

OFFSHORE CHANNEL

WORLD TREND & TECHNOLOGY

FOR OFFSHORE ENERGY SECTOR

**Offshore
Renewable
Energy**

- Wind Energy
- Wave Energy
- Tidal Energy
- Solar Energy

Jul & Aug 2023



Farshid Ebrahimi
Responsible Director

Offshore renewable energy consists of many different sources that are abundant, natural and clean, like Wind, Wave, Tidal and Solar. Unlike traditional fossil fuels, this energy will never run out. Renewable energy is essential for reducing the potentially devastating effects of climate change, and protecting the natural environment for future generations. Offshore renewable energy includes offshore wind, wave, tide and solar, where the strength of the wind, the pull and rise and fall of the tides, and the movement of waves, produces a vast amount of power that can be harnessed by modern technology.

The energy of the oceans can be harnessed by modern technologies without emitting any greenhouse gases, making offshore renewable energy a potential cornerstone

of the clean energy transition all around the world.

Offshore Channel Magazine reports on innovative engineering projects around the world, profiling the key players making a difference to the engineering profession. It's our flagship publication and our main channel for keeping our members up to date on what's happening at the offshore industry.

Offshore Channel Magazine is the flagship publication of the international Society of Professional Engineers. Published six times per year, Offshore Channel Magazine covers news and commentary on professional issues: licensing, engineering ethics, employment, legislative and regulatory issues, education, and many others that have a direct impact on professional engineers.

**DEME**Dredging, Environmental
& Marine Engineering

FIRST JACKET FOUNDATION IN AT ZHONG NENG OFFSHORE WIND FARM

Green Jade, the first Taiwan-built offshore wind installation vessel, operated by CSBC-DEME Wind Engineering (CDWE), has installed the first jacket foundation at the 298 MW Zhong Neng offshore wind farm.

The 298 MW Zhong Neng offshore wind farm is being built some 13 kilometres off Changhua County on the west coast of Taiwan by a joint venture between Copenhagen Infrastructure Partners (CIP) and China Steel Corporation (CSC), who contracted CDWE for the transportation and installation of the 31 jacket foundations and the accompanying pin piles.





THE OFFSHORE SUBSTATION AT GODE WIND 3 OFFSHORE WIND FARM WAS SUCCESSFULLY INSTALLED 30 KM OFF THE ISLAND OF NORDERNEY

Here, all the energy produced by the 23 wind turbines will be collected and converted.

Gode Wind 3 will have a capacity of 253 MW, and together with Borkum Riffgrund 3, which is also under construction, it will be able to supply the equivalent of 1.2 million German households with green power.

The 1st floating wind turbine of the PARC EOLIEN OFFSHORE DE PROVENCE GRAND LARGE (PGL project) was towed from the Port of Marseille-Fos to the installation site at sea, more than 17 km from the coast.

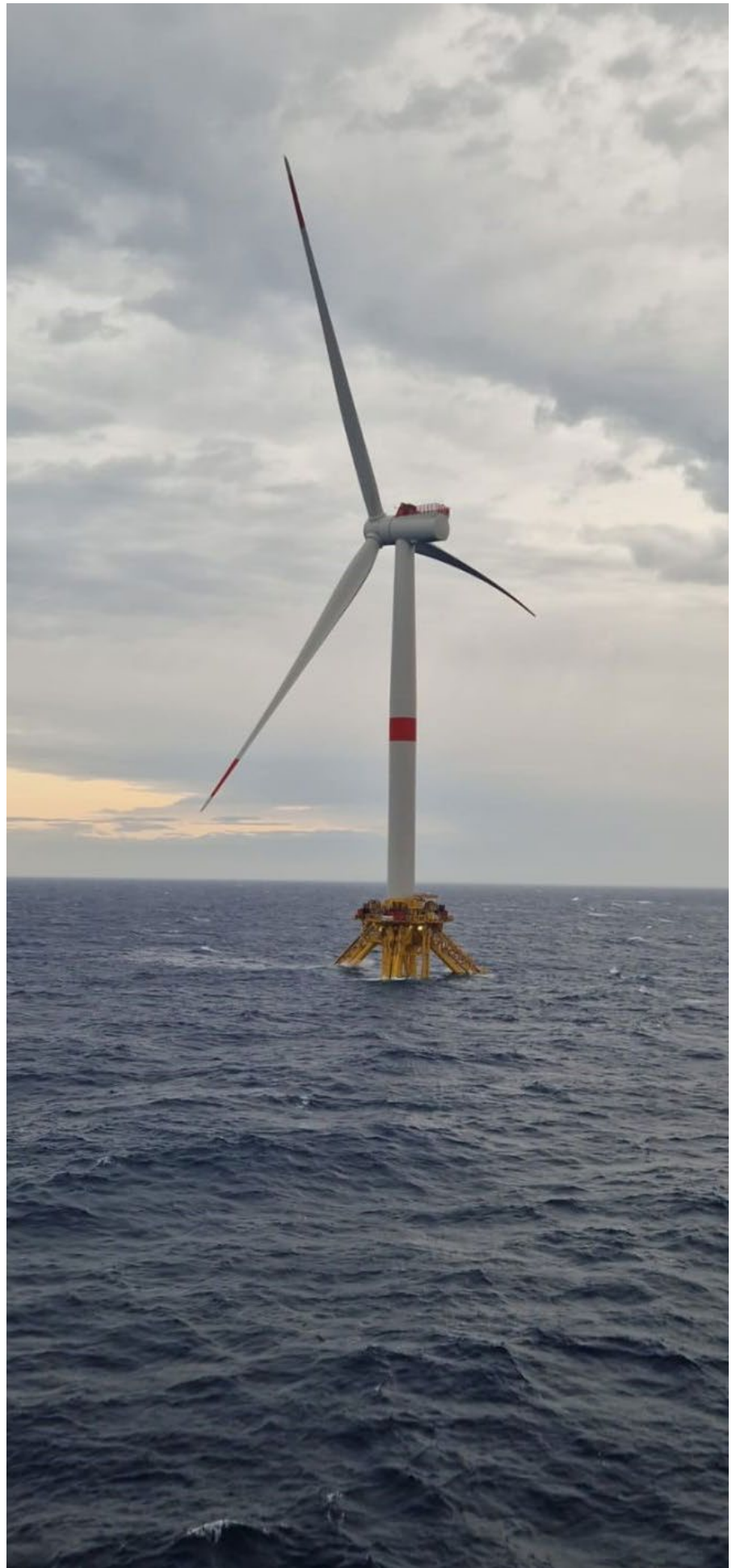
Two more wind turbines will join it shortly. Boluda Towing (France) is actively participating in this project, for port towing as well as for ocean towing and assistance to the offshore installation. SBM Offshore / Franck Delmas / EDF Renouvelables



FIRST PROVENCE GRAND LARGE FLOATING WIND TURBINE STANDS OFFSHORE FRANCE

The first Siemens Gamesa 8 MW floating wind turbine has been installed at the Provence Grand Large offshore wind farm site off the coast of Port-Saint-Louis-du-Rhône in France.

After assembling the turbine and its float, the first Provence Grand Large wind turbine left Quai Graveleau in Fos-sur-Mer to be towed 17 km from the coast to its installation site.





KONGSBERG

Successful project delivery in South Korea! Hyundai Frontier, loaded with Kongsberg Maritime technology, completed its inaugural wind turbine installation near Jeju Island.

The vessel is a 14k ton self-propelled jack-up wind turbine installation and is first of its kind operating in South Korea.

Despite pandemic challenges, our team's dedication and K-Pos DP system led to a job well done, delivering the product before schedule. We are very proud of the teamwork, trust, and effective communication that made it possible.

BARGE WITH SPECIALLY DESIGNED BARGE MASTER TECHNOLOGY SET SAIL WITH VINEYARD WIND'S FIRST TURBINE

On 6 September, the first GE Haliade-X wind turbine generator for the 800 MW Vineyard Wind offshore wind farm left the New Bedford Marine Commerce Terminal towards its location more than 30 miles off the coast of Cape Cod. The barge on which the turbine is transported is using specially designed technology by Dutch company Barge Master.

Foss Maritime, a US service contractor that provides union jobs for its employees, has partnered with DEME Offshore US to design and build highly specialized US-flagged barges to transport the components to the lease area. The Marmac in New Bedford, Mass., and the Foss Prevailing Wind in Boston, both 400-feet-long, are the only two barges in existence capable of transporting in an upright position GE's massive Haliade-X turbine components that when constructed will rise more than 700 feet.

Barge Master technology

The barges utilize a specially designed Barge Master technology that uses a patented control system and cylinders

that support a platform and actively compensate the motions of the barge. The wind turbine components are fastened to the motion compensated platform for a smooth ride in ocean conditions.

"It may look easy, but the safe transportation of these components miles over the open water is no small feat," said Vineyard Wind CEO Klaus S. Moeller. "While we've had many firsts, once this turbine is installed, it will stand as a proud symbol of American's energy transition. I want to thank all of our partners for their continued collaboration and look forward to celebrating the progress of our industry."

GE will initially load the U.S.-flagged Marmac from the New Bedford Marine Commerce Terminal with three vertically placed tower sections reaching more than 200 feet in height, three 321-foot-long blades and a nacelle pod that houses the generating components. Foss will deliver loads weighing more than 1,700 tons each, to construction partner DEME Group's Sea Installer vessel with 300-foot-deep legs stationed 65 miles from New Bedford south of Martha's Vineyard.







Principle Power

PRINCIPLE POWER EXPANDS WINDFLOAT® PRODUCT PORTFOLIO, LAUNCHES WINDFLOAT

WindFloat F - the new patented, flat panel, pontoon-based solution from Principle Power - extends the floating pioneer's 4th generation WindFloat® portfolio, marking a new era of industrialization and global expansion.

Emeryville, California - Floating wind industry leader Principle Power has expanded its WindFloat product portfolio to two fully industrialized products: the existing WindFloat tubular design – now called WindFloat T – and the new flat panel, pontoon-based solution, known as the WindFloat F.

Leveraging 12 years of operational experience, both WindFloat products are market ready, suitable for the next generation of offshore wind turbines, and will play an integral role in the company's wider industrialization vision for floating wind.

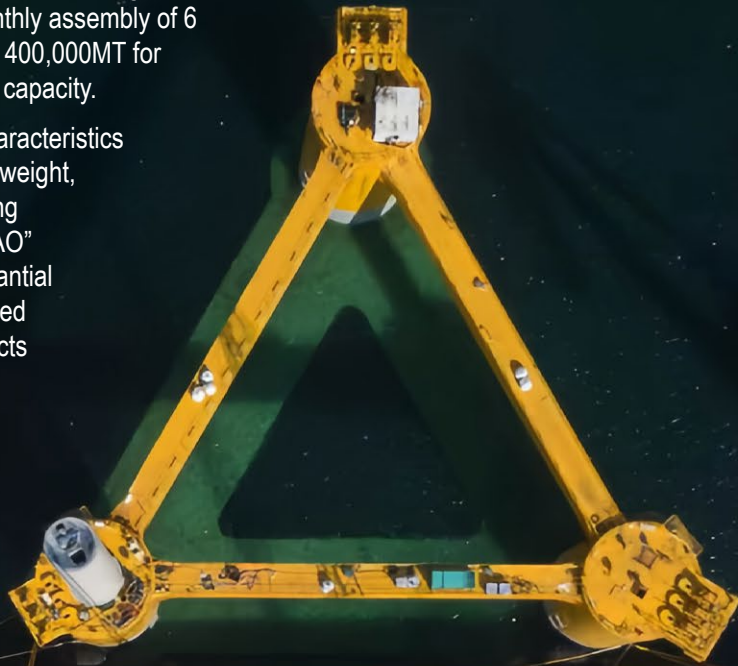
This is a major milestone in the history of Principle Power. We have taken the bankable, proven, and reliable WindFloat tubular design and leveraged many of its characteristics to develop a patented new design, the WindFloat F. Whether it's the WindFloat T or the new WindFloat F, we will work with customers to select the right WindFloat for their projects.

Julian Arrillaga Costa — CEO

FIRST FLOATING WIND PROJECT, FUYAO, DEMONSTRATES CAPABILITIES

CNOOD-Wenchong Heavy Industries (CWHI) specialises in the large scale manufacturing of fixed and floating wind foundations produced via its seven strategically located fabrication yards spanning a total area of 3,294,000 sqm. We are well positioned to meet the growing global demand for floating wind foundations from our Dongguan and Longxue manufacturing facilities with a current monthly assembly of 6 sets and an annual fabrication capacity of 400,000MT for subsections with plans to further increase capacity.

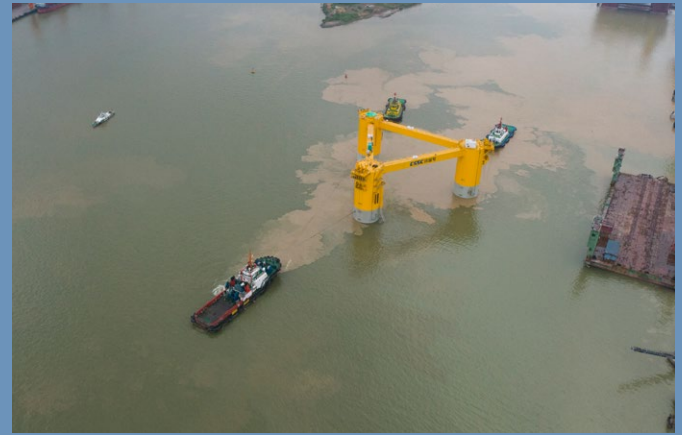
Floating wind foundations have similar characteristics to fixed foundations: large volume, heavy weight, complex structures with high manufacturing difficulty. During construction of the "FUYAO" floating platform, we harnessed our substantial shipbuilding heritage and experience gained in the manufacturing of wind power products combined with advanced manufacturing technologies.



Aerial view of "FUYAO"



Commemoration Ceremony



"FUYAO" departs Dongguan Yard prior to installation

Installed at an average water depth of 60 meters, "FUYAO" was China's first deep water floating wind power project and is equipped with a CSSC 6.2MW Anti-Typhoon Type I Wind Turbine. The unit's tower height reaches 78 meters, the central height of the hub is 96 meters and, with a 152 meter diameter of the wind whistle, was the largest floating wind turbine in China. The floating unit has a total length of 71.96 meters, 33 meter depth, 80 meter width and weighs 3,351 tons.

CNOOD-Wenchong Heavy Industries Co., Ltd (CWHI), headquartered in Guangzhou, Guangdong Province, China, is a world leading solution provider specialising in large scale manufacturing for offshore structures, renewable energy, oil

and gas applications, infrastructure and mining. CWHI is a subsidiary company of Guangzhou Wenchong Shipyard Heavy Industry (GWSHI), itself part of China State Shipbuilding Corporation (CSSC).

With over 40 years of experience, CWHI has an extensive track record supplying complex projects globally for the energy sector. CWHI's core business sectors include: Large scale structural fabrication, engineering, resources integration, supply chain management, project management, global logistics and financing. We are Ahead for Energy, proudly contributing to the world's transition towards sustainable energy.



Integration of the Tower



MITSUI O.S.K. LINES, LTD. INVESTS IN TOUCHWIND BV AND BECOMES SHAREHOLDER

Japanese shipping company Mitsui O.S.K. Lines, Ltd. (MOL) is going to invest in Dutch floating wind technology developer TouchWind BV and will obtain a minority share in the company.

With a financial investment, field testing of TouchWind's tilting angled one-piece rotor floating wind turbine can be expanded as well as new research into positive wake effects.

Ryota Hayashi, General Manager responsible for Wind Power Projects Unit in MOL states: 'We are pleased that we can continue the journey with TouchWind and have become a shareholder of the company as we see exciting potential in their technology'.

Founder and CEO of TouchWind, Rikus van de Klippe welcomes MOL as shareholder in TouchWind: 'We have been working together for over a year now on the further development of our floating wind turbine. Field testing with a 6m diameter rotor is in full preparation at the Oostvoorne lake in the Netherlands. With MOL as a shareholder and their investments we can speed up our testing programme, prove our technology and reduce time to market'.



R ROLL GROUP

ROLL GROUP & HEBETEC ENGINEERING INTRODUCE PATENTED OFFSHORE FLOATING WIND FOUNDATION LOAD-OUT SOLUTION

Strategic partners Roll Group & Hebetec Engineering AG announced their shared patented solution for offshore floating wind foundation load-outs during the SPE Offshore exhibition in Aberdeen.

This solution was developed to provide efficient and cost-effective solutions to logistical challenges of large and heavy offshore wind farm components. Roll Group and Hebetec Engineering AG engineering have a strategic corporation agreement which focuses on the global demand for renewable and civil construction solutions.

FoWeLo, as the solution is called, uses innovative equipment and technology to tackle a very real and current challenge: the high costs and high dependency for loading out offshore floating wind foundations.

The patented FoWeLo system was developed to solve two critical industry challenges: the high cost and port logistics constraints of launching floating offshore wind foundations. The system offers a robust design using existing hydraulic equipment and temporary steel structures. It is designed to be fully containerized, with no restrictions due to tidal effects,

which simplifies mobilization and ensures low CO2 emissions by using seawater as a counterweight.

“We definitely believe that the FoWeLo system is an innovative solution for an industry that faces high transportation costs. As floating offshore foundations are the only option for offshore wind in many countries, we have a role to play and aim to develop innovative technical solutions. The FoWeLo system is a price competitive option and will increase the load out speed of the foundations” says Steven Dunnewijk, CEO Hebetec Engineering AG.

Roll Group CEO Peter Rondhuis adds: We are delighted that we have designed the FoWeLo system in cooperation with our partner Hebetec Engineering AG. Within this strategic alliance, we have complementary skills and competences that lead to a great synergy between both companies. The FoWeLo solution uses existing gantry, mooring and ballasting equipment from Roll Group, whereas the strandjacks and APS skidding equipment are provided by Hebetec Engineering AG. This – together with our combined engineering skills and market know how – makes us the perfect partners for this invention.”





TUGDOCK

TUGDOCK SIGNS MEMORANDUM OF UNDERSTANDING WITH THE SALAMANDER FLOATING OFFSHORE WIND FARM

Tugdock has signed a Memorandum of Understanding with Salamander floating offshore wind farm to collaborate on innovation for floating offshore wind energy in Scotland.

Salamander Offshore Wind is a joint venture development project between Simply Blue Group, Ørsted and Subsea7 and will be located offshore from Peterhead in North-East Scotland. Salamander Offshore Wind has signed an exclusivity agreement as part of Crown Estate Scotland's Innovation and Targeted Oil and Gas (INTOG) leasing round.

Tugdock is a fast-growing company based in Cornwall UK. The Tugdock technology consists of a modular road transportable space frame with the use of patented air lift bags that are filled and then vented using compressed air. By confining the air lift bags into a space frame configuration and deck arrangement, their product can be used as additional buoyancy modules or submersible platforms.

This technology enables floating offshore wind turbine substructures to be built or assembled and the turbines integrated in ports with water depth or space restrictions. It is a lighter, shallow drafted, quicker, and more cost-effective alternative to a steel hulled barge or floating dock.

Salamander Offshore Wind has engaged with Tugdock to discuss opportunities to collaborate in research and innovation related to the development of technologies and supply chain

for floating wind energy in Scotland.

Shane Carr, CEO of Tugdock says: "The objectives of this exciting collaboration are for Salamander Offshore Wind and Tugdock to jointly develop innovative knowledge and technologies to accelerate the development of floating wind energy. This is currently a fast-evolving industry around the world. We are delighted to have agreed this forward-looking collaboration and we are confident that it will lead to significant progress."

Tom Brown, Innovation and Interface Manager of Salamander Offshore Wind says: "Tugdock is a highly innovative young company and we are looking forward to working closely with them to explore the applications of their technology."

Lucas Lowe-Houghton, Director of Business Growth at Tugdock, adds: "Floating offshore wind will be vital in achieving the UK's mission to achieve net zero. Proactive collaboration between companies will help the industry to meet the challenges and unlock its full potential."

In recent months, Tugdock has also announced partnerships with Sarens, the global leader in crane rental and heavy lifting, and with Crowley, a US-based supply chain solutions company serving the offshore wind sector, exploring floating offshore wind in locations, such as the US West Coast.

INNOVATIVE IN-LINE MOORING BUOYANCY SOLUTION FOR FLOATING WIND AND SURF SECTORS

Specialising in buoyancy, protection and insulation solutions, Aberdeen-based Balmoral has a long and proven track record of successful buoyancy installations around the world.

A comprehensive range of 'off-the-shelf' products are deployed across a number of applications, from simple location markers to short term installation/deployment aids, while specialised mooring buoy arrangements bring unique characteristics and advantages to the floating wind and SURF markets.

Balmoral's in-line mooring buoyancy system is designed to secure floating wind turbines and other structures to a seabed anchor whilst providing uplift to the mooring line. It can also act as a connection point between the bottom and top sections of the line while allowing trajectory and tension to be controlled within the water column.

Traditional mooring systems feature a pendulum fixture using a tri-plate and buoyancy module secured via a padeye at the base of the steelwork which gives an offset centre of buoyancy.

Balmoral's engineers identified the biggest vulnerability of this system was fatigue failure due to the offset loads so, to mitigate against this and change the load transfer characteristics, developed a proprietary in-line mooring buoy.

The company's in-line system features a dynamic connection interface that allows the different sections of the mooring lines to be tethered securely and responsively without adversely loading the buoyancy structure.

Central steelwork passing through the dynamic connection, with buoyancy elements mounted on either side, results in the key interface between components being at the centre of the assembly.

This brings a number of unique advantages that include movement minimisation, buoyancy load transfer isolation, fatigue reduction and a distinctly more stable solution for floating wind turbines, FPSOs and other subsea tether connections.

The company's engineering manager, Craig Sharp, said: "Our robust design process considers the combination of material characteristics and associated design controls, derived from detailed analysis, which allows us to supply the most cost effective and fit for purpose solution.

"Our in-line mooring solutions are designed in accordance with all relevant industry standards while we have also worked hand-in-hand with clients to deliver their third party approved designs across a number of projects.

"As they are provided in modular fashion our mooring buoyancy systems can be configured to suit specific project uplift requirements."

In-line mooring buoyancy benefits

- Lower number of components and connections
- Increased reliability with fewer potential failure points
- Reduced risk of wear
- Decreased dynamic loads on mooring points compared to traditional pendant line connection
- Improved fatigue life characteristics
- Easier handling with lift points acting through the centre of mass eliminating unwanted bending loads
- Enhanced access to mooring connections for inspection during service life



**EEW
GROUP**

FIRST MONOPILES FOR COASTAL VIRGINIA OFFSHORE WIND FARM LEAVE EEW SPC

On September 21, the first eight monopiles for the Dominion Energy Coastal Virginia Offshore Wind Project were loaded at the Rostock quayside. In preparation for RoRo loading, the monopiles were lifted into the transport cradle using the Strand Jack system. Now aboard the carrier deck, the foundations are on their way to Portsmouth Marine Terminal in Portsmouth, Va., USA, where they will arrive in approximately 2 1/2 weeks.

In total, EEW SPC will produce 176 monopile foundations that are up to 83 meters long, weigh 1,538 tons and have a diameter up to 9.5 meters. The largest offshore wind project in the USA to date is expected to provide clean, renewable electricity for up to 660,000 homes once construction is complete in 2026.

NAVANTIA AND WINDAR LOAD OUT THEIR FIRST BATCH OF MORAY WEST MONOPILES

The joint venture between Navantia Senergies and Windar Renovables has loaded out the first XXL monopiles for the Scottish Moray West offshore wind farm.

For the joint venture, which the developer Ocean Winds contracted to deliver 14 out of the total of 60 wind turbine monopiles, these are the first monopiles that were manufactured at their new plant in Fene, A Coruña, Spain.



Boskalis

SHORT STOPOVER IN THE NETHERLANDS FOR OUR BOKALIFT2

Three months after the Bokalift 2 left Rotterdam for the installation of XXL monopiles along the east coast of the United States, our newest crane vessel returned to the Netherlands. During this stopover she will be prepared for her next project: installing XXL monopiles and offshore substations for the Moray West offshore wind farm in Scotland. To reach the port of Amsterdam, our Bokalift 2 sailed through the IJmuiden sea lock, the largest sea lock in the world that was opened last year and to which Boskalis contributed in multiple ways. With our trailing suction hopper dredgers Strandway and Shoalway, we carried out dredging work for the new lock and our colleagues from Boskalis' Inshore and Nearshore Diving Services team executed preparatory work for pouring 30,000 cubic meters of underwater concrete. Last but not least, one of our heavy transport vessels transported three steel lock doors weighing around 2,900 tons each.





ULSTEIN VERFT SIGNS NEW SHIPBUILDING CONTRACT ON A CABLE LAYING VESSEL FOR NEXANS

On 19 September 2023, Nexans Marine Operations AS and Ulstein Verft entered into a contract on the construction of a large DP3 cable laying vessel.

The vessel, an ST-297 CLV design by Skipsteknisk, is an updated version of the Nexans Aurora, delivered in 2021.

We awarded the contract for a new vessel to Ulstein after an extensive tendering process, where Ulstein's track record, including the delivery of Nexans Aurora, was important factors in deciding on the shipyard Ulstein Verft yet again. We are looking forward to working with Ulstein for this new exciting project,

says Pascal Radue, Nexans EVP Generation & Transmission.

Ulstein is excited to see Nexans return to Ulstein Verft for the construction of a new cable laying vessel. In 2021, we delivered the Nexans Aurora on time despite the challenges we faced with handling the Covid pandemic. This adds to our long history of delivering vessels to the agreed quality and time. We look forward to continuing our close collaboration with Nexans and are very pleased that Nexans again trusts Ulstein Verft with the new addition to its fleet,

states Ulstein Group's CEO, Cathrine Kristiseter Marti.

The new vessel is based on the Nexans Aurora design, as developed by Skipsteknisk, which is now playing an important role in Nexans' turn-key supply of advanced subsea high voltage systems to support the electrification of the world,

including providing vital connections between countries and regions, offshore renewable solutions as well as electrification solutions for other offshore installations.

The vessel is specially designed to carry out the transport and laying of various types of subsea cables, including cable bundles as well as recovery and repair. It can perform effectively even in challenging weather conditions and boasts exceptional manoeuvrability and station-keeping capabilities. Ulstein Verft is responsible for the vessel's construction and the preparation of its topside equipment.

This cutting-edge cable laying vessel features a split turntable on deck capable of holding up to 10,000t of cable, an under-deck turntable with a 3,500t cable capacity, and a fibre optic basket holding 450t. The vessel measures 31 metres in width, 149.9 metres in length, and is accommodated for a crew of 90.

We are experienced in constructing large and complex vessels and we look forward to commencing the work on the cable laying vessel for Nexans,

says Lars Lühr Olsen, managing director at Ulstein Verft.

FÉCAMP OFFSHORE WIND PROJECT

Enbridge and its partner EDF Renouvelables are developing the Fécamp Offshore Wind Project off France's northwest coast, not far from Dieppe.

The 497-megawatt (MW) wind project will feature 71 Siemens Gamesa Renewable Energy 7 MW turbines to be manufactured in France. The project will generate electricity equivalent to the power needs of more than 416,000 homes.

Turbines will be located between 13 and 22 kilometres off Fécamp's coast, at depths around 30 metres, and deployed in an area of about 60 square km.

Enbridge has a 17.9% ownership stake in the Fécamp Offshore Wind Project, which is expected to enter operation in 2023.

Photo: Dougie Cecil



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The newbuilt Seaway Alfa Lift at the SIF terminal at the Maasvlakte, captured during one of our recent photoflights.

www.flyingfocus.nl



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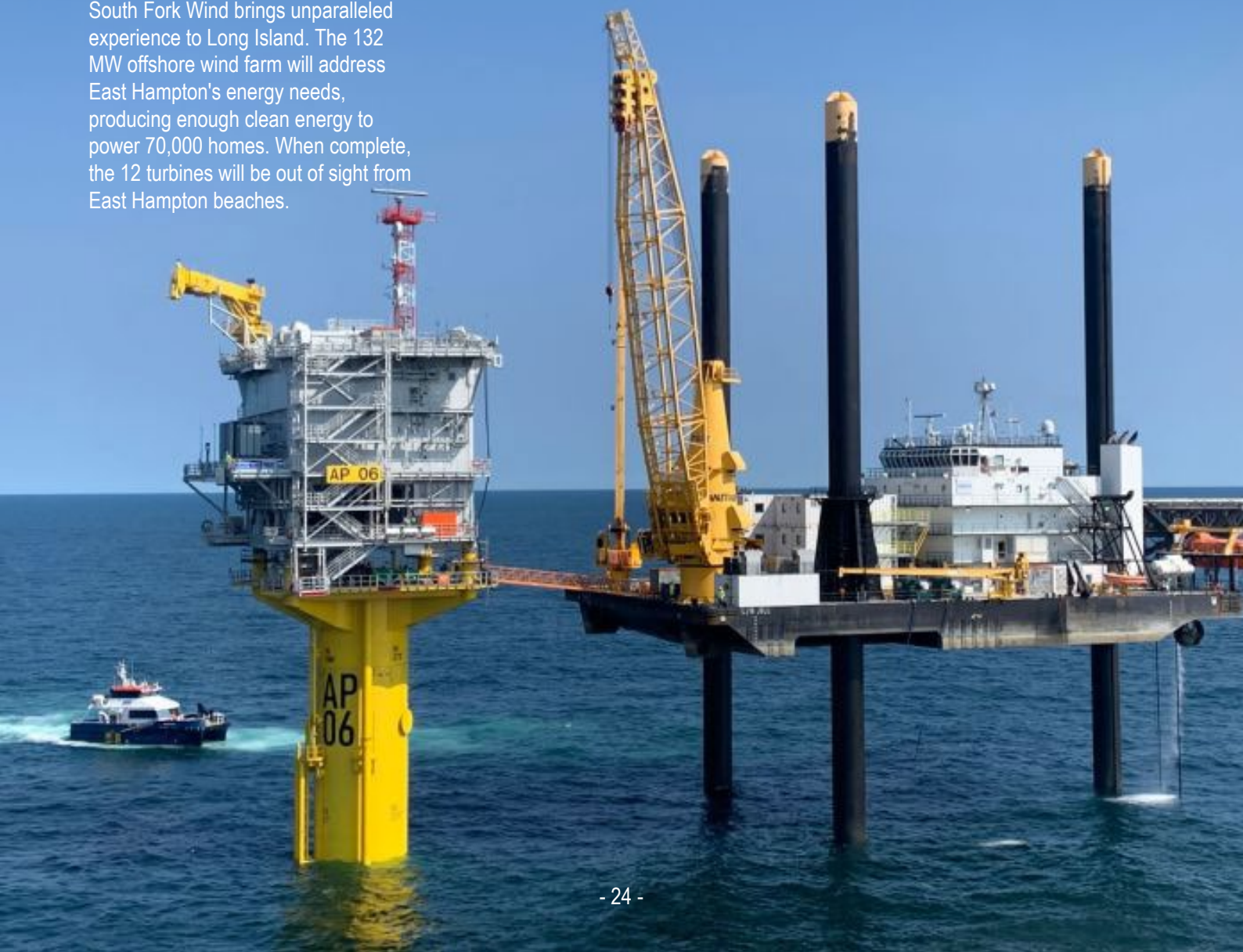
A UK FIRST! The Hybrid CTV, HST MILLIE is IMO Tier 3 compliant with SCR's (Selective Catalytic Reduction) to reduce NOX & SOX.

She was designed by Chartwell Marine Ltd for High Speed Transfers Ltd and is now completing final sea trials ahead of her handover.



THE WINDSERVE ODYSSEY APPROACHING THE OFFSHORE SUBSTATION & L/B JILL AT ØRSTED & EVERSOURCE'S SOUTH FORK WIND FARM

South Fork Wind brings unparalleled experience to Long Island. The 132 MW offshore wind farm will address East Hampton's energy needs, producing enough clean energy to power 70,000 homes. When complete, the 12 turbines will be out of sight from East Hampton beaches.





MAMMOET PTC210-DS
Giant Ring Crane

Photo: Jelco Stouthandel





AN IMPORTANT SITE ACCEPTANCE TEST (SAT) TOOK PLACE AT THE PREMISES OF SK OCEANPLANT IN SOUTH KOREA

The Eager.one team was awarded the design and supply of a remotely operated Jacket Lifting Tool for South Korean offshore wind specialist SK Oceanplant.

This remotely operated Jacket Lifting Tool will be used for upcoming offshore wind projects in Asia. It will be able to handle up to 2500t jackets from the yard onto transport vessels. The HMPE (High Modulus Polyethylene) rigging design is engineered for two types of lifts; Floating inshore lifts with a sheerleg containing 4 hooks and for lifting with a land based Gantry Crane with 3 hooks, which is required for fabrication purposes (to lift the top section on the lower section).





COMBiLiFT
LIFTING INNOVATION

COMBILIFT LAUNCHES COMBI- LC, FOR WIND TURBINE BLADES AND TOWER TRANSPORT

Ireland's Combilift has moved into the offshore wind energy sector with the launch of a product designed to meet the load handling demands of large-scale offshore wind manufacturers.

The Combi-LC, designed in collaboration with Siemens Gamesa, allows for the movement of wind turbine blades and towers – some as long as 115 m and weighing in at around 70 tonnes, through production stages and on to storage locations. The patent-pending design is based on two fully customisable remote-control units with low-level chassis beds that can work in tandem master and slave operation, with dimensions and wheel configurations that vary according to load type and weight.

Siemens Gamesa has signed a multi-million dollar order for a number of Combi-LC units and Combilift said that it is in active discussions with other manufacturers with similar demands.



RED7 MARINE COMPLETES THE UK'S FIRST INSTALLATION OF ARTIFICIAL NESTING STRUCTURES FOR THE OFFSHORE WIND INDUSTRY

Red7Marine has recently completed the installation of three nearshore artificial nesting structures along the East Coast of England on behalf of Ørsted, the global leader in offshore wind. The structures are required as a part of the Development Consent Order for the Hornsea 3 Offshore Windfarm as an ecological compensation measure for a vulnerable seabird species– the Black-legged kittiwake (*Rissa tridactyla*).

Red7Marine has been involved with the project since August 2022 managing the fabrication and installation process, working with Ørsted and its designers. Two of the artificial nesting structures (ANS) are located approximately 1km from the shoreline of South Beach, Lowestoft, and the third is 1.4 km from the shoreline of the RSPB Minsmere Nature Reserve.

This nearshore artificial nesting structure project is the first of its kind. Each structure is purpose-built, bespoke, and specific to the landscape characteristics of each location. The structures also present an educational opportunity, allowing researchers to better understand kittiwake. The structures comprise of a monopile foundation and internal grouted jacket, each monopile weighs in excess of 30t and has an embedded depth below seabed of 30m. The upper pile sleeve is fitted with two vertical steel tubes for vessel berthing and the final component is the topside nesting structure.

Jochem Tacx
Cesare Meinardi

An aerial photograph of a large offshore supply vessel, likely a jack-up vessel, with a prominent red lattice crane extending from the deck. The vessel is positioned on a deep blue sea. The image is oriented vertically on the left side of the cover.

BUILDING AN OFFSHORE WIND FARM

OPERATIONAL GUIDE

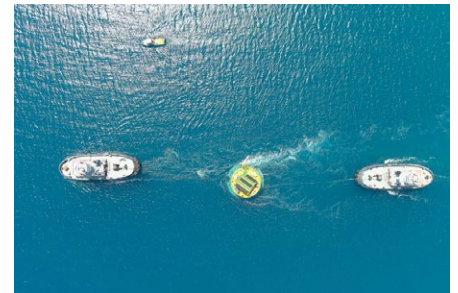
Second edition



Fraunhofer
IFAM

POTENTIAL OF DRONES OFFSHORE DRONES

Wind turbines offshore have plenty of advantages, but maintaining them is challenging. So-called offshore drones can relieve the burden of impassable work such as maintenance, inspection, repair or surveying. They have been specially developed for these difficult conditions. With the "Offshore Drone Campus Cuxhaven" (ODCC for short), Fraunhofer IFAM is creating a test and development infrastructure for unmanned aerial systems for offshore use. The aim is to provide industry and the economy with a long-term planning perspective and procedural security for the regular operation of offshore UAS.



MULTIMARINE SERVICES LTD ANNOUNCED THE CONSTRUCTION OF THE FLOATING ELECTRICAL HUB (FEH) FOR BOURBON FOR EOLMED, THE FLOATING OFFSHORE WIND FARM PROJECT DEVELOPED BY QAIR GROUP

The FEH will be installed in the wind farm off Gruissan and Port-la Nouvelle in France.

The fabrication was completed safely and within the timeframe at Multimarine's Fabrication Facilities in Limassol Port, Cyprus.

This is a major milestone for Multimarine where another fabrication project is successfully delivered to a multinational client. This project further enhances the reputation of Multimarine in delivering complex and specialized fabrication projects to the Energy and Renewable Industries. It also proves the strategic importance of Limassol Port and Cyprus in the regional and international offshore development projects.

Renos Phokas, Group CEO, comments "The offshore wind industry is a major emerging market globally and our vision is for Multimarine to play an important role in the fabrication deliverables. We are constantly working to become a leading contractor in renewable energy. The outcome of our first offshore wind project was extremely positive and we look forward for our participation in the renewable energy projects that we have in the pipeline".

STILLSTROM A/S AND NORTH STAR JOIN FORCES TO ACCELERATE VESSEL ELECTRIFICATION & OFFSHORE CHARGING IN THE OFFSHORE WIND INDUSTRY



Stillstrom, a leading provider of innovative offshore charging solutions, and North Star, the UK's leading offshore support services vessel operator, sign a Memorandum of Understanding (MoU) to accelerate the adoption of offshore charging and vessel electrification technologies for Service Operation Vessels (SOVs) in the offshore wind sector.

Under the terms of the MoU, Stillstrom will leverage its extensive experience in offshore charging infrastructure to demonstrate how Stillstrom's charging solutions can benefit the operations of North Star's growing SOV fleet. These solutions will enable the vessels to recharge their battery systems using wind energy while in the field.

"We are excited to partner with North Star on this important initiative," said Kristian Borum Jørgensen, CEO of Stillstrom. "By working collaboratively, we aim to demonstrate that by combining the latest advancements within offshore charging solutions and vessel electrification technologies for SOVs we are able to significantly decarbonize offshore wind operations while also delivering a compelling business case."

North Star, with its vast experience in offshore operations, will provide valuable insights into the vessel integration operations with the charging units. The company is committed to exploring innovative technologies and operational practices that support the offshore industry's transition towards cleaner and more sustainable operations.

Matthew Gordon, CEO of North Star, expressed enthusiasm for the collaboration, stating, "Working in concert with Stillstrom aligns with our commitment to minimizing the environmental impact of our operations. We look forward to working closely to explore and to implement advanced charging and electrification solutions that optimize our vessel performance while significantly reducing our carbon footprint."

The partnership between Stillstrom and North Star signifies a shared commitment to promoting sustainable and environmentally friendly practices within the offshore wind industry. By combining their expertise and resources, the two companies will promote hybrid and full-electric vessels and charging solutions to offshore wind developers, enabling decarbonized operations and improved efficiency.

verlume

TEST PROGRAMME SUCCESS FOR COLLABORATIVE RENEWABLE SUBSEA POWER PROJECT, EXTENSION SECURED

A collaborative renewable subsea power project has successfully completed its initial four-month test programme in the UK North Sea, proving that a subsea battery storage system can reliably power subsea equipment through being recharged by a wave energy device.

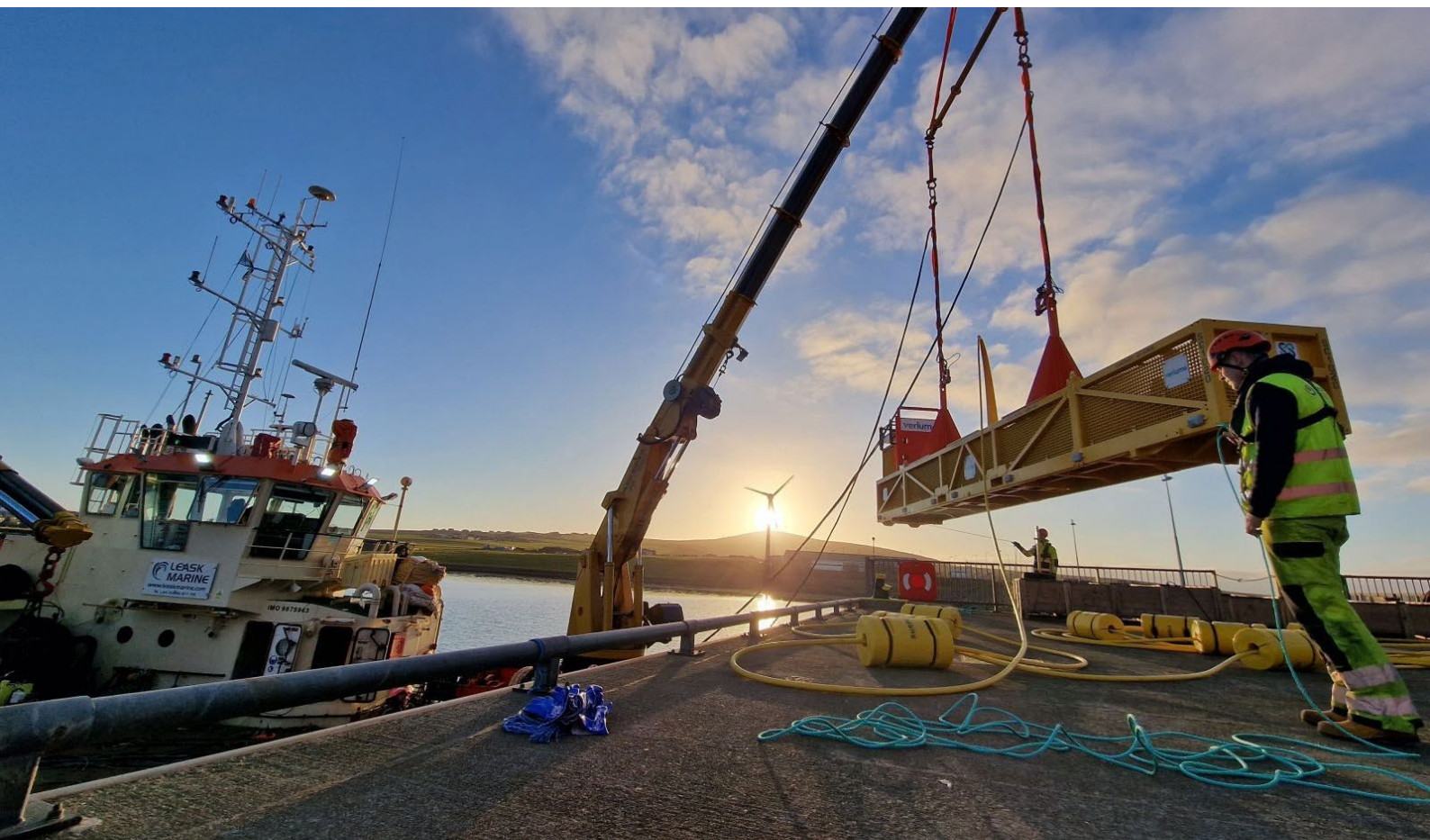
Deployed in the waters five kilometres off the East coast of Orkney, Scotland in February 2023, the Blue X wave energy converter – built by Edinburgh company Mocean Energy – was connected with a Halo underwater battery developed by Aberdeen intelligent energy management specialists Verlume in a ‘first-of-its-kind’ project.

The four-month RSP test programme was devised to prove the concept of using renewables to power subsea equipment, employing intelligent subsea battery storage to manage the inherent intermittency and deliver a continuous power output through the batteries.

A key objective of the project was to demonstrate that the system could provide power to subsea electronics modules, provided by Baker Hughes, simulating the control and communications needed for subsea well heads using 100% renewable energy.

In addition, tests were conducted using a resident autonomous underwater vehicle (AUV) provided by Transmark Subsea. This included having a docking station integrated onto the Halo system to create a charging point and a communications link to the surface via the Halo through the Blue X. The AUV was charged 50 times to show effective clean power delivery to underwater vehicles.

Following the success of these tests, showing an integrated alternative to subsea umbilical cables, the test programme has been extended. The technologies will remain in the water and will conduct additional testing deliverables until spring 2024, allowing for further industry-leading project data to be captured around maintainability, survivability and reliability.



OFFSHORE PHOTOGRAPHER

AN IMAGE CREATION SPECIALIST WITH THE NECESSARY CERTIFICATIONS TO ACCESS MARINE SITES, TO DOCUMENT THE ACTIVITIES OF THE OIL AND GAZ AND MARINE RENEWABLE ENERGY INDUSTRIES



A technician accesses a foundation / Saint Brieuc Windfarm -France – C.Beyssier

Christophe decided in 2022 to stop sailing. After 25 years commanding vessels such as harbour and coastal tugs, and having spent several years on the coast of Africa on anchor-handlers and supply vessels, he has decided to combine his 2 passions, associating the sea, the maritime industry & image.

As well as documenting your large-scale operations or the work of your teams, Christophe can help you with your communication projects. He has cameras in his bag, of course, drones, but also a fullformat camera with 4k quality.

He'll be with you for the long haul, providing you with photos,

aerial images and videos:

The images that will highlight your expertise !

To find your offshore photographer:

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Christophe Beyssier

Photographer – France

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www.visualprod-offshore.com

Whatsapp: +33(0)6 11 97 56 50

To work with me: cbeyssier.photography@gmail.com



HLC 295000

THE HEAVY LIFT GIANT



Illustration by: Christoph Kadur

LIEBHERR


RIDGEWAY

ROCK BAGS
 100% RECYCLED

INNOVATIVE SUBSEA ASSET PROTECTION

Introduced into the U.K. and Europe by Ridgeway and Sumitomo in 2009, We have been busy listening, learning and promoting the offshore applications and benefits of the Kwoya Filter Units or more commonly referred to by the offshore and marine markets as “Rockbags”.

Designed originally as an effective means of “filter layer” scour protection for subsea structures in dynamic seabeds and challenging velocities, the Kwoya Filter Unit Rockbag has evolved to become a significant technical product and proven a safe, 100% recycled clean engineering solution with various innovative options on size and product specifications.

The knowledge base and expertise learned from severe Japanese weather conditions has expanded the use of the Rockbags over many decades within civil engineering applications also marine infrastructure protection of cables, pipelines, and seabed correction. Patent protected for various applications (Patent Nos EP2341592, EP2348215 and EP2354535, the Rockbags, used in combination with other traditional methods of cable and scour protection, are adding value to the solutions toolkit of the marine contractors.

Ridgeway have been working in collaboration with clients to add value on providing tools for stability calculations, CFD, excessive performance testing and modelling also trusted environmental subsea performance during their lifetime and importantly safe decommissioning.



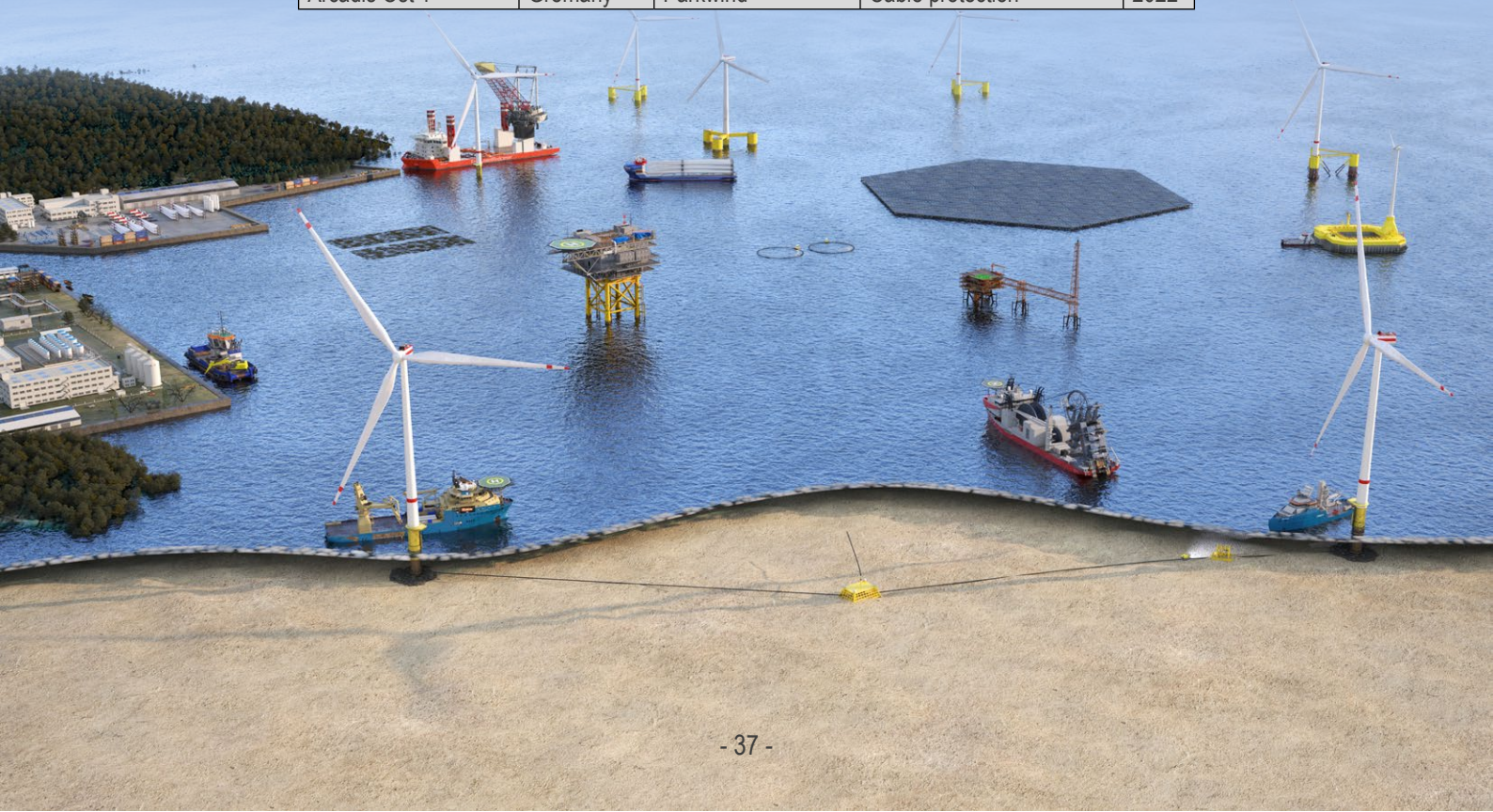
Once installed the filter unit Rockbags create their own mini ecosystem encouraging the regeneration of aquaculture environments, this aspect has become an important aspect for developers adding real value environmental engineering and sustainability in their subsea solutions.

In addition to this, Ridgeway have established a comprehensive geographical stock network of fast response capability for filled Rockbags under hook at ports throughout Europe utilising local labour and logistics.

Ridgeway have now a significant project track record for example flagship projects such as Teesside Offshore Wind Farm by EDF Energy Renewables. A world first in 2013 using Filter Unit Rockbags for scour protection on monopiles. It has also won contracts for works in Ireland at Arklow Bank, in Scotland at Beatrice, in England on Robin Rigg constructed by German provider E.ON, Gwynt y Môr wind farm in Wales (RWE Renewables UK) and other E.ON's schemes such as Humber Gateway and Rampion. For more information please visit: www.rockbags.com

RIDGEWAY

Offshore Wind Farm Project	Country	Owner	Protection	Year
Sherringham Shoal	UK	Equinor	Cable Underpinning	2010
Nordsee Ost	Germany	RWE	Jacket scour protection	2012
Arklow Bank	Ireland	GE Energy	J-tube cable support	2012
Teesside	UK	EDF	Monopile scour protection	2013
Westermost Rough	UK	Orsted	Cable protection	2014
Karehamn	Sweden	E.on	Cable protection	2014
Gwynt y Mor	UK	RWE	CPS Stabilisation	2014
Humber Gateway	UK	E.on	Cable protection	2014
Luchterduinen	Netherlands	ENCO	Freespan correction	2015
Dolwin 2	Germany	Tennet	Cable protection at OSS	2015
Dudgeon	UK	Equinor	Cable protection	2016
Wavehub	UK	Wavehub	Cable protection	2016
Egmond aan Zee	Netherlands	Shell	Freespan Correction	2016
Rampion	UK	E.on	Cable protection	2016
Robin Rigg	UK	E.on	Monopile scour protection	2016
North Wind	Belgium	Parkwind	Belmouth Stabilisation	2016
Race Bank	UK	Orsted	CPS Stabilisation	2017
Beatrice	UK	SSE	Bellmouth cable support	2018
East Anglia 1	UK	Scottish Power	Cable protection	2018
Kincardine Floating	UK	Pilot Offshore	Export cable support	2018
Formosa Phase 1	Taiwan	Orsted	Monopile scour protection	2019
Wind Float Atlantic	Portugal	Repsol/EDP/ENGIE	Cable route preparation	2019
Barrow	UK	Orsted	Cable stabilisation at OSS	2019
Yunlin	Taiwan	WPD	Monopile scour protection	2020
Hornsea 1	UK	Orsted	Cable protection/support	2021
Galloper	UK	RWE	CPS Stabilisation	2021
Saint Nazaire	France	EDF	Cable protection	2021
Hollandsee Kust Zuid	Netherlands	Vattenfall	Cable crossing protection	2022
St Brieuc	France	Iberdrola	Export cable protection	2022
Arcadis Ost 1	Germany	Parkwind	Cable protection	2022





SUBSEA ROBOTICS SERVICES

PETRODIVE GROUP PLANS TO DEVELOP ITS ROV CAPABILITIES

Dubai-based subsea services provider PETRODIVE has recently acquired 5 ROVs.

The acquisition of these ROVs adds to PETRODIVE's capacity to undertake the broadest range of ROV requirements from O&G and Maritime Contractors. This includes high-quality survey work, inspection, repair, and maintenance (IRM), and heavy intervention tooling down to 1,000 meters.

PETRODIVE Teams are experts in providing the most effective solutions that can prolong the life of subsea assets.

PETRODIVE invested \$5 million in its ROV fleet. The Company established its ROV Division in 2021, initially focusing on providing experienced personnel at all levels in observation and work class vehicles. It operates both in Africa and internationally.

It currently owns 3 ROVs with observation classes and 2 ROVs with work classes and is planning to acquire more ROVs in the future.

OBSERVATION CLASSES AND WORK CLASSES

ROVs are controlled by a ROV operator typically on a surface vessel, using a joystick like you would play a video game. A group of cables, or tethers, connects the ROV to the ship, sending electrical signals back and forth between the operator and the vehicle. They use external sensors that are mounted on the vehicle to measure things like conductivity, temperature, and depth.

Observation Class

PETRODIVE uses observation class ROVs to inspect infrastructure and the underwater area to help plan future projects for Oil and Gas Contractors. These ROVs are equipped with high-end cameras and lightweight sonar systems to avoid missing any small details like cracks. A manipulator (arms and hands) on one of these vehicles tends to be small with limited functionality (1-3 functions typically), and their thrusters can be either vectored or standard.

Work Class

PETRODIVE also uses Work class ROVs. They are used for ocean floor exploration, deep depths that divers cannot reach, and heavier construction tasks that take more time on the bottom than divers can spare. Due to their FO-equipped umbilicals, they can carry additional sensors and have multiple capabilities that allow for additional tools. Their sensor and sonar arrays can image large areas or provide minute details to specific structures. Most are equipped with a pair of manipulators—one for heavy lifting and grasping and the other with up to 7 individual functions that can be nearly as nimble as the human hand! The thrusters on these ROVs are vectored and very powerful, producing from 50 to over 200hp.

The Panther is a great alternative to heavier hydraulic vehicles, particularly where deck space is at a premium. These ROVs set the standard for electric light work class vehicles operating across a broad spectrum of subsea energy projects.



Dan-Bunkering



Our concept Turnkey Fuel Solutions is an end-to-end solution for large scale offshore wind projects. We have a professional team who will be there every step along the way; from the initial stage concerning budgets and planning to the installation of the last wind turbine and the beginning of the maintenance work.



Signing a cooperation agreement between SynergyXR and Fidar Offshore Animation for the development of VR&AR technology in the offshore renewable energy industry.

SynergyXR is a powerful cloud platform that lets companies train employees, deliver maintenance and offer remote support across all XR devices without having to write a single line of code.



CORPOWER OCEAN DEPLOYS C4 WAVE ENERGY CONVERTER



CorPower Ocean has successfully installed its first commercial scale WEC (Wave Energy Converter) in northern Portugal, as it accelerates towards making wave energy a bankable technology for mass deployment. The CorPower C4 device was launched in the port of Viana do Castelo, before being towed to the Aguçadoura site located 4km offshore.

After connecting to a pre-installed UMACK anchor on the seabed, the device was connected to the Portuguese national grid through a subsea export cable. The system will now undergo a commissioning program, with functions and operational modes being gradually verified. Operations and Maintenance (O&M) methods for offshore service access, device retrieval and tow-back to the on-land service base in Viana do Castelo will also be tested.

CorPower Ocean CEO Patrik Möller said: “This is a big milestone for CorPower Ocean and a very exciting chapter for marine energy. I am hugely proud of the entire CorPower Ocean team who have worked relentlessly to make this happen. The effort of the team and our partners to take us here is simply remarkable.”

The C4 previously completed a one-year dry test program with simulated wave loading in Stockholm, to tune and debug the system. It incorporates breakthrough technology to unleash the full potential of wave energy at utility-scale, including inherent storm protection for extreme conditions and phase control technology for amplified power capture in regular sea states.

CorPower Director of Integration & Testing Jean-Michel Chauvet said: “We are now entering an exciting phase

demonstrating our first commercial scale machine. This builds on 40 years of scientific research followed by a decade of structured engineering to deliver a step-change improvement to the performance and reliability of wave energy.”

One of the biggest challenges for the world to reach net-zero goals is to ensure there is clean energy available at all times, 24/7 each day of the year. With its consistent power profile, wave energy can take on the critical role to help stabilizing our energy systems – This is key to address climate change – and for the world to be able to leave fossil behind.

Having entered the final phase of a structured 5-stage product verification process, which began in 2012, CorPower Ocean aims to take its technology to a type certified bankable technology offering in the coming years.

The Hiwave-5 Project is funded by the Swedish Energy Agency and Portugal 2020 through AICEP Global (Norte2020) and CCDR-N. CorPower Ocean has also been financially supported by EIT InnoEnergy, the European Commission, Wave Energy Scotland, CoreSpring New Technology, ALMI Invest Greentech, SEB Greentech VC and additional private investors.

CorPower Ocean is receiving wide support from utilities and project developers engaging in efforts to bring wave energy technology to a bankable product offering, including EU-SCORES project partners ENEL Green Power, EDP and Simply Blue Group.


ENERGY TRANSITION: EU HAS SUPPORTED CREATION OF NEW PROTOTYPE OF WAVE POWER PLANT



Developed by the University of Applied Sciences Kiel (FH Kiel), the German Naval Yard and Thyssenkrupp Marine Systems, the prototype could be the first step towards electricity generation from wave energy at a larger scale. It could be used in offshore wind parks in addition to wind turbines. The contribution from the European Regional Development Fund to the project is 593.308€. The prototype was developed by apprentices in collaboration with the University of Applied Sciences (FH Kiel).



Ocean Power Technologies successfully deployed another PowerBuoy off the coast of New Jersey equipped with OPT's MDAS solution for on-water trials.



OCEAN POWER TECHNOLOGIES UNVEILS BREAKTHROUGH: WAM-V DEMONSTRATES REMOTE CONNECTION TO POWERBUOY® FOR ON-WATER CHARGING

Presentation at MARSEC West Event Highlights Successful Demonstration of Autonomous Vehicle's Ability to Attach to Wave Energy Converter PowerBuoy®

Ocean Power Technologies, Inc. ("OPT" or "the Company") (NYSE American: OPTT), a leader in innovative and cost-effective low-carbon marine power, data, and service solutions, is proud to announce a pivotal achievement in the field of autonomous maritime technology. During a presentation by OPT's VP of Global Sales and Marketing, Matt Burdyny, at the 10th Annual Maritime Security West (MARSEC West) event, OPT revealed a groundbreaking milestone: the successful demonstration of the Wave Adaptive Modular Vessel (WAM-V) attaching itself remotely to a buoy and establishing a connection that will enable charging.

This significant achievement was unveiled through a compelling video, captured during on-water trials conducted earlier this month. The video showcases the docking of the WAM-V to a buoy, exemplifying OPT's advanced autonomous capabilities. The successful connection that will enable charging represents a significant leap forward in the integration of renewable energy sources within the maritime industry.

"Our successful demonstration of a WAM-V remotely attaching itself to a buoy that will enable establishing a charging connection is a defining moment for OPT and the maritime technology sector as a whole," stated Matt Burdyny after the presentation. "This achievement underscores our commitment to reshaping autonomous maritime operations by leveraging renewable energy for sustainable charging solutions."

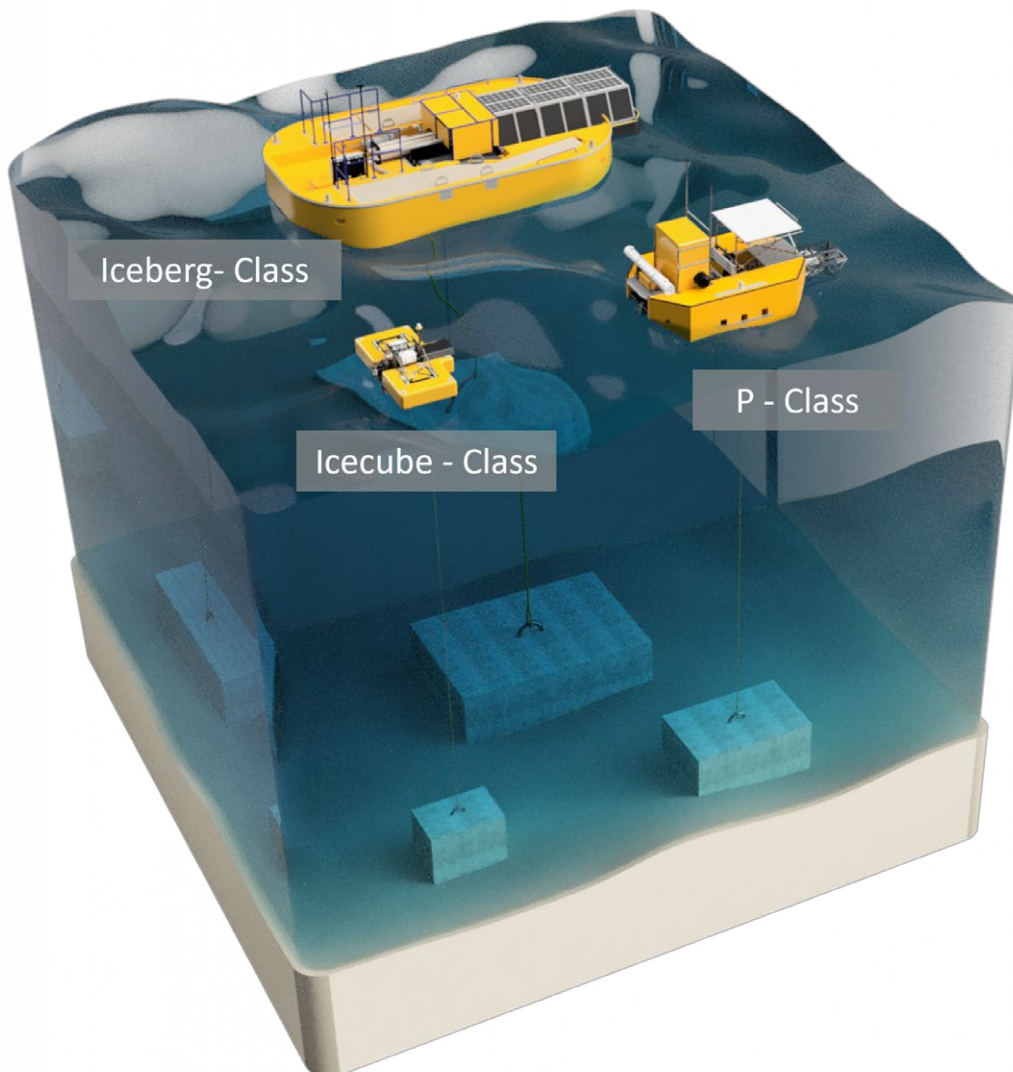
By showcasing the successful docking of the WAM-V on-water, OPT paves the way for a future where autonomous vessels can operate for extended durations, opening doors to various applications within the maritime domain.

Additionally, OPT's CEO, Philipp Stratmann, expressed his enthusiasm about the achievement, stating, "Our team's success in demonstrating remote docking that will enable charging capabilities is a testament to OPT's leadership in advancing maritime technology. This milestone propels us towards realizing a future where sustainable energy and autonomous operations integrate seamlessly."



**ONEKA TECHNOLOGIES
RECEIVES US\$3.4 M
FROM DOE'S POWERING
THE BLUE ECONOMY™
INITIATIVE**

In the relentless pursuit of a sustainable and cleaner future, technological advancements in renewable energy sources are crucial for mitigating climate change and reducing our carbon footprint. Oneka Technologies, a company using exclusively renewable energy from the waves to turn seawater into freshwater, has recently received a significant allocation of US\$3.4 M from DOE's Water Power Technologies Office's (WPTO) Powering the Blue Economy™ Initiative to further develop its Icecube project and marine energy subsystem solutions.



WAVE-POWERED DESALINATION INNOVATOR ONEKA TECHNOLOGIES SECURES A FIRST TRANCHE OF CA\$12.5M FOR ITS SERIES A FUNDING LED BY HOFFECKER AND PROMINENT IMPACT INVESTORS



September 20, 2023 — Oneka Technologies (“Oneka”) a leading provider of wave-powered desalination solutions, is proud to announce today the closing of its main Series A equity round of financing with CA\$12.5M investment led by the Hoffecker Family and other leading family offices, venture funds and private angel investors namely, Horizon Capital Holdings, AQC Capital, the Wilson Family, Propulia Capital and Invest Nova Scotia.

In the context of a more challenging fund-raising environment for startups, the closing of this round of financing represents a clear shift of investor interest for unique and credible climate tech solutions and a testimony to Oneka’s commercial readiness and proven alternative to the relatively more polluting and energy intensive conventional desalination industry offering.

“As an impact investor and philanthropist, we have been searching for innovative water solutions which could address at large scale the global and growing issue of water access. We have been won over by Dragan Tusic’s ambition and leadership, and the world-class team he has been able to assemble to position Oneka as a future leader in the sustainable desalination space.” said Ira and Matthias Hoffecker.

Considering the significant level of interest by the community of Impact investors, Oneka is leaving the round open until the end of the year and accepting up to CA\$10M of additional capital from accredited investors who could add value to our company beyond capital.

Dragan Tusic, Founder & CEO of Oneka : “My team and I are proud to welcome our new investors who share similar values and ambitions. This investment that enables us to have the means of our ambition is received with great responsibility and will effectively be put to use to accelerate our progress toward our mission.”

“We are looking forward to benefiting from our investors’ expertises and networks to generate positive social and environmental impacts alongside significant return for our shareholders.” said Alain-Olivier Desbois, Chief Finance & Impact Officer.

Taking into account the ability and capacity of Oneka’s team to deliver its acceleration plan, this additional injection of capital will support a faster deployment of its solutions to match the growing demand for desalination solutions in many regions around the globe.

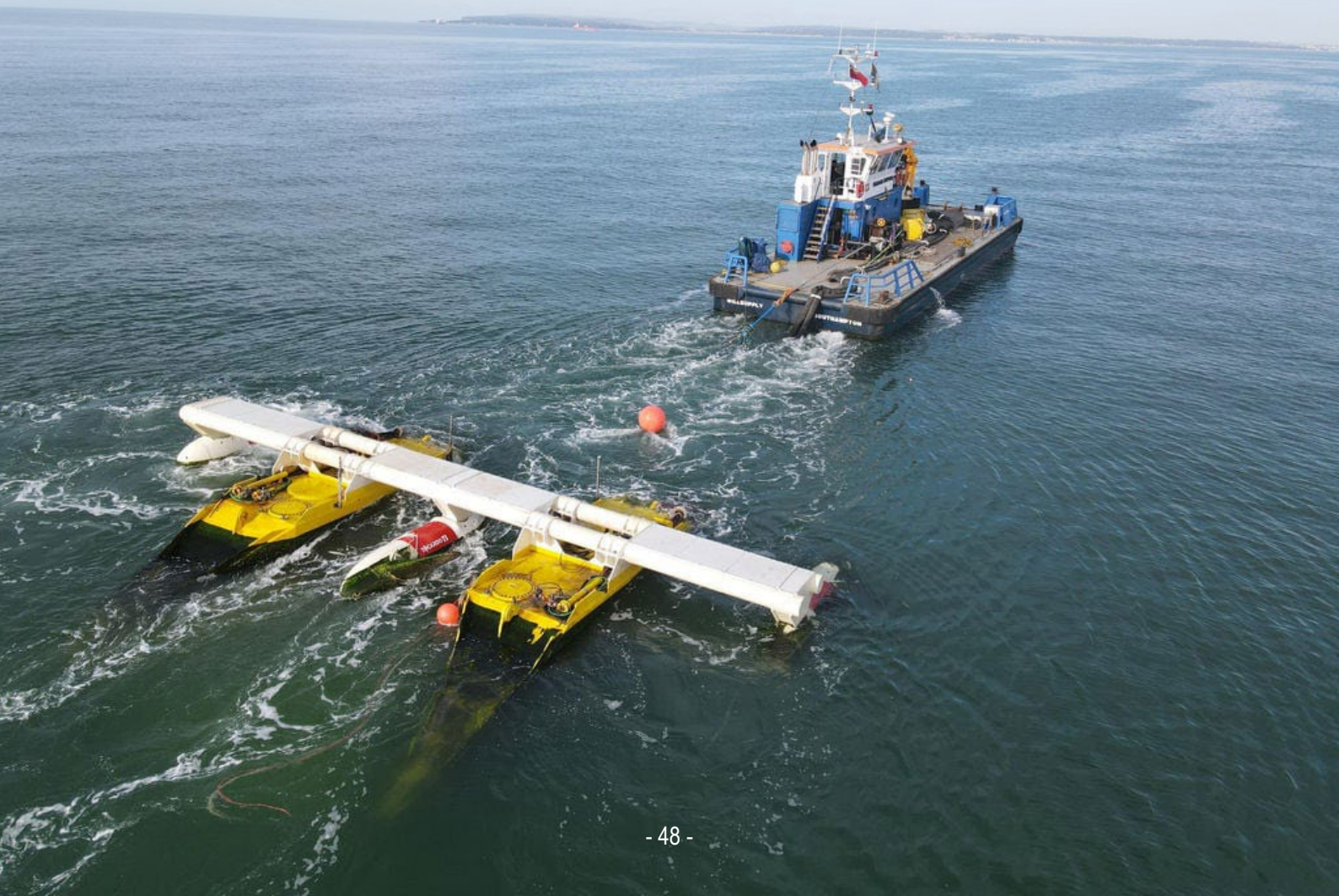
TIDAL ENERGY:
A RENEWABLE ENERGY SOURCE
ENTIRELY PREDICTABLE

MOR ENERGY & MAGALLANES RENOVABLES APPLAUD UK'S TIDAL ENERGY BOOST

"It's official, the tidal stream energy market has taken off with 11 companies awarded the contracts for difference," said MOR Energy, a QED Naval subsidiary company, which has been supported in the latest UK renewables auction round along with Spanish-based Magallanes Renovables which also welcomed this significant milestone for the entire tidal energy sector.

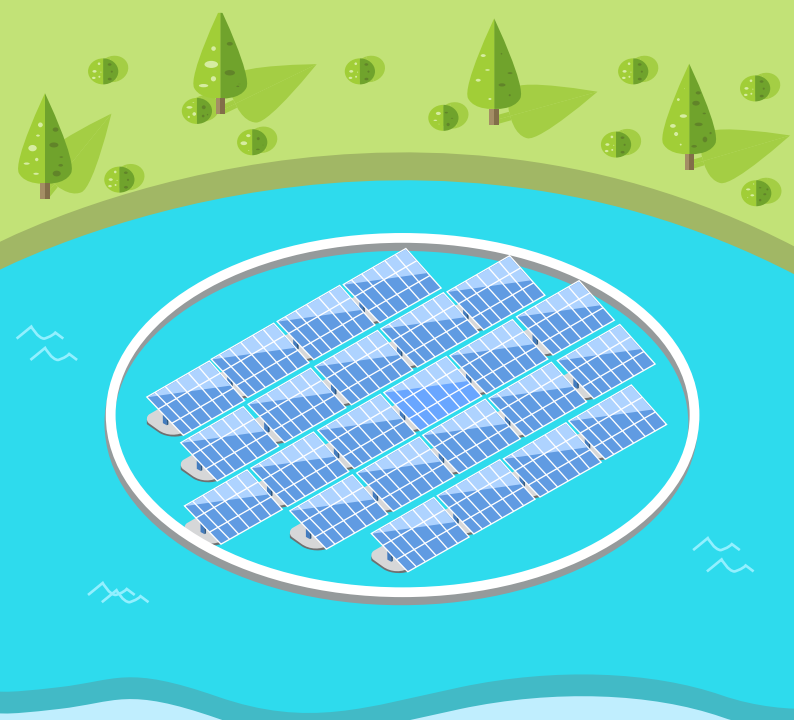
Jeremy Smith, CEO of QED Naval, said: "We are delighted with this news and I would like to thank all our shareholders who have backed our ambitious vision and disruptive tidal technology. This is a huge vote of confidence in the tidal stream energy sector and will allow us to move forward with our plans to develop the infrastructure and create skilled jobs in the supply chain.

"With a global tidal energy market of £76 billion, and a predicted GVA of £1.4bn by 2030, supporting some 4,000 jobs, the UK has the chance to truly become the frontrunner of the ocean energy market globally."

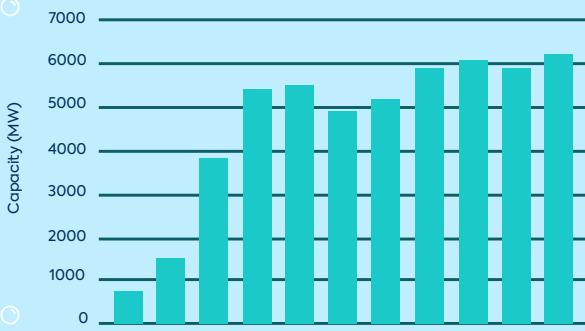


MARKET OVERVIEW

FLOATING SOLAR 2023



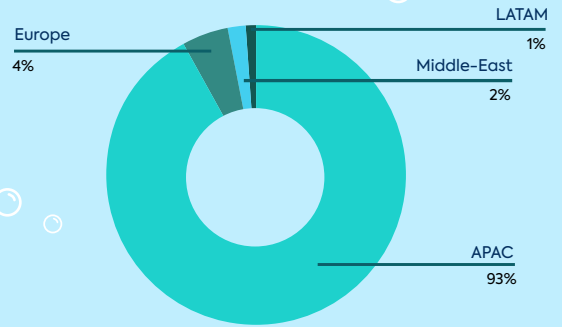
Historical and expected annual global floating solar installations



Source: Wood Mackenzie

- According to Wood Mackenzie, the global floating solar installations amounted to about **3.8 GW** in **2022**.¹
- **In the next ten years**, cumulative global floating capacity is expected to surpass **58 GW**.

Market share



Source: Wood Mackenzie

The **Asia-Pacific (APAC)** region remains the **most dominant player** in the floating solar market, boasting over **93% of installations** in 2022 with a total capacity of **3 GW**.¹

Financial landscape



The global floating solar market is expected to increase from **\$2.5 bn** in 2021 to **\$24.5 bn** by 2031.^{2,3}

Market drivers



Land scarcity



Increased land costs



New market entrants



Growing market maturity

Potential

A recent study published in the journal Nature found that covering **30%** of the **world's reservoirs** (between 0.01 km² and 30 km²) with floating solar panels could yield **9,434 TWh** of electricity annually, a figure that is close to the electricity output of all the world's coal-fueled power plants.^{4,5}

Top 3 countries for floating solar potential:



1,911 TWh per year



1,107 TWh per year



865 TWh per year

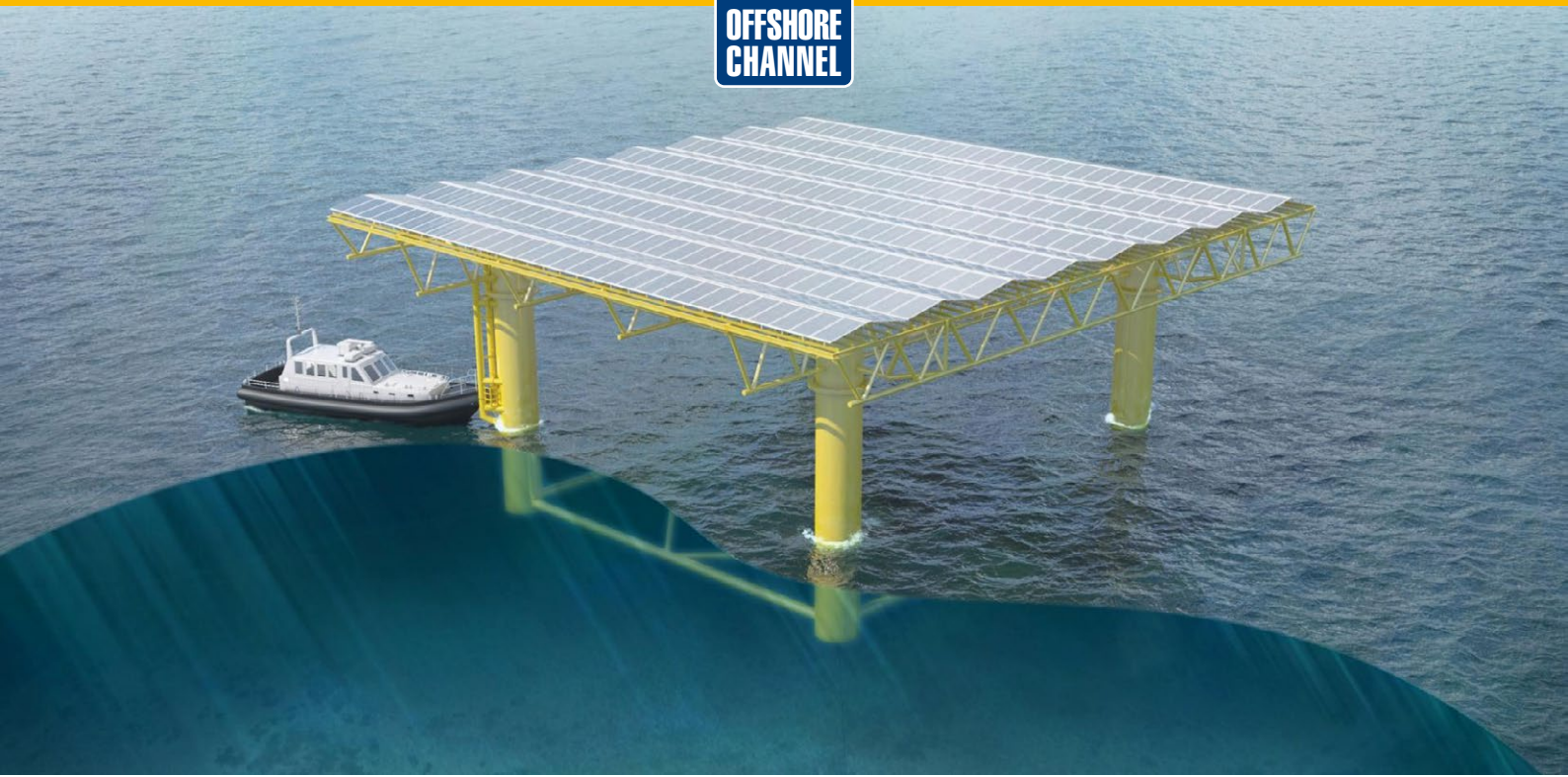
If implemented, the floating solar projects could preserve an estimated **106 km³ of water** annually, a quantity that is almost equivalent to the amount of water utilized by **300 million people** each year.

SEAVOLT

LAUNCHES A FIRST OF A KIND SOLAR ENERGY TEST PLATFORM

OSTEND, BELGIUM – SeaVolt, a collaboration between Tractebel, DEMA, and Jan De Nul, gets ready for its first floating solar energy test platform to be installed offshore. The platform floatation system is currently located in the port of Ostend, on the Belgian North Sea coast, where main contractor Equans is finalizing assembly. The test platform will be the first installation in the Belgian North Sea aimed at the large-scale development of offshore solar energy and is scheduled to be towed offshore, anchored, and put into operation to gather data for at least a year starting in August.

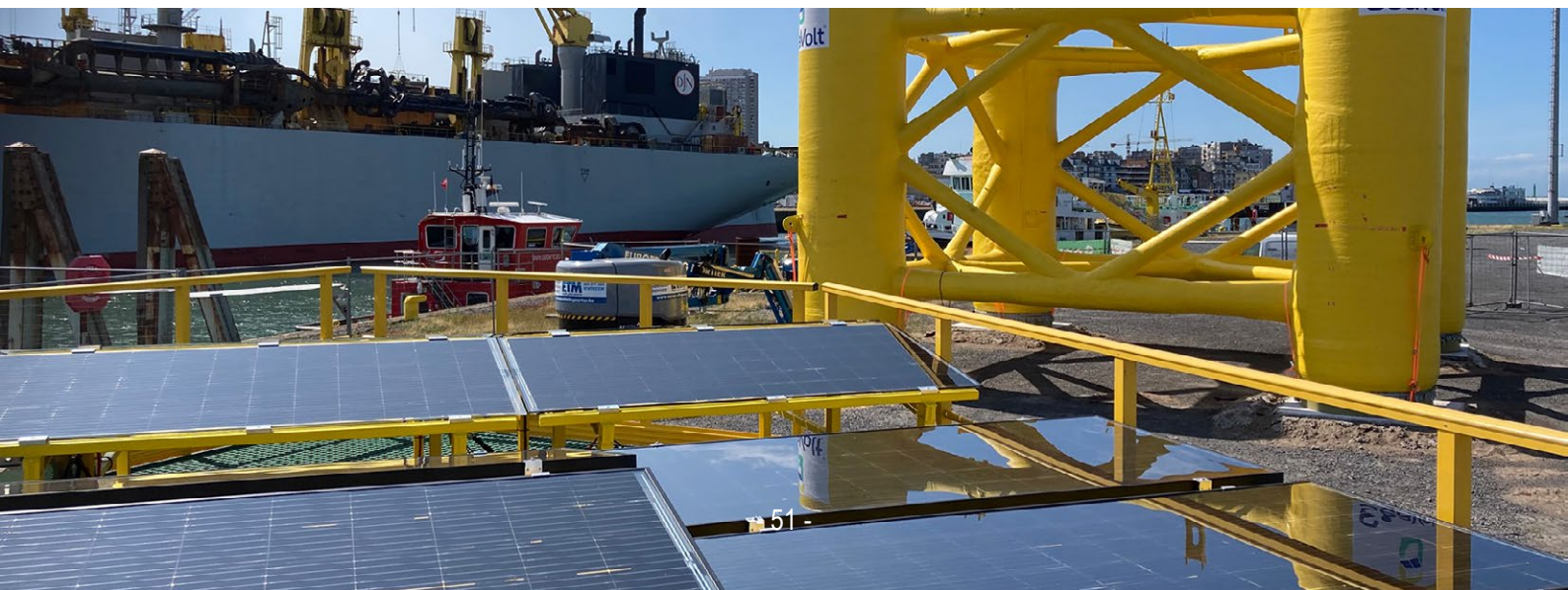


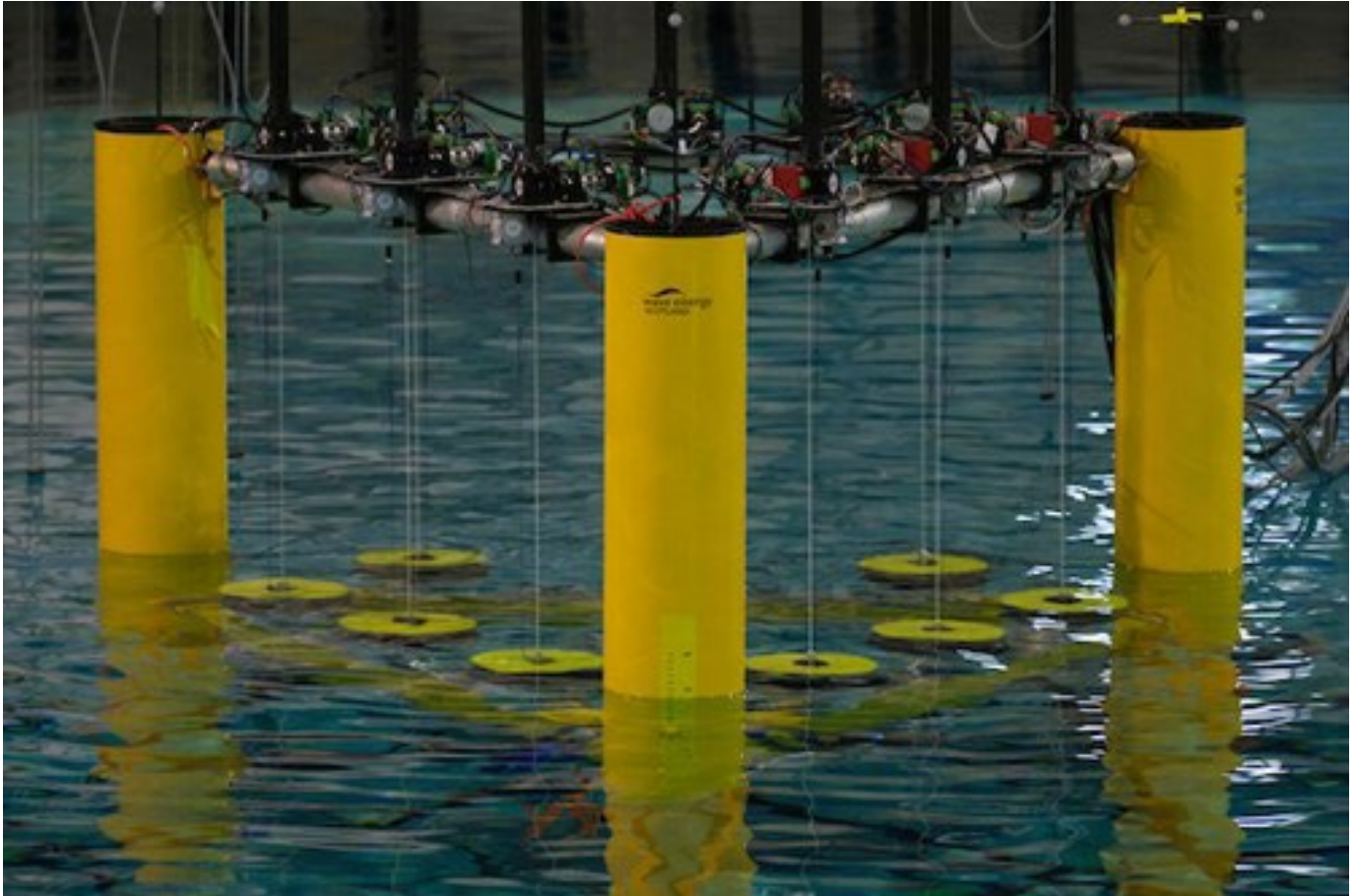


SEAVOLT'S FIRST OF A KIND TEST PLATFORM INSTALLED IN OFFSHORE WATER

The SeaVolt Consortium is happy to announce that we successfully transported and installed our test installation with great accuracy. It is now in place in the Blue Accelerator test zone located near the Port of Ostend, Belgium.

On the platform, we will perform research and development activities for the offshore solar industry. This great achievement and big milestone is the result of close cooperation between Tractebel, @DEMEgroup, and @Jan De Nul Group, and was achieved with the support of the Belgian Deputy Prime Minister and Minister for Justice and the North Sea @Vincent Van Quickenborne, and Secretary of State for Science Policy @ Thomas Dermine via funding from VLAIO and BELSPO, along with the partners, (sub)contractors and port officials.





WES INVESTIGATING THE POTENTIAL OF COMBINED WIND/WAVE STRUCTURES

Following the promising range of potential benefits identified in the scenarios within the “Wave and Floating Wind Energy - Opportunities for Sharing Infrastructure, Services and Supply Chain” report supplied by Offshore Wind Consultants (OWC) Ltd, Wave Energy Scotland (WES) has begun a series of tank tests at the University of Edinburgh’s FloWave facility. There are some clear synergies between the technical requirements and suitable locations for floating wind and wave energy. To maximise the future cost reduction in both sectors, it may be effective to share some of the sub-systems and infrastructure between these two technology types. Versatile wind and wave platforms (where projects are in the same region and use common platform designs) may therefore provide an attractive solution to both sectors.

The overall improvement in the physical and numerical understanding of the design drivers will enhance the support WES can offer to developers to optimise their design solutions and to enable future MW-scale multi wave absorber platform systems to be developed.

Alongside this, offshore energy in Scotland was recently

bolstered by the leasing of 30GW of ScotWind projects, and several of these leased sites have an attractive wave energy resource which may support versatile wind and wave platforms in the future.

The tank tests currently being completed by WES use sea states which are representative of one of these future floating wind lease sites on the west coast of Scotland, leased through the ScotWind programme and which has an appropriate water depth and wave resource for large scale wave energy exploitation.

The physical model used for the testing incorporates multiple identical wave energy absorbers mounted onto a semi-submerged, triangular floating platform. The platform is generic but similar to many concepts under development within the floating wind sector, while each absorber is a simplified version of a submerged pressure differential device. The absorbers have taken inspiration from AWS Ocean Energy’s Archimedes Waveswing; a submerged wave power buoy which has been developed and funded through WES’s Novel Wave Energy Converter Programme.



NEW MOORING SYSTEM FOR OFFSHORE, COASTAL FLOATING SOLAR ARRAYS

The novel mooring solution consists of perimeter pontoons, barriers, clump weights, mooring lines and anchors. Its creators claim it is cheaper in materials and maintenance, as well as more wave-stable, compared to mooring systems using elastic cables.

From pv magazine global

An international research group has designed a new mooring system for offshore, coastal floating solar arrays that is claimed to reduce costs of such projects.

Compared to the prevalent method of mooring with elastic cables, the novel method is said to reduce mooring costs for a system of 195 kW by 24%, from \$62,200 to \$47,160 over its service life. "Elastic mooring cables need to be tightened periodically because the creepage of rubber can lead to the loss of tension resulting in the increase in maintenance cost over time," the scientists said referring to one of the possible issues in using this technology.

In the paper "An Adaptive Barrier-Mooring System for Coastal Floating Solar Farms," which was published in Applied Energy, the scientists explained that the cost reduction is due to the cheaper material cost and fewer requirements

for maintenance in the new system. "The cost comparison is only indicative as there is significant uncertainty in the various costs," they emphasized. "In addition, the cost estimations only include the mooring system. Other related costs, such as transportation, have not been considered."

Dubbed adaptive barrier mooring system (ABMS), the new system consists of perimeter pontoons, barriers, clump weights, mooring lines and anchors.

"The barrier is hinged to the pontoon at the top and tied to the clump weight at the bottom, while the mooring lines connect the clump weight with the anchors fixed at the seabed," the researchers explained, referring to the functions of the system's different parts. "The pontoon provides the buoyancy, while the barrier tensioned by the clump weight mitigates the wave action with the mooring lines holding the platform in place."

In their analysis, the scientists used models scaled at 1:30, with the parameters of the various configurations carefully considered to be realistic compared to field deployment. They compared the performance of a floating array based on a conventional elastic system with that of a floating farm where

the sea-facing front is supported by ABMS and the coast-facing rear is supported by a variation of this ABMS-based system where the barrier is replaced by mooring lines.

The researchers found that the system using the new mooring tech is 40% more vertically stable in short wave periods. In addition, the ABMS-based system proved to handle changes in water depth of up to 36%, which is highly relevant under tidal fluctuations, without introducing slack in the mooring cables. "Slack may produce sudden jerks and damage the mooring points," the researchers explained.

The research team included scientists from the Nanyang Technological University in Singapore and the Dalian University of Technology in China. "We hope that the development of ABMS can further aid the development of coastal floating solar farms in the future," the team concluded. "At present, floating solar farms have already been installed in freshwater bodies such as lakes and reservoirs. However, very few coastal floating solar farms have been installed so far despite the wider availability in sea space, due to the challenges of more complex environmental conditions in the coastal environment."

ARE SOLAR PVT EVACUATED TUBES THE FUTURE OF THE OFFSHORE FLOATING SOLAR PANELS?



Matthias Herberich



Farshid Ebrahimi

Looking to the future, we need to be open to new ways to we can make our contribution to climate protection effectively.

In the currently available PV floating systems, they use framed standard photovoltaic modules and these are today more than 2 sqm and flat. But the size of the modules increases more and more with increasing performance. In the countryside this may be an advantage, but on the water, this is a big disadvantage. The static load caused by snow and above all wind and high waves are a major risk factor. The load on the material is therefore very high.

“Our innovative TUBE MODULE has addressed this problem”, explains the developer of this tube Matthias Herberich.

The round shape reduces the possible snow load. Wind and

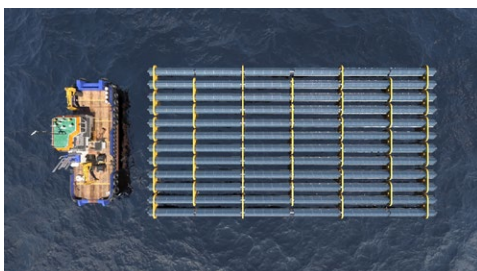
waves have less attack surface. Thus, many photovoltaic projects can from a static point of view with classic modules on land and on water realized only at high cost.

Not to forget the design, because the power generation by Photovoltaics can also look good.

The prototype in the field of floating PV has already been successfully tested in practice. The next steps are optimization of size and performance and after this the test in wind and wave tunnel for the preparation of pilot plants at sea and on land.

Founding of a start-up. Investors are welcome.

Contact: entwicklungsbuero-herberich@email.de



FIDAR OFFSHORE ANIMATION COMPANY



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Torslanda, Gothenburg, Sweden



OUR PROJECTS AROUND THE WORLD



- 01 **FLOWPOWER** Aarbakke Innovation AS Norway 2021
- 02 **RETRACTABLE BOW FOILS** Wavefoil Norway 2021
- 03 **OFFSHORE FLOATING SEAWEED FARM** WyndTek Netherland 2021
- 04 **SOUTH BROOKLYN MARINE TERMINAL** SEA.O.G Company USA 2021
- 05 **CONTROLLED FLOW EXCAVATION** Seajet UAE 2021
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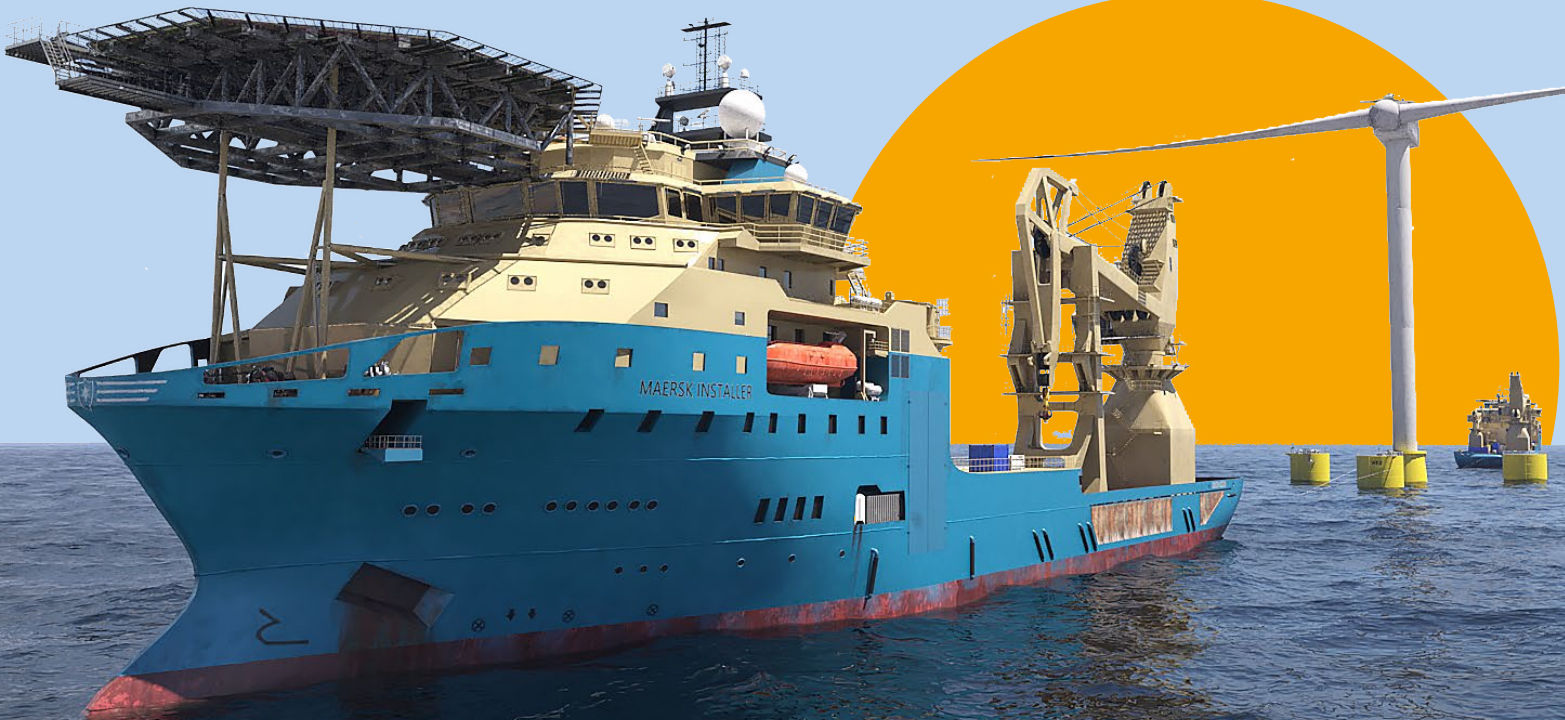
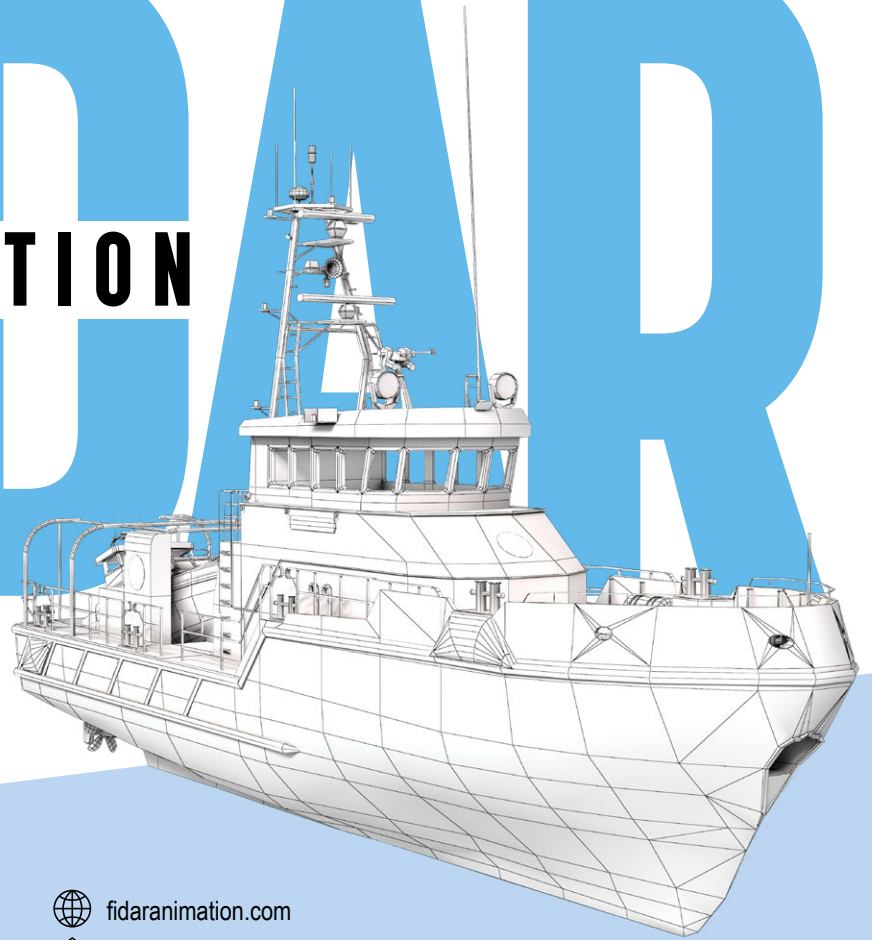


info@fidaranimation.com



Add1: 2 Frederick Street, London, WC1X 0ND

Add2: Osmağça Mah. Reşitefendi Sk. No: 11
34000 Kadıköy İstanbul



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Editor-in-Chief

Farshid Ebrahimi

Project Manager

Hossein Eskandari

Editorial Office

Head of Editorial Office: Jochem Tacx

Project Management: Morteza HosseinPour Fazel

Image Editing: Mahya Kian Taheri

Financial Department: Niloofar Ahmadi

Authors

Alireza Ghaemi, Naiem Eslami, Sajad Shahverdi,
Pooya Shojaadini, Reza Derakhshandeh, Alireza Amjad,
Behnam Medghalchi

Art Direction

Alireza Jafarpour, Saide Hassani

Translation

Naser Mostafavi

Business Development Manager

Negin Hashemi

Contact

Offshore Channel Magazine
Torslanda, Gothenburg, Sweden
info@offshore-channel.com
Tel. +46-76-904-0095