsurprisingly at the top of the list is Saudi Arabia and its NREP headed by the Renewable Energy Project Development Office (REPDO) which is still working through its second round but nonetheless has 1.2GW of solar ready to be bid on in the third round – split between categories A and B.

B is the much larger of the two – comprising 1GW of solar PV – and consisting two projects:

- 700MW Ar Rass
- 300MW Saad

Manah Solar I

REPDO issued the RFP documents for NREP R3 at various points in April (2020) and structured its indicative schedule around the disruption of the pandemic which at this point of the year was pushing many ongoing tenders back. However, such is the scale of the pandemic that REPDO recently added yet more bidding time for its third round – the RFPs for Ar Rass and Saad projects are now due on 9 December.

Elsewhere up to nine developer consortia bid on a 755MW solar PV programme in Iraq on 1 September which was re-tendered following its initial launch in May 2019. These are:

- 300MW Karbala solar PV – Karbala Province
- 225MW Iskandariya solar pv – Babil Province
- 50MW Jissan solar PV – Wassit Province
- 50MW Al Diwania solar PV – Diwania Province
- 30MW Sawa-1 solar PV – Muthana Province
- 50MW Sawa-2 solar PV – Muthana Province
- 50MW Khidhir solar PV – Muthana Province

A spokesman for Iraq's Ministry of Electricity told the state-run Iraqi News Agency in June that the 755MW tender was put to one side due to the pandemic but was subsequently re-issued to the market. The bids submitted on 1 September are thought to be between $0.04 and $0.08 per kilowatt hour.

"We spent a lot of time, money, and bid bond on the bid. All gone to waste."

A similar story comes from Kuwait where the KD530 million ($1.7 billion), 1.5GW Al-Dibdibah solar PV project is to be re-tendered as an independent power producer (IPP) which was announced a week after its cancellation by the Kuwaiti Council of Ministers on 13 July despite the receipt of seven bids. The tender scrapping was blamed on the pandemic… however the decision also enabled the switch to the IPP format, which will mean the prospective developer will be expected to raise the project financing as well as O&M the asset when it is up and running.

KAPP will replace Kuwait National Petroleum Corporation (KNPC) as the implementing authority on the tender and will also be mandating a new advisory team. The RFQ stage is expected to be initiated in Q1 2021.

Oman has also had some issues at the political level affecting its procurement drive due to the pandemic – its PPP unit was folded into the Ministry of Finance last month, after just a year of existence. Nonetheless, there are hopes that this will not disaffect the Oman Power & Water Procurement Company (OPWP) and its 1GW+ solar programme which has nine prequalified consortia coveting the following projects:

- 500-600MW Manah Solar I IPP
- 500-600MW Manah Solar II IPP

Each project will be awarded to separate consortia and, much like on the latest Saudi NREP round, an extra-long period of bidding time was given to reflect the disruption of the pandemic – RFP bids are due 7 December.


400MW Noor PV II multi-site solar

Advisers

The original advisory team for the 1.5GW Al-Dibdibah in Kuwait was not dismissed without controversy, as a source on the team told *IJGlobal* at the time: "We spent a lot of time, money, and bid bond on the bid. All gone to waste." The episode provided a fresh reminder of the difficulty of getting projects off the ground in Kuwait, where just two PPPs have reached financial close since 2008 – the most recent being the Umm al Hayman wastewater PPP in late July.

Nonetheless, a sufficient amount of time has now passed and the Kuwaiti solar PV is once again drawing interest from other consultancy firms. *IJGlobal* also asked around in the market for other upcoming renewables with advisory roles to be filled over the coming months.

Emirates Water and Electric Company (EWEC) is understood to have yet to issue the RFP for the transaction advisory for a 1.5GW solar scheme in Abu Dhabi – the third such major IPP after the 2GW Al Dhafra solar IPP and 1GW+ Sweihan solar IPP.

Meanwhile additional opportunities await in North Africa – the Moroccan Agency for Sustainably Energy (Masen) invited expressions of interest from developers for the first phase of its 400MW Noor PV II multi-site solar programme in February, just a month before the start of the pandemic. The programme has been slowed down for obvious reasons and has long since missed its anticipated RFP launch target of Q2 2020, but nevertheless it is understood that an advisory team has yet to be appointed by Masen.

The sites selected by Masen for Noor PV II include:

"I think banks are more stable but only the stable projects will attract robust market appetite."

- Bejaad
- Boujdour 2
- El Hajeb
- Guercif
- Kelaa des Sraghna
- Laayoune 2
- Lakhtatba
- Midelt
- Taroudant

Developers may be selected for each of the locations marked by Masen and a maximum of 40MW of solar PV may be developed at each site, consisting of smaller lots of 5MW to 20MW each.

Next door in Algeria, the government announced in May plans to launch its 4GW TAFOUK1 solar programme, which comprises new solar PV projects spread out across the North African state. The projects have a combined value between $3.2 and $3.6 billion, according to the government's own estimate, which has certainly caught the eye of consultants.

The government set out the framework for a 4GW solar programme in April 2017 with the intention of satisfying both domestic power needs and export purposes, but progress had slowed well before anyone worked out what the number after Covid referred to. Regardless, TAFOUK1 is expected to be complete by 2024 and as of yet no advisory team has been appointed on the programme.

Banks

All of these renewable energy opportunities across MENA may well be mouth-watering enough to dampen your facemask, but what about the financial viability of fresh power projects going ahead?

"I think banks are more stable but only the stable projects will attract robust market appetite," one financial adviser in Dubai told *IJGlobal*. "It's an attractive sector and the contractual models have been proven in the region and, as long as they broadly follow the template, then there is no reason why they can't get closed."

Several utilities across MENA have sought outside support to achieve this semblance of stability for the period ahead – only at the start of September Morocco's energy utility Office National de l'Électricité et de l'Eau Potable (ONEE Water) received €50 million as part of a €300 million debt package provided by the European Bank of Reconstruction and Development to the government.

The message being sent is clear – to avoid the panic generated in the market caused by Oman's energy utility OPWP's announcement on 19 May to IPPs (as well as IWPs and IWPPs) that it would be deferring power (and water) capacity investment charges on its offtake agreements. The issue was resolved little over a week later after an intervention by the recently-enlarged Ministry of Finance to maintain these payments. Had the deferrals gone ahead however, the losses would have run into the hundreds of millions of dollars – a far more expensive casualty than damaging market appetite for funding new renewable energy projects.

American colleges tap into energy P3

It takes two to tango and more often than not – when it comes to public private partnerships in the US – the public side has two left feet, according to *IJGlobal* reporter **Elliot Hayes**…

Infrastructure in the US – which has annually been touted by the ill-informed as being on the verge of taking off for longer than anyone cares to recall – has one burgeoning P3 sector that is building towards an impressive crescendo.

The better informed always reply to the claim the market is taking off with the cliché that the US is not one homogenous market but a group of 50 individual markets… and so the discussion follows the path of a million conference panels.

This turbulent year, rocked by a global pandemic, has seen confidence in US infrastructure rocked across more traditional sectors with coronavirus blamed for delays to deal progress as well as public-side funding issues.

For example, the sponsors behind New York's JFK Airport are concerned it will not be able to obtain public funds for the deal unless the federal government bails out the Metropolitan Transportation Authority. Then in Maryland, the transportation department has been blamed for cost overruns and delays to the delivery of the Purple Line as the private consortium threatens to walk away. Over in Hawaii, the Honolulu Authority for Rapid Transportation has delayed the award of its $9.2 billion transit project for a sixth time due to the Federal Transit Authority refusing to release funds until it is convinced the P3 will work.

It is in this environment that projects being led by educational establishments – with no real ties to the state's administration – are all the more appealing.

There have been 2 P3-style projects brought to financial close in the US since 2017, bringing in the private sector to replace ageing heating and cooling infrastructure and then operate it over the course of a concession, greatly enhancing the university's green credentials which is increasingly important to learning establishments' reputations.

IJGlobal has been tracking the evolution of this sector since its early days and now – having established the foundation of 2 recently-closed deals – it is maturing nicely and providing a pipeline of projects with 5 in planning and the potential for many hundreds more.


University of Iowa

"I think Ohio State was a pioneer, and the University of Iowa is the second of its size."

Andre Cangucu, chief BD officer at Engie North America

Engie has firmly established itself in this space, and market rumour has it that the French infra specialist is in discussions to build a team to focus solely on university P3 projects. It is already playing a central role on the 2 consortia that have both taken transactions to financial close – Ohio State University and the University of Iowa.

"I think Ohio State was a pioneer, and the University of Iowa is the second of its size," says Andre Cangucu, chief business development officer at Engie North America.

Ritu Kalra, head of the western region and for higher education in Goldman Sachs' public sector and infrastructure finance division, adds: "A lot of universities are asking themselves, 'Why are we in the business of owning and running our own power plants? That's not our bread and butter'."

And this dawning realisation within the realms of the US further education world is helping these projects gain a foothold as the "no-brainer element" of these deals (as one industry observer calls it) wins over hearts and minds. They are alert to the attraction of spinning off non-core assets, replacing outmoded, inefficient and dirty infrastructure.

Utility P3s "will proliferate" during the next few years as colleges work swiftly to replace utility infrastructure, according to a report from Moody's Investors Service. In a separate report, S&P Global noted that institutions have started using P3s for energy projects too.

Risk transfer is a key reason that colleges are opting for energy P3s "and that's something you have to get right," Goldman Sachs' Kalra says.

So far, so good

The private sector – having been through the mill for years chasing willow-the-wisp deals being driven by a slew of transport departments – take solace from working with universities where there is no lack of capital to pay leases and an abundance commitment.

The ease with which the $1.165 billion Ohio State University (OSU) was closed in late 2017 by Engie and Axium Infrastructure serves as a pathfinder for similar deals. It

involves the lease-based outsourcing of an on-campus energy asset and was an alarmingly straight-forward deal.

"The facility generates electricity with combustion turbines and then utilizes the exhaust heat to make steam and heat water, which Ohio State uses to heat campus buildings," said Serdar Tufekci, chief executive of the SPV.

"The CHP facility also includes a central chiller plant, which will be the first one west of the Olentangy River to provide cooling in the Midwest campus and West Campus buildings. This combined capacity is both financially and environmentally responsible."

Back in 2017, Zach Horn – Engie employee and former OSU student – said: "I really do think that's kind of where energy infrastructure is going to go within the next 20 years. People are definitely going to want to move away from the central power plant and make [sustainability] their own thing. I think Ohio State was ahead of the curve on that."

However, it took until 2019 for an almost identical repeat of the transaction to come to market and make it over the line earlier this year (March 2020). This time, Engie partnered with Meridiam to reach financial close on a P3 transaction with the University of Iowa with its $1.319 billion utility system.

"This agreement is an excellent step forward for the University of Iowa," says board of regents president Dr Michael Richards. "We must continue to be creative in leveraging our assets to find ways to provide the funding that Iowa's public universities need to be their best."

On Ohio, Engie and Axium financed its $1.165 billion P3 with an $850 million long-term private placement facility backed by around 8 institutional investors, a $140 million credit facility comprised of a $125 million revolving capex loan with a five year tenor and $15 million letter of credit from RBC Capital Markets, MUFG, CIBC and Santander. The equity amounted to $175 million and was split 50:50 between the 2 SPV members.

"Engie is excited to help lead the University of Iowa in its zero-carbon transition and towards a more sustainable energy future," says Houston-based Gwenaelle Avice-Huet, chief executive of Engie North America.

As to the 2020 Iowa concession, financing was straight forward. The $1.319 billion project was financed with $423 million in equity and $869.51 million in debt on a 68:32 gearing.

The debt breakdown was split between a commercial bond for $614.74 million and a capex loan of $271 million, and $10 million in working capital. The capex loan and the working capital was provided by KeyBank, KfW-IPEX Bank and Santander.


California State University at Fresno

A week from financial close on the University of Iowa (UI) project, it was announced that Hannon Armstrong had made a $115 million cash investment to join Engie and Meridiam on the project.

"The UI is pleased to partner with Engie and Meridiam over the next 50 years in order to deliver on its strategic plan, which is focused on the success of students; research and discovery; diversity, equity, and inclusion; and engagement," says UI president Bruce Harreld.

"With Engie and Meridiam, the university has found partners that share our values of investing in our people, improving sustainability, and transitioning toward a zero-carbon footprint."

Cookie cutter contractual agreements

Both deals were done under 50-year concessions. The Ohio deal featured a $1.015 billion upfront payment to the university while the Iowa deal had a $1.165 billion upfront payment.

Ohio State is paying the Engie-Axium consortium an annual fee that includes a fixed fee that starts at $45 million and grows 1.5% a year and an operating fee to cover costs (starting at $9.2 million based on a three-year average of university costs).

Iowa will pay its concessionaire a fee of $35 million from years 1-5, increasing the fee by 1.5% each year after that.

Engie will be operating, redeveloping and maintaining both assets once complete.

Looking Ahead

Since financial close for Iowa University a further 5 deals have been announced.

In June (2020), Iowa State University revealed it was seeking to redevelop its coal-fired utility system via a P3, having closely observed the Engie-Meridiam deal with University of Iowa.

The University of Idaho has been busy preparing to issue procurement documents for redeveloping some its campus utility assets via DBFOM P3 contracts. The university will first run a procurement for its district energy plant, with the tender due to be released before the end of this year (2020).

California State University at Fresno is set to release an RFP for the Central Utility Plant Replacement Project. The university already has 4 teams shortlisted:

- Bulldog Energy Alliance – Engie and Ullico
- Bulldog Infrastructure Group – Meridiam, Noresco, United Technologies, GHLHN Architects & Engineers
- Plenary Utilities Fresno – Plenary, Webcor Construction, Johnson Controls and Syska Hennesy
- Victor E Energy Partners – Fengate Capital Management, Veolia Energy Operating Services, WM Lyles Co, Kennedy/Jenks Consultants and Taylor Engineering

The University of Maryland, College Park issued an RFQ in April (2020) for the build, operate, maintain and – possibly – finance of its NextGen Energy Program. The deadline to qualify was 29 July and shortlisted bidders are expected in Q4.

In March (2020), The University of Washington (UW) issued an RFI for the renewal of its campus energy systems. The deadline to submit to qualify was 17 April.

Louisiana State University is currently mulling whether it should proceed to issue an RFQ to redevelop its ageing power plant. The RFQ had been due for launch in September (2020) but university officials have yet to agree on a procurement model.

With 5 projects in the pipeline to follow 2 cookie cutter pathfinders and many hundreds of educational establishments around the US being heated and cooled by ancient systems, these projects looks set to be the only infrastructure sector that is coming of age in the 50 individual markets.

New Fundamentals – energy funds in 2020 and beyond

The future is increasingly less restrictive for infrastructure funds investing in renewable energy, according to *IJGlobal* reporter **Arran Brown**…

"Thank god for coronavirus," they'll say. Though not as eloquent as National Geographic and David Attenborough, nor as determined and wilful as Greta Thunberg and Extinction Rebellion, coronavirus may yet earn the distinction of being a more effective catalyst for righting our climate wrongs. It would be the most exquisite irony if the dreaded death of 2020 was the lifeline humanity needed.

Battered oil prices, petrified transport networks, en masse working from home – these are a few of the unintended effects wrought by the disease that brought with them remissions in carbon emissions. Its lasting legacy, however, will arguably be a renewed vigour to the environmental, social, and governance investment imperative.

The pandemic has served as a test of resilience to systemic shock. It has given investors a painful lesson in risk and volatility, one that will only be repeated with the infinitely more menacing threat of climate change. Indeed, Covid-19 and climate change have a common cause: an unthinking and arrogant appropriation of the planet's resources.

Therefore investors, as well as governments and political entities, are now beginning to look again at how their action can have a material influence in the world. ESG funds and renewable investments have enjoyed stability, outperformance of benchmarks, and boosts in investment in spite of the pandemic.

Renewable generation, storage, and energy efficiency funds will welcome and enjoy their new-found vogue. Better late than never, though there has been an unfortunate lag. Among the managers surveyed for this piece, some have been investing in renewables as far back as 1999.

For the old hands, this is just the latest of several developments in the green fund landscape to occur of late. In the past year several listed funds have altered their mandates, and private players have developed revamped fund offerings reflective of the transformed investing environment.


Chris Holmes

"What we've seen in recent years is more competition coming into the market for core renewables – onshore wind and solar in particular."

The Listed Space

Since September 2019, at least three London Stock Exchange Listed funds have requested shareholder consent to alter investment mandates.

On 27 September 2019, energy production-focused The Renewables Infrastructure Group (TRIG) advised shareholders to back plans to recalibrate its geographical mandate from 50% UK, 50% continental Europe exposure to 35:65 in favour of Europe. Shareholders voted overwhelming in favour of the amendment the following month.

At the other end of the energy spectrum, in February this year (2020), the SDCL Energy Efficiency Income Trust (SEEIT) – asked its shareholders to remove the 25% minimum exposure to UK assets within two years of its initial public offering. It passed the next month.

The latest listed vehicle to change its mandate proposed a geographical and technological mandate. In June, Bluefield Solar Income Fund sought approval to change its investment objective and policy to allow for no more than 25% of GAV to be invested in other renewable energy assets and energy storage. Additionally, it said that up to 10% of GAV would be invested outside the UK.

Chris Holmes, co-lead investment adviser to JLEN, peer to these funds in the LSE-listed segment, offers his views as to why these changes are occurring at this juncture. "Some of it is down to the vintage of the funds – they launched at a time when it was sensible to have an investment mandate as defined at that time with a return expectation which they set out. Then, that was considered achievable.

"What we've seen in recent years is more competition coming into the market for core renewables – onshore wind and solar in particular. It's made it increasingly challenging for some funds, particularly single sector funds to meet their return targets. The natural thing to do is to ask where else can we go?"

Some arguments issue from the fact that these vehicles are finding it ever more challenging to acquire in the space that they set out originally. This is particularly true of those formerly investing in streams of feed in tariffs (FiTs), renewable obligation certificates (ROCs) and contracts for difference (CfDs) – since retired or limited by the UK Government.

Subsidised assets with limited or no exposure to power prices are in demand, meaning in turn that returns on assets with a strong subsidy component are being competed lower.

Outlining its response to these circumstances TRIG noted that European renewables markets still have support schemes (in Ireland, France, Germany). "Elsewhere, falling capital costs, favourable weather conditions, and availability of land have resulted in projects being developed at attractive risk-adjusted returns without

recourse to subsidies," it said in a statement at the time, adding that European non-subsidised projects can achieve returns in line with UK ROC projects.

What's more is that the UK is set to add a further 20GW of renewable energy by 2030, compared with Europe's 100GW.


Jonathan Maxwell

"We are going to be doing more in the UK in certain very interesting areas, but what we've found also – as we knew we would – is that there's quite a significant scale of opportunities in continental Europe."

For SDCL founder and chief executive Jonathan Maxwell, there has never been any question that their vision embraced anything but an international profile. SDCL's mandate adjustment is a question of securing the best risk-adjusted reward for their investors while charting a strategic pathway to grow at scale.

"We are going to be doing more in the UK in certain very interesting areas, but what we've found also – as we knew we would – is that there's quite a significant scale of opportunities in continental Europe."

He stresses the importance of tracing fundamental value: SDCL is presently finding more opportunities in North America than in Continental Europe, and seeing more opportunities in the UK than last year. "We just wanted to remove restrictions that would prevent us from deploying capital in the best interest of shareholders."

One of the advantages of SDCL's model is that revenues are not predicated on incentives and subsidies; it's about doing commercial deals not as susceptible to regulatory headwinds.

"We're about energy solutions to corporate, commercial, industrial, and public sector counterparties," he explains, "to help them meet their energy needs on site and reducing their energy demands in the first place. The propositions have to stand on their own two feet. We offer cheaper, cleaner, more reliable, and more commercially-sustainable solutions."

What of JLEN's mandate? The other Chris at JLEN – Chris Tanner – and partner at Foresight Group – investment adviser to the fund, illustrates their vehicle's in-built advantage: "We have always had a broad mandate to invest in environmental infrastructure, and that includes things beyond renewable energy, things that go with the themes of sustainability and climate change. We feel that we have the right mandate for the times, in terms of energy sustainability, but more generally sustainability – and climate change definitely. JLEN's mandate can support new ways of contributing positively to climate change and sustainability as new technologies and subsectors develop or become attractive."

Environmental infrastructure is defined by the company as infrastructure projects that utilise natural or waste resources or support more environmentally-friendly approaches to economic activity. Beyond generation of renewable energy, it includes the supply and treatment of water, the treatment and processing of waste, and projects that promote efficiency.

Those haven't always been easy adds, according to colleague Chris Holmes. "Yes, there have been times requiring an education for our shareholders to explain JLEN's decision to add different technologies to its portfolio – anaerobic digestion is an example – but over the years we've proven that investing into this technology was a wise decision and the diversification story is illustrative of the


Chris Tanner

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benefits of JLEN's broad mandate." JLEN's mandate has meant it can invest in a wider range of technologies without having to go through the process of shareholder approval.

Progress in Private Funds

Private green energy fund managers have been refining their investment theses and methodologies for as long, if not longer, than those in the public markets. New iterations of funds have on occasion not just been larger as far as LP commitments go, but broader in geographical mandate and technological focus.


Anaerobic digestion


Rosheen McGuckian

"We knew that growth would be as big in solar as in wind in Europe and that adding solar smooths seasonality of earnings."

Irish fund manager NTR has itself metamorphosed, having been founded in 1975 as a 'classical' infrastructure business, before investing in wind and waste in the 90s, and expanding into wastewater treatment, bio-energy, and solar in the noughties.

The company demerged in 2015 to form Atlas Investments (roads and water) and NTR which exclusively pursued the renewables using vehicles investors were not yet accustomed to.

"When we launched our first fund, we were a bit of an anathema – no one had heard of a long-term fund!" relates Rosheen McGuckian, chief executive at NTR.

NTR's first vehicle – NTR Wind 1 LP Fund – which launched in 2015, is a 25-year fund, providing long-term cash yield from the assets for their entire lives.

"We were slightly ahead of ourselves with our first fund. At the time, two out of three institutions I would speak to about long-term vehicles would express uncertainty or say they were interested but internal rules precluded them from participating."

Fortunately, McGuckian sees the acceptance of longer vehicles broadening in appeal, saying the market is coming round to the logic of having a vehicle commensurate with the life of an asset: "The premise was why would you take the time to get an asset built, have it operating beautifully, and then sell it on?"

NTR's first fund was exclusively onshore wind in the UK and Ireland, aiming to target a technology and geography it was eminently comfortable in, and recognising the ROC and REFiT growth opportunity in the UK and Ireland. "But we always knew we were going to go broader and multi-technology thereafter," says McGuckian.

NTR identified solar as another technology with the lowest cost of electricity, adding it to the second fund's – NTR Renewable Energy Income Fund II – mandate in addition to adding a host of new European markets including Benelux, France, Italy, and the Nordics. "We knew that growth would be as big in solar as in wind in Europe and that adding solar smooths seasonality of earnings. We also allowed up to 15% storage to collocate with wind and solar projects. We knew in developing that aspect of the strategy it would be a big part of the future."

Zug-headquartered SUSI Partners has spent the past 10 years developing single-strategy funds across the green energy spectrum. It launched its maiden fund in 2010 acquiring brownfield renewable energy assets, before developing an energy efficiency strategy – Fund I reached final close in 2013, Fund II in 2019 – in addition to an energy storage fund (final close in 2016).

SUSI's history is closely aligned with the maturity of individual technologies which become trigger points for a fund strategy once the technology became reliable enough at scale to provide the basis for returns.

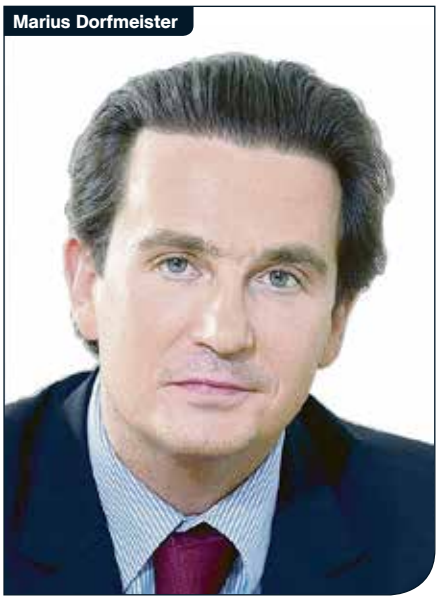
Their latest venture – the largest yet – is the SUSI Global Energy Transition Fund, which reached a first close this summer. This flagship product brings together production, storage, and energy efficiency within one vehicle.

Marius Dorfmeister, co-chief executive and global head of clients, rationalises the development: "We see a convergence in the market of the three technologies. Years ago, owing to the availability of technology, it was simpler to come up with products relating to energy production. Nowadays you don't do just energy production; it comes with something else whether that be energy storage, energy enabling, or energy efficiency. It makes sense to reflect the convergence of these technologies by having a single fund."

Marco van Daele, co-chief executive and chief investment officer at SUSI, elaborates: "Technology convergence is one aspect. The commercial dimension is another one. We see business models evolving, combining the technologies from an engineering point of view but it's also possible to find a lot of new commercial ways of monetising those assets beyond just being paid for MW hour produced.

"An example is an investment we've made in Australia. We're backing a developer to roll out a portfolio of residential and commercial behind-the-meter solar rooftop generation and battery storage systems. Combining them leads to a reduction in the energy bill of about 20%, as well as energy consumed. The end consumer doesn't pay for energy consumed, they pay a flat rate that is 20% cheaper than what they used to pay."

Another novelty with the latest fund is its evergreen structure, which they claim is better suited for this holistic approach. SUSI had not used this fund structure previously, explaining that this limitation has been due to traditional fund structures used in infrastructure investing, themselves artefacts of the buyout and real estate world.


Marius Dorfmeister

"Nowadays you don't do just energy production; it comes with something else whether that be energy storage, energy enabling, or energy efficiency."

Dorfmeister points to several advantages of the evergreen structure, including its efficiency. "An advantage is that it cuts out the need for repeat cycles of due diligence, not only a new manager, but a new legal entity – it saves time. It makes sense for consultants to work with fund managers who are entertaining evergreen structures." He adds that the model can reach investors in countries SUSI hasn't had as many clients from, and appeals, too, because it doesn't

limit and cause investors to be stuck for reasons of liquidity. “In the end, evergreen structures are about doing the right thing for the investor” says van Daele. “This structure avoids potential conflicts between investors and the manager, but also between investors in terms of exits especially.

"In a closed-end fund the investors need to be monetised at some point. Sometimes that happens at the right point in the cycle, sometimes not. That creates the potential for conflict. Those are clearly avoided with this structure”. He also cites growing numbers of LPs who prefer to receive the return but not the capital in difficult and overly-monetised markets.

The next 10 years

Renewable energy generation has been the favourite strategy of many energy and infrastructure funds for the past 10 years. What forces and trends do the coming 10 portend?

Single technology funds are increasingly unlikely to stand out in a growing segment. Some see a bifurcation of the market, where there is a justification for specialist players with deep knowledge of a sector. For van Daele, unfocused yet sub-scale funds might be less favoured. “You’ll be competing both with local players who have better networks and with global capital that flows into an increasingly commoditised sector.”

JLEN’s Chris Tanner emphasizes the importance of the pipeline for these prospective single tech funds. He recommends: “A very strong pipeline in the sector you’ve chosen. With the history of listed renewables funds in the market, there is a wealth of educated investors who would be happy with multi-technology funds. You’ve got to have a compelling pipeline that will allow you to be able to hit growth targets in several years’ time.”

“There is still scope for single technology funds, they do exist and it’s a justifiable strategy”, argues NTR’s McGuckian. “The limitation is what happens when the tap is switched off and the government decides they no longer want to subsidise a particular technology as happened in the UK with onshore wind? The advantage of having several countries in your mandate is that you can go where the growth is and also differing technologies succeed to different levels in different locations – so with multi-jurisdiction de facto you’re going multi-technology.”

New investment jurisdiction is an avenue being pursued by players in the forthcoming decade. SUSI, notably, is developing local expertise for the launch of its inaugural Southeast Asia fund, which promises a higher risk-return profile. Likewise, Germany’s Aquila Capital is understood

Marco van Daele

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to be developing its ties in the market there, influenced by Daiwa Energy and Infrastructure’s acquisition of a stake in the manager in 2019.

All managers are optimistic for the scope innovation across the next 10 years. Part of that is the convergence of technology which will be reflected in investments and sources of income for funds. “I do agree there is a greying between different areas,” says McGuckian. “We already provide paid-for grid firming services with our wind and solar assets. For certain projects, it makes a lot of sense to add storage to projects. You have an expensive grid connection that can take more than your generation can provide for maybe 60% to 70% of the time, so you can collocate two technologies and enhance revenues by selling at time of generation, selling at another time when required, or by providing gird firming services.”

Electrification of transport, heating, industrials, efficiency and hydrogen are all sectors earmarked for advancement and targets for funds in the next decade. Subsidies will undeniably form a big part of that. A desire for a green recovery has also unlocked development capital for some of these.

The EU set out green hydrogen as a major part of where investment needs to go. Though some say it’s not going to be hugely commercialised in the next 2 to 3 years. Germany and France have announced dedicated capital to catalyse innovation in these areas, in particular hydrogen. As for the UK, JLEN’s Chris Holmes believes more needs to be done. “The government should be turning its attention to its long-term net zero target by 2050 and ask itself what the new areas are that need stimulus, be it transport, hydrogen, carbon capture and storage. These are the sectors that need support.”

European policy makers have set much more significant CO2 reduction targets for 2030 compared to 2020 goals. A key component in meeting those targets will be by addressing buildings, which constitute 40% of energy demand and 30% of greenhouse gas emissions. A significant way to bring these down is energy efficiency.

SDCL’s Jonathan Maxwell is enthused by what this promises. “The solutions for the next 10 years don’t look like the solutions of the past 10 years. The renovation wave forming part of the EU’s green deal is essentially a euphemism for energy efficiency. The sums being poured into this are absolutely mind blowing. This is really a shift in gears. That’s not to say there won’t be stimulus in renewables, but what is going on in energy efficiency will be orders of magnitude larger.”

Promising applications in energy efficiency include integrating energy efficiency in new build construction, applications for green gas such as greening the gas grid, in parallel to greening the electricity grid.

Continued evolution and innovation will definitely come on the technology side. One of the dimensions often overlooked is on the commercial side. The affordability of technology drives business models and that’s the main innovation arena over the next 5 or 10 years according to SUSI’s Marco van Daele. “Given technologies are available and reliable at scale and cheaper, the toolkit is there to come up with very innovative business models, and that’s the exciting question.”

The ESG wave won’t be stopping any time soon. Marius Dorfmeister highlights the tidal shifts in asset allocation by institutional investors, particularly away from volatility and especially towards ESG propositions.

Undoubtedly the green energy investment fund space is undergoing a renewal of its vows to address global concerns while courting many new suitors. It couldn’t be happening sooner. SUSI’s van Daele strikes a positive note, though: “If you take the mindset that every challenge is also an opportunity, then climate change being the biggest challenge confronting mankind this century, then it is also the biggest opportunity.”

Winds of Change – technological constants

With renewables taking centre stage for greenfield investment, technologies – old and new – are being evolved and innovated. Here *IJGlobal* reporter **Sophie Mellor** focuses on some of the most recent developments in the battle against climate change…

The energy sector in recent years has witnessed more innovation than at any time since the Industrial Revolution. Countless technological enhancements have been made to increase output and bring niche sectors up to utility scale, progressively moving power generation away from fossil fuels.

As the market shifts away from reliance on fossil fuels with lenders and investors increasingly opting out of "dirty" forms of energy production as an ESG requirement, the self-starting evolution of alternative energy is receiving support from all sides.

Renewable energy – a growing percentage of which is produced by offshore wind – is in many markets rapidly replacing coal, oil and (increasingly) gas. In line with this trend, the industry is moving to upend the energy economy with new technologies to replace or enhance established ones.

With most of the conversation centred on offshore wind, it is pretty much talked out and already working at maximum efficiency… in the right conditions. Deeper water, intermittent wind and wake loss effects are of the drivers for the investment in technology.

Water depth poses a challenge in unlocking markets where offshore wind could be a viable energy producer. However, with the maturity of offshore wind, the period of apprehension before large-scale floating turbine investment was remarkably short.

However, the relatively high capital expenditures for deep-water wind arises from substructure and installation expenses – amounting to 35% of total construction costs. As a result, developers and researchers are modelling anchors and substructures around those found in nature to cheapen costs through efficiency.

A team at Purdue is working to 3D print anchors with concrete – as opposed to the more typical steel option – in multiple thin layers stacked one on top of another similar to that found on the shells of shrimp. The new structure and material will make the anchors resilient to cracking as it moves with the tides of the sea.

Other projects like SpiderFLOAT created by America's National Renewable Energy Laboratory is designing modular components shaped like spider legs to reduce the costs of deepwater substructures by limiting materials and simplifying routine O&M costs.

Another large growth market in floating technology is solar – the less sexy, but equally practical technology which has the more alluring feature that it can be located on any significant body of water.

New technologies, like those developed by Ocean Sun, envisage placing floating solar panels on dams and in slow moving rivers, lakes, coastal seawater, and manmade reservoirs using technology based on the structure of water lilies.

As opposed to the solar PV panels made of polyethylene plastic – commonly used for conventional solar systems – Ocean Sun's floating units are made of a polymer membrane, which are thin, lightweight, and buoyant enough to stay atop water surfaces.

The polymer membrane material is also hydro-elastic in nature and 1mm thick, allowing it to move with the waves, rather than resisting them.

However, biomimicking only goes so far. Like pigeons excelling at living in an urban environment, innovations are growing around the energy caused by human movement. Shell is installing turbines next to motorways utilising wind draft force from cars moving at high speed, collecting the air pushed away as they travel.

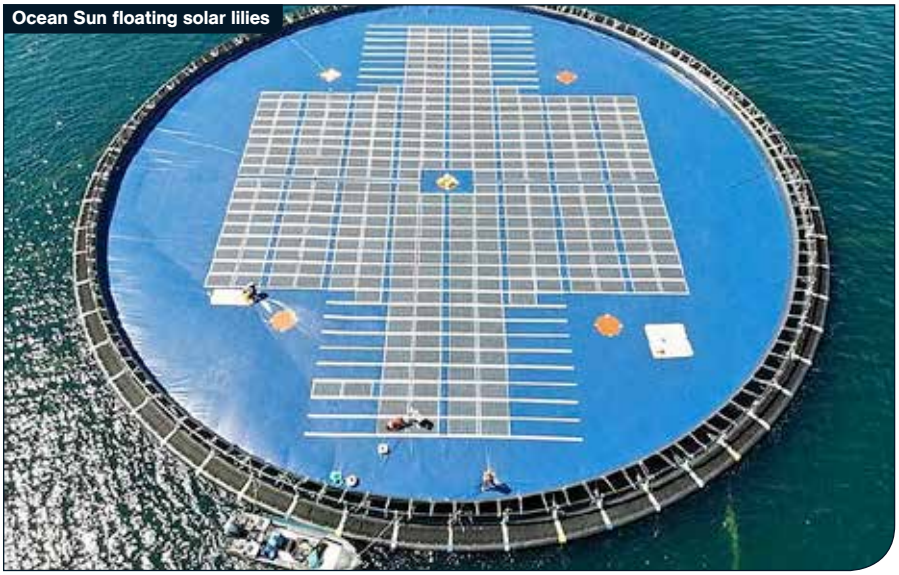
Opposing this and far more concealed in nature, the first shaft hydropower plant has gone on stream in Germany this month, installed inside a river bed.

Developed at the Technical University of Munich, the new plant does not need to divert the course of the river but instead, is dug into the upstream of a weir. The water flows into a shaft with a turbine and generator, drives the turbine, and is then returned to the river under the weir, seamlessly integrated into the river's natural environment.


Orbital Marine Power

Meanwhile out at sea, renewable energy specialists are as always keen to get marine power working at large scale efficiency.

In the first *IJUnplugged* webinar with Chris Milne, chief financial officer of Orbital Marine Power, *IJGlobal* discussed the Scottish company's discrete 2MW unit, which can be placed under water, to generate energy from the ebbs and flows of the tide. One of its greatest strengths is that the submergible turbines can be raised above sea level for routine maintenance and repairs.


Ocean Sun floating solar lilies

"Now more than ever, we have an incredible opportunity to partner with clients, researchers and product developers to develop technologies that bring cleaner energy choices to residential consumers."

Dr Tej Gidda, GHD global future energy business leader

Meanwhile in the world of hydrogen, large-scale projects are being financed and built with government and private finance support. Even with significant electrolysers in project pipelines finally being realised, this has not slowed innovation in its scale and its power.

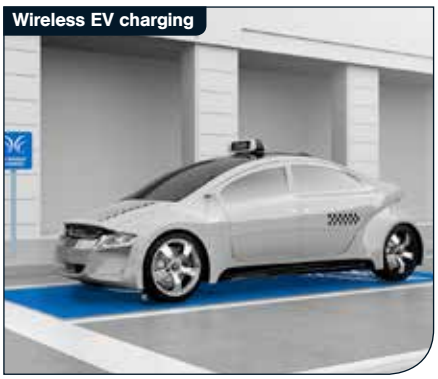
GHD is attempting to create a household hydrogen energy storage system – LAVO – to collect and purify rainwater, and use energy from household solar panels to produce a 60kWh battery, allowing self-sustaining household energy, independent from the grid.

In other cases, firms are incorporating hydrogen into construction infrastructure, long-haul trucks, vans and cars as well as in the latest Microsoft datacentres.

There has been an upsurge in pressure from the public to realise hydrogen fuel cells in cars and buses within cities, but electric vehicles are winning this battle even though they take considerably longer to charge… though significant technology improvements are being driven on this front.

Some researchers are looking to charge cars wirelessly. A team at Stanford University is building a system capable of efficiently transferring power instantly to a moving vehicle within arm's length using magnetic coils – expecting a product by 2022.

While discussing renewables, it is important to note that on the other end of the spectrum, technological advancements are still being deployed to increase the efficiency of fossil fuels. Flylogix and Cambridge Consultants, part of the Capgemini Group, are now using local drone piloting from centrally-controlled operations to increase the resilience of their services to offshore oil and gas installations and lower costs.


Wireless EV charging

Innovation has built a head of steam in recent years and the momentum behind these developments continues to impact the market on a seemingly daily basis, leveraging greater efficiency and lower costs. But with the race to fulfil ESG requirements and get renewable energy assets operational and competitive, farfetched technologies are now being taken seriously with large developers and financiers ready to deploy capital.

Top Trumps – wind turbines

R&D is leading the turbine manufacturer agenda, rolling out ever-larger units for a market that is not ready to deploy them. In such a fast-moving environment, it is only a matter of time before their efforts pay dividends, writes *IJGlobal* reporter **Elliot Hayes**

Research and development is leading the agenda for wind turbine manufacturers as they roll out ever-larger units for a market that is not quite ready to deploy them. However, in such a fast-moving environment where big is beautiful, it is only a matter of time before their efforts pay dividends.

While there will always be a role for the land-based turbines which tend to range in size from 1MW at the humble end of the scale to 7MW where planning permission can be achieved, the R&D efforts are being focused where the turbine manufacturers believe the market is shifting – offshore.

To this end, there is constant competition among the market leaders to roll out increasingly-large units with the biggest model commercially available at the time of going to press being the 14MW offering from Siemens Gamesa.

Size does not always matter when it comes to turbines, however. With the launch of bigger and more powerful turbines, it does not render its smaller counterparts obsolete.

Siemens Gamesa seems to have covered itself from all angles with a selection of turbines ranging from a 2.1MW unit straight up to its 14MW power house announced earlier this year. However, there are reasons to choose a smaller turbines. Pricing is what

first comes to mind and of course regulations surrounding the visibility of turbines from shore are also a big factor, not forgetting (in some cases) impact on military radars.

Granted, the more powerful the turbine the fewer the number of units the developer will need to install to achieve the total windfarm's required output, which is especially important when working offshore installing them on the seabed… not to mention the previously-agreed placement of units with the relevant planning department.

With the introduction of floating offshore wind and its apparent approval from the finance community, just how big turbines will get in the next few years is a matter for conjecture.

Lenders wring their hands at the notion of turbines growing beyond their comfort zone and suggest that it will be more challenging to lend against them, but the wind farm developers will hold their feet to the fire until they turn up at the table… and in no time at all their greatest concern will have become mainstream. And the worst case scenario is that the turbine manufacturers end up with plenty of promo shots for PR.

As for the special purpose vehicles forging ahead with offshore windfarms around the world as the sector becomes increasingly mature, there is a wide array of turbines available leaving developers spoilt for choice.

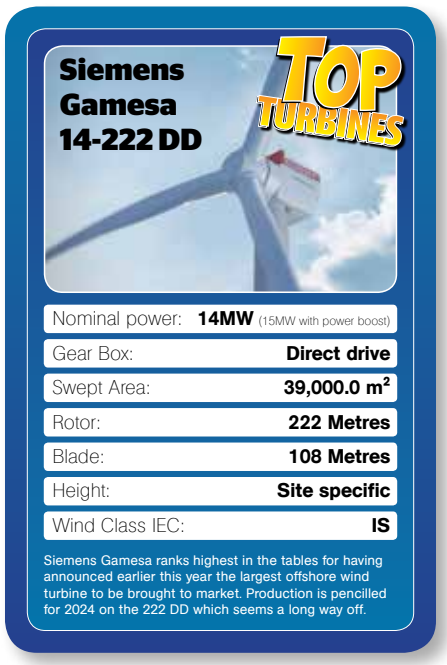
Big is bountiful

Siemens Gamesa ranks highest in the tables for having announced earlier this year the largest offshore wind turbine to be brought to market. Production is pencilled for 2024 on the 222 DD which seems a long way off, however with wind farm developments being extensive it will not be long before developers come knocking.

"We've gone bigger for the better… The new SG 14-222 DD is a global product which allows all of us to take giant steps towards protecting and preserving our planet."

Markus Tacke, chief executive of Siemens Gamesa Renewable Energy

Siemens Gamesa is seeking to have a Danish test site up and running for this model by 2021. Markus Tacke – chief executive of Siemens Gamesa Renewable Energy – says of this new model: "We've gone bigger for the better… The new SG 14-222 DD is a global product which allows all of us to take giant steps towards protecting and preserving our planet.



"We ourselves became carbon neutral in late 2019 and are on track towards meeting our long-term ambition of net-zero CO2 emissions by 2050. Our installed fleet of over 100GW both offshore and onshore abates more than 260 million tons of CO2 emissions annually."

General Electric announced the launch of its GE Haliade-X turbine in 2018 and installed its first test unit in Rotterdam the following year. The team is working to obtain its Type Certificate and this should be completed in 2020.

Ørsted has already signed with GE to use the turbine on two US windfarms – the 120MW Skipjack in Maryland and the 1.1GW Ocean Wind in New Jersey – that will be commissioned in 2022 and 2024, respectively.

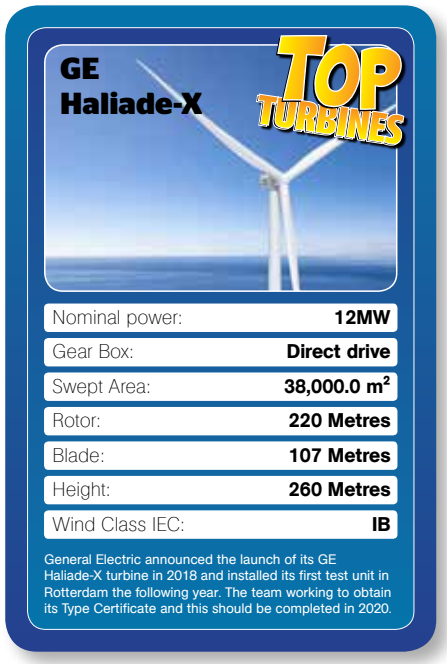
At the launch of this model, John Lavelle – chief executive of offshore wind at GE Renewable Energy – said: "This is a very important milestone for us as it confirms the robustness of our Haliade-X 12MW design, and gives certainty to our current and future customers who believe in the attributes of our platform.

"When we introduced the Haliade-X 12MW we established a new paradigm in the industry, and we will continue to do so by innovating, improving, and introducing new features to our Haliade-X platform, making offshore wind a more affordable and competitive source of renewable energy."

For MHI Vestas, the popular V164-9.5MW has been regularly upgraded. It was originally called the V164-7.0MW when first launched in 2014, the output was then increased to 8MW and later to 9MW. With an upgrade to a 10MW unit also currently available, it was the first wind turbine to achieve double digit power.

"This is a very important milestone for us as it confirms the robustness of our Haliade-X 12MW design, and gives certainty to our current and future customers who believe in the attributes of our platform."

John Lavelle – chief executive of offshore wind at GE Renewable Energy



MHI Vestas chief technology officer Torben Hvid Larsen said: "At MHI Vestas, we are focused not on what others are doing but being the best at what we do. The V164 – 10MW turbine in the best proof point yet that we do not accept limitations of conventional thinking and that we think beyond ourselves. We have embraced the challenge of transforming what is possible in our field".

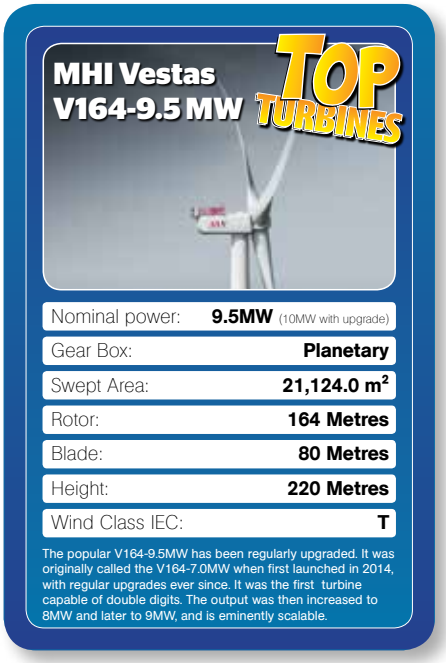
MHI Vestas has signed a deal with SSE for its 1.1GW Seagreen wind farm and also

with Engie and EDPR for its 30MW floating wind farm.

The upgrade was achieved through a small design change to enhance airflow and increase cooling in the converter.

"At MHI Vestas, we are focused not on what others are doing but being the best at what we do. The V164 – 10MW turbine in the best proof point yet that we do not accept limitations of conventional thinking."

Torben Hvid Larsen – chief technology officer at MHI Vestas



China

Looking towards China, and the army of wind turbines that is appearing along the coast line, it is on track to become a large market for turbine manufacturers. However, Chinese specialists have been working to develop some of the largest turbines on the market.

Over the course of the last three to four years, a time of rampant M&A movement on greenfield projects in European seas, Chinese companies have been aggressively outbidding European rivals to own stakes in big projects to learn the technology to bring it back to China.

The process started in 2016 when State Development and Investment Corp (SDIC) bought Repsol out of its stakes in the Beatrice and Inchcape offshore wind farms in the UK.

China Three Gorgers quickly followed suit and in the same year bought an 80% stake in Germany's 288MW Meerwind offshore wind farm for €1.7 billion. The following year after a call from the Beijing government to go global on offshore wind, China Resources National bought a 30% stake in the Dudgeon wind farm in Scotland for £803 million.

China Three Gorges then went on to buy a 10% stake in the 950MW Moray East Wind Farm (Scotland) paying £35 million for a minority stake in 2018… and this is when blockades on Chinese investments into European wind cropped up.

At around this time, China opted to evolve its own offshore wind market. Designed for sites off the south-east coast, Goldwind installed its first 8MW turbine on the Xinghua Bay II offshore wind farm in April 2020.

The Chinese turbine manufacturer says the Goldwind GW175 8MW is the latest generation of large-capacity offshore wind turbines with fully-independent intellectual property. It is designed to house all electrical equipment in the nacelle and is typhoon adapted. The manufacturer has also been creeping up on its competitors as it claims it will deliver turbines of more than 15GW in 2020.

A spokesperson for Goldwind told *IJGlobal* that "With more than 60+ gigawatts and 34,000 permanent magnet direct-drive wind turbines installed worldwide, Goldwind's 8MW offshore turbine further demonstrates the power and breadth of this technology in a myriad of complex wind applications. Based off of Goldwind's 6MW offshore machine with 80% universal component parts, this latest and the largest turbine produced by Goldwind is a laddering development that maximizes technical continuity, reliability and performance".

China Dongfang Electric's 10MW turbine is China's first independently-made double-digit turbine. A prototype was installed on the same wind farm as the Goldwind GW175 8MW in July 2020 and then connected to the grid the following month. Once the prototype passes test and verification, it will be ready to go to market with the developer claiming it can make up to 100 units per annum. The turbine is typhoon resistant and features a permanent magnetic direct drive system and carbon fibre blades.

Yu Peigen, general manager of Dongfang Electric Group, stated that: "The roll-out of the 10MW unit has made the leap forward and large-scale development of the wind power industry from onshore to offshore possible, and has also laid a solid foundation for Dongfang Electric Group to become stronger, better and bigger."

As with all renewable energy technology, R&D is forging ahead at full speed with innovations being brought out to increase output on existing models with the primary goal to reduce the number of models deployed for maximum generating capacity. As new markets open up to the potential of offshore wind and floating models become widely accepted, there is no reason to believe individual units will not be able to create a great deal more that 15MW… in time.

Seagreen Offshore Wind Farm UK

The drawn-out debt raising of the 60% merchant Seagreen offshore wind farm reveals an off kilter future of what kind of financing fully merchant wind financing will require in the future. *IJGlobal* reporter **Sophie Mellor** explores.

The recent debt raise and sell down of the 1.1GW Seagreen offshore wind project was remarkably different from the droves of UK offshore wind farms that preceded it.

Not only did it reach financial close between the 2 peaks of Covid-19 cases in the UK in early June 2020, only 42% of the energy generated at the wind farms was awarded subsidies from the UK government.

As a result of this uncertainty, the debt-to-equity was skewed to be heavily ECA-backed with bank debt only covering the secured contracted revenue and equity footing 58% of the bill.

In the end, the project to be built in Scottish waters in the outer Firth of Forth and Firth of Tay reached financial close concurrently selling down 51% of the equity to French oil major Total.

A brief history

Seagreen was previously owned by Fluor and SSE and first given consent from Marine Scotland to build the wind farm in 2014. Two years later, in 2016, it was among the 2.3GW of Scottish offshore projects in development that lost planning permission as the Scottish courts ruled they presented a risk to wildlife.

However, a legal challenge brought by the Royal Society for the Protection of Birds was appealed in August 2016 and overturned in July 2017.

SSE then opted to exercise its pre-emption right in September 2018 to take full ownership of the 1.5GW Seagreen Alpha and Bravo offshore wind projects from Fluor for £118 million.

Just before the sale, SSE and Fluor submitted plans to Marine Scotland for the project to reduce the number of turbines under the new plan from 150 to 120 – lowering its capacity from 1,500MW to 1,075MW.

CfD results

The third contract for difference (CfD) tender run by the UK's Department for Business, Energy and Industrial Strategy (BEIS) in September 2019 saw heavy competition in the offshore wind category.

With more than 10 bidders, SSE submitted Seagreen Alpha and Seagreen Bravo for state subsidy support and was awarded a £41.61/MWh strike price for 454MW of the first phase of its Seagreen offshore project. MUFG Bank advised on the bid.

With only 42% of the wind farm covered by subsidies, financing proved a challenge with many lenders who lent on previous UK offshore wind farms opting out of the project financing.

To secure future revenue, the sponsors signed a PPA to offtake another portion of the energy produced to reduce the volume sold on a merchant basis.

The revenues of the wind farm are:

- 42% – subsidised by the UK government
- 30% – PPA with SSE
- 28% – sold on the merchant market

With such a low strike price, it is possible the market-rate portion of the project could earn more than the subsidised portion, however, without a government contract, the project lacked the security to bring down overall costs and attract high bank leverage.

Additionally, as the deal was largely structured pre-Covid-19, merchant rates have since dropped to around £30/MWh.

As a result, the sponsors mitigated the risk using low gearing to cover only the subsidised output, providing lenders with more certain cash flow projections, while financing the remainder in equity.

Financing package

The £3 billion Seagreen offshore wind farm is being built with project financing at a 42:58 debt-to-equity ratio.

The £1.3 billion debt package included senior debt facilities provided by 12 banks, with ECAs providing covered facilities to lenders in respect of exports from Norway and Denmark, along with a mezzanine tranche of financing. The lending banks are understood to include:

- AIB
- ABN Amro
- Bank of China
- Barclays
- CaixaBank
- Helaba
- Lloyds
- MUFG
- NatWest
- Rabobank
- Santander
- SMBC

The bank debt has a 19-year tenor. It consists of a £159.5 million generation term loan, a £43.8 million generation revolving credit facility, a £401 million transmission term loan, a £114.67 transmission revolving credit facility, and a £237.7 million ancillary facility.

There were also 2 ECAs providing covered facilities guaranteeing lenders Barclays, CaixaBank, Lloyds Group, NatWest, Santander and SMBC on further packages:

- EKF – £304 million
- GIEK – NKr1.6 billion ($172m / £136m)

Lastly, there was a £220 million, 22-year long-term mezzanine financing raised to further leverage the plant with MUFG placing the bond with German institutional investors.

Equity costs

European energy companies have increasingly looked to oil majors to capitalize on the global energy transition with their scale and skill to finance multi-billion-dollar offshore projects.

As a result, French oil and gas giant Total seemed the right fit to acquire a 51% stake in Seagreen for £70 million with earn-outs up to £60 million, subject to attaining performance conditions.

Total's equity investment is £900 million, which it will finance with 70% debt.

The 51% stake in the wind farm includes an equivalent stake in a potential extension at the site of up to 360MW.

SSE, on the other hand, has already invested £250 million into Seagreen which will be released through the project financing. Its future equity investment is estimated at £850 million – £50 million of which is being deployed in 2020. SSE is also understood to be financing its equity portion through debt financing.

The margins for the lending on the equity and debt portions have been arranged at the same rate.

The site

Seagreen is sited 27km from the Scottish coast and will have a 1.075GW capacity and generate 5,000GWh of electricity annually. It has secured all necessary major permits and onshore construction began in Q1 (2020), to reach operations in 2023.

SSE will lead development and construction of the asset, as well as provide O&M services once operational.

The wind farm will have 114x 10MW MHI Vestas V164 turbines. Seaway 7 has been selected to install the inter-array cables and foundations. Petrofac was previously chosen to install the substations and Nexan was to manufacture and install export cables.

Advisers

Sponsor advisory team

- MUFG – financial adviser for debt financing
- Jefferies – financial for equity sell down
- Linklaters – legal for financing and equity sell down
- Mott MacDonald – technical
- Benatar & Co – insurance
- BDO – model audit

Lender advisory team:

- Norton Rose Fulbright – legal (and to Total on equity acquisition)
- EIG Global Energy Partners – financial on mezz tranche

MLAs - VALUE

Rank May 2020 - August 2020	**Company**	**Deal Value** (USDm) May 2020 - August 2020
1	BNP Paribas	1018
2	Mizuho Financial Group	789
3	Credit Agricole Group	594
4	Societe Generale	572
5	Groupe BPCE	542
6	Morgan Stanley	479
7	Sumitomo Mitsui Financial Group	442
8	UniCredit	437
9	Mitsubishi UFJ Financial Group	395
10	Credit Suisse	369
11	OCBC Bank	342
12	Sumitomo Mitsui Trust Holdings	260
13	DBS Bank	253
14	Standard Chartered Bank	180
15	ING Group	176
16	Citigroup	156
17	Nomura	149
=	National Bank of Canada	149
19	CIT Group	102
20	BancoEstado	100

FINANCIAL ADVISERS - VALUE

Rank May 2020 - August 2020	**Company**	**Deal Value** (USDm) May 2020 - August 2020
1	Royal Bank of Canada	2,542
2	Houlihan Lokey	1,686
3	Whitehall & Company	1,300
4	Mizuho Financial Group	1,183
5	Sumitomo Mitsui Financial Group	1,140
=	Alderbrook	1,140
=	Cranmore Partners	1,140
8	Macquarie	692
9	EY	558
10	Barclays	154
11	Scotiabank	152
12	Leucadia National Corporation	110
13	Planum Partners	30

LEGAL ADVISERS - VALUE

Rank May 2020 - August 2020	**Company**	**Deal Value** (USDm) May 2020 - August 2020
1	Hunton Andrews Kurth	13,040
2	Latham & Watkins	5,370
3	Morgan Lewis & Bockius	4,409
4	Sidley Austin	3,800
5	Clifford Chance	3,468
6	Milbank	3,140
7	Emmet Marvin & Martin	3,100
8	Bracewell	2,200
9	Jones Day	2,050
10	Mishcon de Reya	2,000
11	Debevoise & Plimpton	1,831
12	Vinson & Elkins	1,686
13	Shearman & Sterling	1,660
14	Norton Rose Fulbright	1,538
15	Aleman Cordero Galindo & Lee	1,535
=	Arifa	1,535
17	Herbert Smith Freehills	1,440
18	Simpson Thacher & Bartlett	1,350
19	Baker McKenzie	1,335
20	Saul Ewing Arnstein & Lehr	1,300

SPONSOR - VALUE

Rank May 2020 - August 2020	**Company**	**Deal Value** (USDm) May 2020 - August 2020
1	Engie	3,542
2	Nextera Energy	3,490
3	AES Corporation	3,260
4	E.ON	2,170
5	NiSource Inc	2,000
=	Air Products and Chemicals	2,000
7	Ontario Power Generation	1,963
8	Dominion Questar Gas	1,800
=	Duke Energy	1,800
10	Xcel Energy	1,569
11	Entergy Corporation	1,370
12	Exelon Corporation	1,300
=	Global Infrastructure Partners	1,300
14	American Electric Power	1,200
15	TenneT	1,139
16	PPL Corporation	1,037
17	EIG Global Energy Partners	988
18	Carlyle Group	843
19	Eurogrid	809
20	Empresas Públicas de Medellín	750

MLAs - VALUE

Rank May 2020 - August 2020	**Company**	**Deal Value** (USDm) May 2020 - August 2020
1	Rabobank	1,743
2	Societe Generale	1,427
3	BNP Paribas	1,351
4	Credit Agricole Group	1,339
5	Santander	1,304
6	Sumitomo Mitsui Financial Group	952
7	CaixaBank	904
8	Mitsubishi UFJ Financial Group	754
9	AMP	670
10	HSBC	545
11	ING Group	544
12	Royal Bank of Scotland	512
13	Groupe BPCE	472
14	Mizuho Financial Group	448
15	KfW	442
16	NordLB	420
17	Citigroup	412
18	Banco Sabadell	383
19	CoBank	374
20	BayernLB	351

FINANCIAL ADVISERS - VALUE

Rank May 2020 - August 2020	**Company**	**Deal Value** (USDm) May 2020 - August 2020
1	Mitsubishi UFJ Financial Group	3,867
2	BNP Paribas	2,795
3	Green Giraffe	1,790
4	Santander	1,786
5	Evercore Partners	1,728
6	Macquarie	1,060
7	EY	838
8	CohnReznick	704
9	IN.Credible World	607
10	Plan A Capital	603
11	Riverside Risk Advisors	558
12	Bank of America	533
13	CCA Group	521
14	Operis	467
15	BBVA	431
=	Chatham Financial	431
17	International Finance Corporation	414
=	UniCredit	414
19	Astris Finance	410
20	Scotiabank	403

LEGAL ADVISERS - VALUE

Rank May 2020 - August 2020	**Company**	**Deal Value** (USDm) July 2020 - August 2020
1	Clifford Chance	8,618
2	Norton Rose Fulbright	5,330
3	Linklaters	5,137
4	Latham & Watkins	4,250
5	Ashurst	3,800
6	Milbank	3,373
7	Watson Farley & Williams	2,444
8	Allen & Overy	2,325
9	Shearman & Sterling	2,304
10	White & Case	2,214
11	DLA Piper	2,137
12	Mayer Brown	2,013
13	Aleman Cordero Galindo & Lee	1,535
=	Arifa	1,535
15	Garrigues	1,390
16	Herbert Smith Freehills	1,303
17	Cuatrecasas	1,235
18	Jones Day	1,061
=	Loyens & Loeff	1,061
20	Wilson Sonsini Goodrich & Rosati	1,030

SPONSOR - VALUE

Rank May 2020 - August 2020	**Company**	**Deal Value** (USDm) May 2020 - August 2020
1	Equinor	3,361
2	AES Corporation	3,281
3	SSE	2,172
4	Total	2,144
5	KKR & Co	1,357
6	Enercon	1,231
7	TenneT	1,139
8	Calpine	1,100
9	EDF	1,093
10	Iberdrola Group	902
11	JP Morgan	847
12	WPD	847
13	SoftBank	816
14	Gulf Energy	815
15	Eurogrid	809
16	Canada Pension Plan Investment Board	735
17	sPower	704
18	Mainstream Renewable Power	644
19	Windparke Zeewolde BV	607
20	Boralex	603

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Contact your local representative for more info:

Americas
Alex Siegel
+212.224.3465 ▪ Alexander.siegel@ijglobal.com

Latin America
Albert Negron
+646.940.0940 ▪ albert.negron@ijglobal.com

EMEA & Asia
Doug Roberts
+44.20.7779.8546 ▪ doug.roberts@ijglobal.com

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