

October 2022

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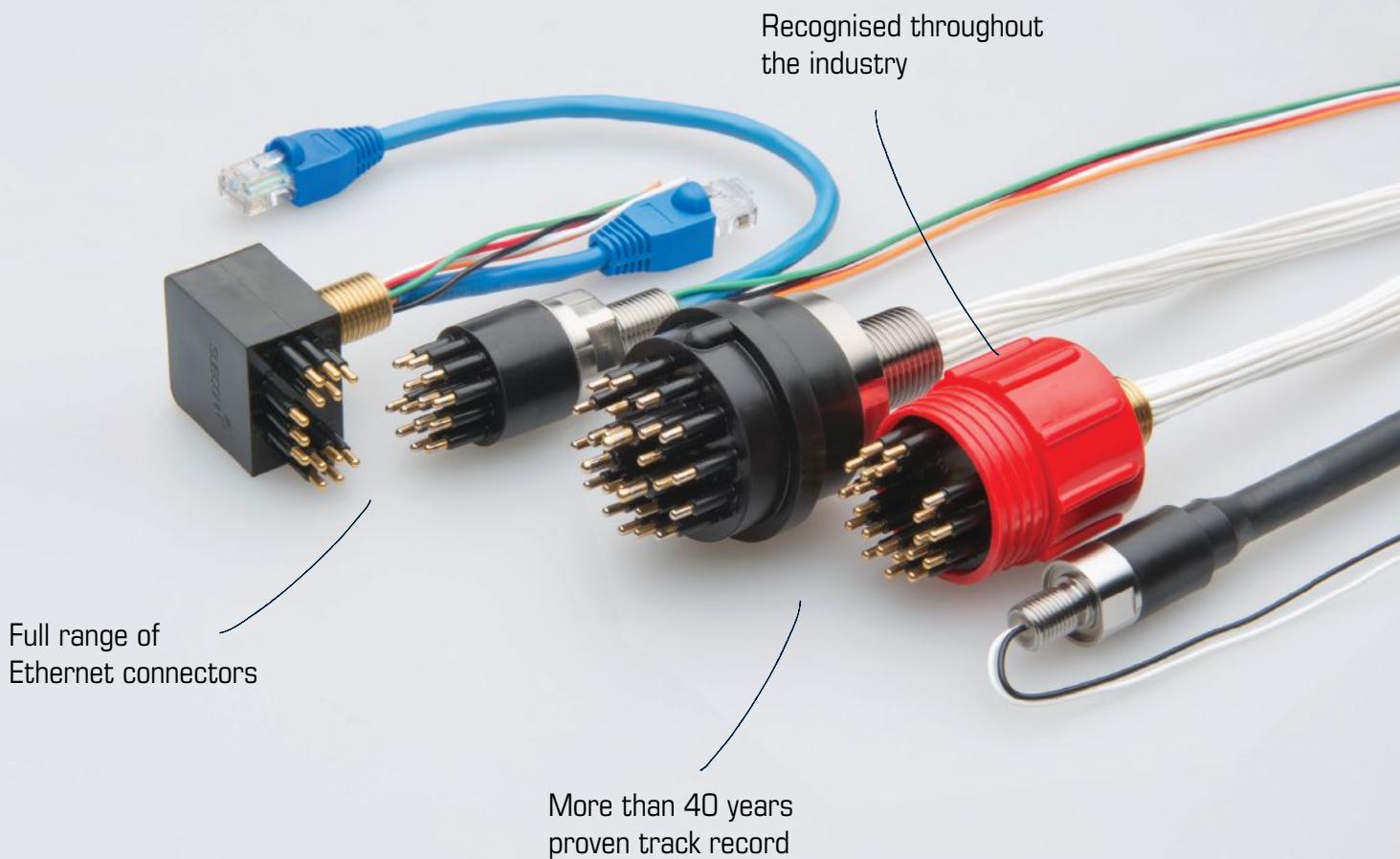




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[WITH THANKS - Ed.]

While determining the best course to net-zero remains a matter of cross-sectorial discussion, one point is without question: the development, trial, and widespread adoption of new offshore technologies and platforms will prove instrumental to a new era of secure, affordable, and low carbon energy production.

Progress will lean on the ocean industry's capacity to harness and integrate previously untapped renewable energy sources, such as offshore wind and wave power, but it will also demand that offshore developers embrace new approaches to infrastructure planning, operations, and maintenance in the name of realizing lean and green efficiencies.

This month we profile some of the disruptive thinking and applied innovations seeking to make ocean tech a true change agent in the energy transition. Our thanks go to Bedrock Ocean, Akselos, CalWave, the National Oceanography Centre, and BOEM.

editor@oceannews.com

Ed Freeman



ON THE COVER:

With its fully electric AUV fleet, Bedrock Ocean Exploration is dedicated to accelerating offshore wind development and making ocean exploration faster, cheaper, and more environmentally conscious. (Photo credit: Bedrock Ocean)

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Technology Systems Corporation

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INVESTMENTS IN OFFSHORE WIND TO PROPEL THE OCEAN INDUSTRY'S ENERGY TRANSITION

**By Amanda Lefton**

Director, BOEM



As global communities continue to face extreme heat, intense storms, and other climate change impacts, there is no time to waste in making the bold investments needed to drive a clean energy future. A thriving U.S. offshore wind industry is key to this transition.

Over the past year, BOEM has moved forward at the pace and scale required to help achieve the Biden Administration's ambitious goal of deploying 30 gigawatts of offshore wind energy by 2030. We have approved the nation's first two major offshore wind projects and initiated the review of 10 additional projects, with more coming this year. Interior Secretary Deb Haaland announced a new offshore wind leasing strategy to provide clear direction on our path, which includes seven lease sales by 2025 in the Atlantic, Pacific, and Gulf of Mexico. We held two of these historic lease sales this year.

Last month, the Department announced an additional goal to deploy 15 gigawatts of installed floating offshore wind capacity by 2035—enough to power more than 5 million American homes! With more than half of the nation's offshore wind resources in deep waters, floating wind can help us reach areas once thought unattainable.

INVESTMENTS IN PEOPLE

As we continue to drive momentum for offshore wind energy development, BOEM is committed to helping create thousands of good-paying, union jobs for American families. We are finding opportunities—particularly with innovative lease stipulations—to incentivize the domestic sourcing of major technical components (e.g., blades, turbines, and foundations), to develop a highly-skilled and well-trained domestic workforce, and to enter project labor agreements.

INVESTMENTS IN GOVERNANCE

As the federal lead for offshore wind energy development, the Department is focused on delivering the processes needed to move offshore

wind forward. We are working to ensure certainty and transparency in our efforts and to actively improve our procedures to provide developers with clarity and predictability. To do this, we are taking a thoughtful, all-of-government approach to transmission, ocean co-use, and permitting so we can build a robust offshore wind industry and ensure coastal and underserved communities can access clean energy with minimal impacts.

INVESTMENTS IN SUPPLY CHAINS

To fully realize the benefits offshore wind can provide, we need a robust and resilient domestic supply chain. Developing this supply chain requires collaboration between federal agencies, states, unions, and industry representatives to enhance U.S. manufacturing, logistics, and workforce development. Working together, we can support efforts to provide Americans with cleaner and cheaper energy, create economic opportunities, and make historic investments in new American energy supply chains, manufacturing, shipbuilding, and servicing.

INVESTMENTS IN THE FUTURE

The nation is primed for a transition to a clean energy future—one that will combat climate change, create good-paying, union jobs, and ensure economic opportunities are accessible to all communities. I'm honored that BOEM can play an important role in this vital endeavor. We will continue to advance this clean energy transition in a way that boosts local economies and lays the foundation for workforce diversity, training, and development. And we will commit to ensuring that all Americans can enjoy the benefits of clean energy and job creation.

For more information, visit: www.boem.gov.

The Bureau of Ocean Energy Management (BOEM) is the federal agency within the Department of the Interior responsible for managing energy and mineral resource development on the U.S. Outer Continental Shelf, including offshore wind.



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AN EXCLUSIVE INTERVIEW WITH BEDROCK OCEAN



Anthony DiMare
CEO & Co-founder,
Bedrock Ocean

bedrock



Ed Freeman
Managing Editor,
Ocean News & Technology

ON&T

Bedrock Ocean is setting out to redesign the marine survey experience from the ground up to pave the way for detailed seabed mapping and public access to reliable and comprehensive subsea data. CEO and co-founder Anthony DiMare recently sat down with ON&T's managing editor Ed Freeman to set out the company's goal to offer a smarter, more efficient way to collect and manage geophysical data.

EF: Bedrock Ocean is a relatively new outfit, so give us some quick insight into how the company got started...

AD: My co-founder, Charlie Chiau, and I have almost three decades of combined experience at the intersection of maritime and technology. This shared passion for true innovation, tempered by our frustration with how little is collectively understood about the ocean floor, is essentially what compelled us to form Bedrock Ocean. We were familiar with the established technologies and practices that govern subsea exploration, but we were unable to find the tools to deliver the operational efficiencies needed to drive a new blue-centric economy primed for the challenges of climate change.

Today, Bedrock—and the team we are building—is on a mission to accelerate the development and maintenance of critical renewable ocean energy infrastructure, in particular offshore wind farms.

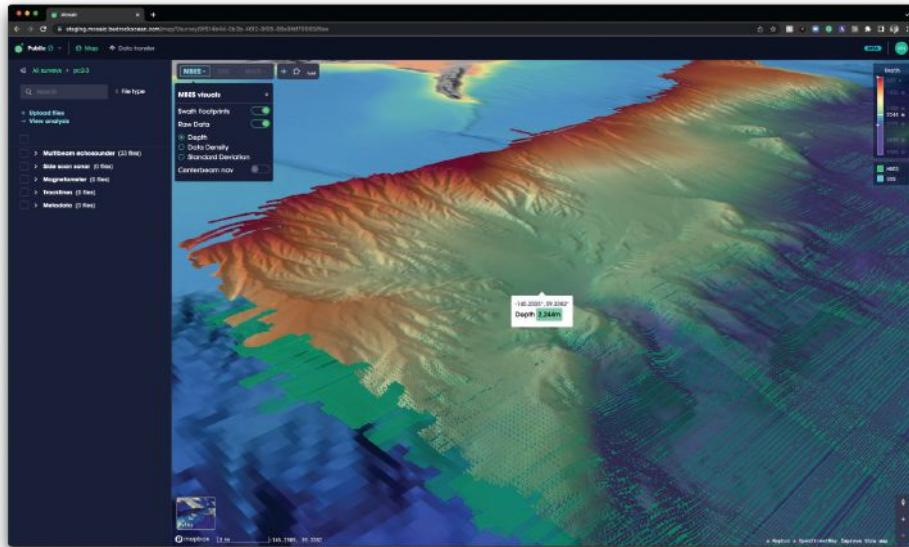
Essentially, we're an ocean-mapping company revolutionizing seafloor data acquisition and management to create the world's first detailed map of the ocean. But we're striving to integrate the most important technology components of ocean exploration into a vertical process, including geophysical ocean surveying and seabed mapping, visualization, and data sharing and management. Charlie and I built this company because we know that the industry lacks a better way to utilize the ocean data that exists, and we think there's a better way to collect that data too. Many companies are trying to solve these problems individually, but we are looking at these problems from a ground-up perspective.

EF: How exactly are you looking to disrupt the offshore renewable energy market?

AD: Right now, ocean mapping methods take too long for us to quickly capitalize on the abundant offshore wind resources available. On average, it takes anywhere from nine months to over a year to complete a geophysical survey

for offshore wind planning because we simply don't have enough precise and reliable data to identify viable locations. With Bedrock's fleet of 100% electric AUVs—which track and then immediately send seafloor data to our cloud platform Mosaic™—we can serve the offshore wind industry with the non-intrusive acquisition, and processing of seabed data in dramatically less time—up to 10x faster, potentially reducing an offshore wind project build timeline by up to 50%.

From the start, we set out to build an unparalleled vertically integrated data service to explore and make subsea datasets more accessible, and that's exactly what we've done. We are creating ocean technology poised to turn the maritime industry on its head by moving the surveying process from GHG-emitting, non-scalable ships to agile, 100% electric, autonomous vessels. We're taking data access to a new level and democratizing ocean data so that it is available in a single place for organizations to use, manage and share seafloor data.



» **Mosaic™** is a cloud-native data platform built to enable survey data management, delivery, visualization, and QA/QC. (Image credit: Bedrock)

As a Public Benefit Corp, Bedrock is committed to providing the world with a free, publicly available map of our world's oceans, 50x more detailed than the current best public map available. Ultimately, we're aiming to visualize the globe's entire seafloor and we are doing it faster, more cheaply than any other tech can currently offer, and with a conscious effort to protect our environment while we do it.

EF: Tell us more about the technology in development...

AD: Our AUVs are 100% electric, extremely agile, and lightweight. Our product design process prioritized the mitigation of any potential environmental impacts of deployment and operation. The AUVs glide through the ocean with minimal sound in Marine Protected Areas (MPAs) thanks to their use of high-frequency sonars, which cause no harm to marine animals. This tried-and-tested non-intrusive approach also cuts down on the usual wildlife permitting process required to operate in MPAs.

One of the reasons we built our tech stack in-house is to have control and offer flexibility across the entire value chain. Being vertically integrated allows us to fully customize our services to our customer's specific needs at any stage of a project, rather than offering a one-size-fits-all service solution.

EF: You mentioned the democratization of data, would you care to unpack that a little for our readers?

AD: As a Public Benefit Corporation, we are required by law to consider more than just the need to return value to shareholders

but also to provide a defined public benefit throughout the life of the corporation.

When we talk about democratizing data, we're talking about making publicly available the critical ocean data that is used for more accurate climate models, improved weather predictions, ocean safety, and sustainable ocean exploration at a reduced resolution than any commercial application.

Today, accessing ocean data is dogged by convoluted processes and bureaucracy. Ocean data still lives on physical hard drives and desktop computers. We still need to work with the data onboard vessels, which are usually not connected to the internet, and if they are, it's not a high enough bandwidth. Our Mosaic™ platform replaces vessel hard drives and the disjointed on-premises management of survey data. The technology is survey-agnostic and supports massive uploads and downloads to and from the cloud. It's designed to span current serial, siloed

workflows within organizations and connect seamlessly with other third parties across the seafloor data lifecycle.

At the beginning of 2022, Bedrock released its first annual Public Benefit Report which details that Bedrock's Mosaic™ platform had ingested nearly 200 bathymetric surveys, covering 4.96 million square kilometers of the ocean. Since the publication, Bedrock's public dataset has continued to grow and now stores and visualizes nearly 900 bathymetric surveys covering 34.2 million square kilometers—almost 9.5% of the ocean. Additionally, Bedrock now provides 1.14 million square kilometers of side scan coverage that enables a better understanding of seafloor characteristics.

EF: How does the Mosaic™ platform work?

AD: Mosaic™ is the first cloud-native data platform specifically designed for seafloor data workflows. It was built to enable survey data management, delivery, visualization, and QA/QC, effectively eliminating the need for physical hard drives and incompatible on-premises software. For offshore wind operators, delays in data collection and sharing, evaluation, and reports can cost millions of dollars and months of lost time—Mosaic's™ rich feature set facilitates near real-time evaluation of the seafloor data necessary to make ambitious offshore wind goals a reality.



» Bedrock's co-founders, Anthony DiMare and Charlie Chiau. (Photo credit: Bedrock)

Just this year, we announced our newest technological advancement for the Mosaic™ platform—our acquisition of Shone Automation's web and vector-based approach to nautical charts. This novel technology was built for viewing and

interacting with all *truly global* Electronic Navigational Chart (ENC) data in a developer-friendly way. Before this technology, nautical charts could be viewed electronically but were not designed for interaction with web-based vector technology—think the technology that powers Google Maps visualization. Bedrock's version—dubbed the Web Navigational Chart (WNC)—was created for viewing or interacting in a browser or native Linux computer and enables modern API-driven queryable elements needed for marine app development, maritime navigational domain awareness for autonomous systems, and much more.

EF: What does the next 12 months look like for the team at Bedrock?

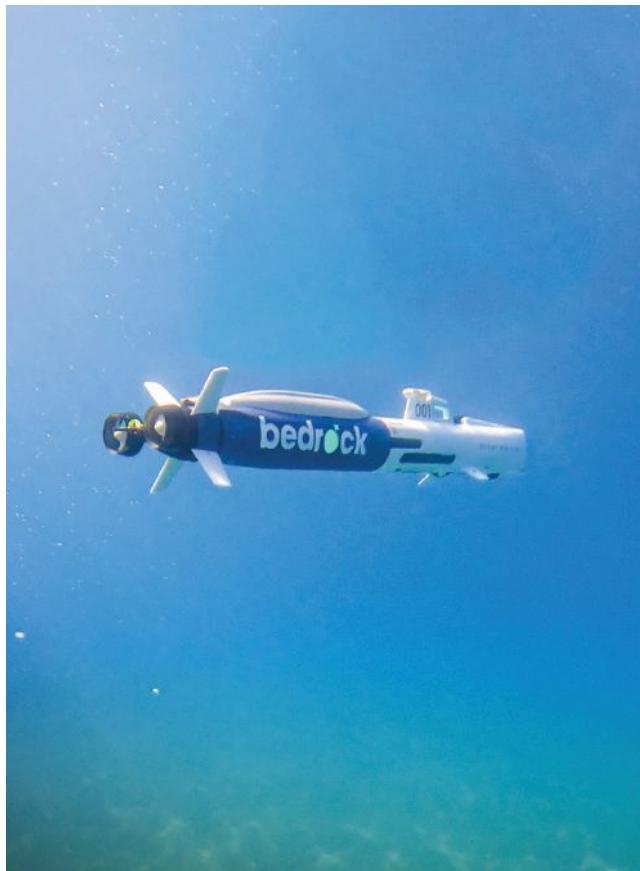
AD: Bedrock's success will be dependent on scalability. With the current supply chain problems that every industry is facing, Bedrock has already secured the materials necessary to scale to production in the next year. We are now working directly with different suppliers to secure lines of production for all future development while securing additional production capacity in the U.S.

We intend to aggressively expand headcount, vehicle fleet size, as well as expand our current operational profile to service any US ocean territory.

EF: Thank you Anthony, sounds like a very interesting 2023 awaits...

AD: This is just the beginning, and we are looking forward to collaborating with the many brilliant organizations out there transforming our data-rich understanding of the planet's ocean. Thank you, Ed.

» Ready to survey: Bedrock's shore-based command. (Photo credit: Bedrock)



» Bedrock's AUVs are 100% electric, agile, and lightweight, designed for easy deployment and minimal acoustic disturbance. (Image credit: Bedrock)





RHODE ISLAND: SETTING THE PACE FOR OFFSHORE WIND

So far, 2022 has been a big year for the offshore wind market in the United States and it is appropriate that the American Clean Power (ACP) Association has its annual conference, ACP Offshore WINDPOWER, in Rhode Island, the nation's leader in offshore wind since the inauguration of the Block Island Wind Farm, the first offshore wind farm in the country, in 2016.

"We're known as the Ocean State for a reason," said Rhode Island Governor Dan McKee. "Over the last several years, we have been able to leverage our first-mover status in the offshore wind sector to build one of the strongest and most diverse Blue Economy clusters in the nation. And we're doubling down on this important sector by key making investments in our port infrastructure and our workforce. Our focus on growing our leadership in ocean-based industries has been core, job-creating driver of our statewide economy, and we're committed to building on that momentum now and the years in the come."

LANDMARK POLICY PLEDGES

Governor McKee's administration has taken a series of landmark steps in 2022 to maintain its place at the forefront of the U.S. offshore wind market.

The state followed up on its 2021 Act on Climate, which sets mandatory, enforceable climate emissions reduction goals leading the state to achieve net-zero emissions economy-wide by 2050,



» RI's Block Island Wind Farm.

by committing to the most aggressive renewable energy standard among any U.S. state—100 percent renewable energy by 2033.

Then came historic legislation that seeks to expand Rhode Island's offshore wind energy resources with a new law requiring a market-competitive procurement for between 600 and 1,000 MW of newly developed offshore wind capacity. This has the potential to meet at least 30 percent of Rhode Island's estimated 2030 electricity demand, or enough electricity to power about 340,000 homes each year. When added to the 30 MW Block Island farm and the planned 400 MW Revolution Wind project, about half of the state's project energy needs will be powered by offshore wind.

PORT DEVELOPMENT

Rhode Island continues to be among the leaders in port development as well. The state recently broke ground on a new facility, known as the South Quay Marine Terminal project, that will serve as game-changing wind turbine staging area, creating a central hub for the Northeast's growing offshore wind economy. When completed, it will create a large, integrated, and centralized hub of intermodal shipping specially designed to support the offshore wind industry. The terminal will provide a significant number of jobs for Rhode Island residents over the years, along with benefits to the state and region, as well as the environment, and improve freight-transport conditions and support the development of clean renewable energy.

INVESTOR IN PEOPLE

Rhode Island also is among the pacesetters for workforce development. In August of this year, the state joined with offshore wind joint-venture partners Ørsted and Eversource, the developers of Revolution Wind, to form a collaborative partnership with higher education, labor, and workforce development organizations, to prepare Rhode Island's offshore wind workforce. The partnership, together with the Community College of Rhode Island, the Rhode Island Department of Labor and Training, Rhode Island Commerce, the Rhode Island Building and Construction Trades Council and Building Futures, will be supported by \$1 million from Revolution Wind. The funding is a portion of a previously announced \$4.5 million commitment to support education, workforce training, and supply chain development in the state.

These are just some of the steps being taken in Rhode Island to place itself at the forefront of the offshore wind market. The smallest state in the US has made the biggest waves in offshore wind to date and it plans to continue making big waves.

For more information, visit: www.energy.ri.gov.



» Pyxis omni-directional transceiver. (Photo credit: applied acoustics)

APPLIED ACOUSTICS UNVEILS NEW USBL LINE-UP

applied acoustics recently launched a new acoustic positioning offering which is their first combined Inertial Navigation (INS) and Ultra Short Base Line (USBL) system. The Pyxis system is free of acoustic calibration and can operate without the need of external GPS or Gyro compass, reducing mobilization time and alignment errors.

The engineering team has been working hard improving the accuracy and performance of the entire Easytrak USBL product range. A new transceiver has been designed for the Alpha system, the 904C, which has increased the accuracy from 3.5% to 3% of slant range. The previous Nexus Lite system has been replaced with the Nexus 2 Lite, utilizing the 2686 transceiver (previously part of the Nexus 2 system), which has increased the accuracy from 1% to 0.45% of slant range. And finally, the Nexus 2 and Pyxis omni-directional transceivers have been redesigned and now include 7 internal elements instead of the previous 5, further improving accuracy and all-round performance.

The Alpha system now has an upgraded 904C transceiver which has a rugged stainless housing and is smaller than the 903C predecessor. The compact form not only allows for less motion in free hanging applications which can improve the accuracy, but it can be deployed by a single person and transported easily making the 904C ideal for small ROV or diver tracking and mobilising on smaller vessels of opportunity. The 904C power supply and receivers have been redesigned, reducing noise and improving the detection of target signals which improves the repeatability of position. A new, more accurate compass allows for the compensation of motion to improve the accuracy when using the 904C standalone without external sensors.

Easytrak Nexus 2 Lite incorporates Sigma 2 Spread Spectrum technology to provide a secure acoustic link. By incorporating Sigma 2 technology, the wide bandwidth transmissions reduce the system's susceptibility to interference. This provides users with an accurate and stable position which is easy and intuitive to operate. A geo-referenced graphical overlay can be offered as an optional extra, which is typically used when operating near shore or surrounding structures like wind farms.

The Nexus 2 and Pyxis systems, with the previous 2686/ 3781 type transceivers had a slant range accuracy of 0.45%, the new 7-element 2782/ 3782 omni-directional transceivers have further increased the slant range accuracy to 0.25%.

Paul Griffiths, Business Development Manager for Acoustic Positioning at applied acoustics said: "Early signs are very exciting, as these products have now gone to market, and many of our customers are reporting back on the impact the improvements have made to their results. Launching Pyxis alongside these other improvements has been a long time in the making, and our engineers have been working tirelessly to keep our USBL range easy to use, reliable and with a range of options to suit different applications and budgets."

SAILDRONE CAPTURES VIDEO INSIDE CAT 4 HURRICANE FIONA

For the second year, NOAA and Saildrone are hurricane chasing with uncrewed wind-powered vehicles.

The Saildrone Explorer SD 1078 was directed into the midst of Hurricane Fiona, the first Category 4 storm of the 2022 season, while the storm was taking aim at Bermuda and then Nova Scotia in late September.

SD 1078 battled 50-foot waves and winds measured over 100 mph to collect critical scientific data and, in the process, is giving us a completely new view of one of Earth's most destructive forces.

Inside the storm, SD 1078 sailed at sustained speeds over 9 mph. At one moment, it reached a peak speed of 39.7 mph while surfing down a massive wave.

SD 1078 is one of seven "hurricane" saildrones that have been operating in the Atlantic

Ocean and Gulf of Mexico during the 2022 hurricane season, gathering data around the clock to help understand the physical processes of hurricanes. This knowledge is critical to improving storm forecasting and is expected to reduce the loss of human life by enabling better preparedness in coastal communities.

"Saildrone is once again demonstrating its ability to provide critical ocean data in the most extreme weather conditions. Hurricane Fiona intensified from a tropical storm to a Category 1 hurricane just before hitting Puerto Rico, causing significant damage and loss of life," said Richard Jenkins, Saildrone founder and CEO. "The data Saildrone vehicles are gathering will help the science community better understand rapid intensification, giving people living in our coastal communities more time to prepare."



» Footage captured by SD 1078 in the Atlantic Ocean during Hurricane Fiona on September 22, 2022, 14:11 UTC. (Photo credit: Saildrone/NOAA)

Saildrone provides data directly to NOAA's Pacific Marine Environmental Laboratory (PMEL) and Atlantic Oceanographic and Meteorological Laboratory (AOML), Saildrone's partners in this mission.

The seven saildrones are a part of a larger NOAA endeavor to understand hurricane intensification. NOAA also has underwater gliders, surface drifters, profiling floats, and aerial assets to collectively gain deeper insight than ever before into the development of hurricanes. NOAA Hurricane Hunter aircraft and weather buoys gather an

array of operational weather observations that are essential to hurricane forecasts.

"Uncrewed systems in the air, on the ocean surface and, underwater and aircraft systems have the potential to transform how NOAA meets its mission to better understand the environment," said Capt. Philip Hall, director of NOAA's Uncrewed Systems Operations Center, which is providing funding for the Saildrone effort. "These exciting emerging technologies provide NOAA with another valuable tool that can collect data in places we can't get to with other observing systems."

SILVER SHIPS AND US ARMY CORPS OF ENGINEERS CHOOSE FURUNO FOR NEWEST RESEARCH VESSEL

Silver Ships and the United States Army Corps of Engineers have selected a comprehensive navigation and communication package for their new Endeavor-range vessel consisting of quality Furuno marine electronics. The 49' mission-specific hydrographic vessel, TOBIN, is designed to allow researchers to survey rapidly-changing terrain in the Mississippi River's demanding waters. The vessel's Furuno electronics will assist them in carrying out their mission safely and efficiently.

The heart of the ship's navigation system is the NavNet TZtouch2 TZT2BB black box, paired with 19" and 24" multi-touch monitors. The large, crisp displays give the captain full access to the GPS/Chart Plotter, Ultra High-Definition Digital Radar from the DRS6AX, and reliable AIS (Automatic Identification System) information from the FA170. The Furuno SC70 Satellite Compass provides the entire system with highly accurate heading, position, and speed over ground information.

The communication system includes Furuno's award-winning FM8900S IMO VHF and the FS1575, Furuno's GMDSS 150W SSB (Single-Sideband) radio. This combination of VHF and SSB allows TOBIN to monitor all VHF transmissions and longer-range communication.



» Marine survey vessel TOBIN will be supported by Furuno electronics. (Photo credit: US Army Corps of Engineers)

SPECTRUM'S DIGITIZERS AND AWGS USED IN NEW UNDERWATER ACOUSTIC LABORATORY

The Acoustics Research Group at the Department of Physics and Astronomy, Brigham Young University, Utah, USA has chosen Spectrum Instrumentation's leading-edge digitizers and signal generators to form the heart of its new underwater acoustics laboratory. The new lab is a big step forward in research on sound waves travelling through water as it effectively provides a miniaturized version of the ocean. Experiments are possible on sound wave's behavior in different water layers and their reflections from the ocean's most diverse ground materials such as rocks, sand, or mud. The miniaturization means that the highest precision is needed from the measurement equipment as the experimental results are scaled up afterwards to indicate what would happen in the real world.

The new laboratory water tank is rectangular and measures 3.6 m long by 1.2 m wide with a maximum water depth of 0.91 m.



» The water tank with the two robotic arms to position the transmitter and receiver. (Photo credit: Spectrum)



» The control console with two grey PCIe chassis in the middle. (Photo credit: Spectrum)

The research involves using a hydrophone for the signals or chirps which are generated by an Arbitrary Waveform Generator (AWG), the Spectrum model M2p.6546-x4. This PC-card generates signals with 24 V output swings that are then amplified before being broadcasted by a hydrophone. After travelling through the tank, the signals are detected by another hydrophone and processed by a Spectrum M2p.5932-x4 digitizer card. The transmitter and receiver are each held by a robotic arm that positions and orientates them within the water so that source and receiver can be positioned as required.

"The tank enables experiments to be done on how the seafloor affects sound waves bouncing off it. A pure rock bottom will have a different effect compared to sand or mud or layers of different materials. "It is even more complicated," explained Dr. Traci Neilsen, the professor in charge of the project, "because water is not homogeneous. Changes in temperature and salinity change the sound speed and cause the waves to bend, similar to how a mirage happens. We plan to examine the impact of water temperature changes on machine learning for localizing sound sources. These tank studies are more repeatable, efficient, and cost effective than ocean experiments and will allow us to develop techniques that can then be tested on ocean data."

The pair of Spectrum PCIe-cards are housed in an external PCIe chassis in the main control console, accurately synchronized together using a Star-Hub module by Spectrum. The setup has a second identical pair of cards in a second chassis that can be triggered into operation by the first chassis.

This scaled experiment requires much higher frequencies in the kilohertz range, than would be used in the ocean. The digitizers and AWG cards have a high resolution of 16-bit and can even sample and output at rates of 40 Megasamples per second respectively, while the skew between channels is less than 100 pico-seconds. That delivers the high precision required for the experiments. The two UR10e robot arms, along with the signal generation and the data acquisition, are all controlled by a custom LabVIEW software program that was created by Adam Kingsley and is referred to as "Easy Spectrum Acoustics Underwater" (ESAU).

A key part of the experimental set up is to model the open ocean, so special anechoic panels from Precision Acoustics on the sides of the tank reduce the reflections. A significant innovation was the design of a filtration and circulation pump by John Ellsworth, who is BYU Department of Physics and Astronomy's Research Laboratories Supervisor. This pump keeps the water clean without creating bubbles in the tank, which are a significant source of noise. With all these preparations in place, impulse responses could be measured, making it easier to eliminate noise from readings when an experiment is being done. The precision of the Spectrum PC-cards with a Signal-to-Noise Ratio (SNR) of more than 71 dB ensures that the impulse response elimination gives accurate experimental results.

SEATRAC SP-48 TO MONITOR DEEP EARTHQUAKE RUPTURE SITES

Seatrac Systems recently announced the sale and delivery of one of its SP-48 persistent Uncrewed Surface Vehicles (USVs) to an elite Geosciences team at Princeton University. Working with longtime collaborator Harold "Bud" Vincent and DBV Technology, Dr. Frederik Simons and his Princeton team aim to advance the current state of the art for seafloor geodesy, which is the science of understanding the depth, shape and movement of the seafloor, and how seafloor bathymetry relates to its gravitational and magnetic fields.

By combining acoustic data with GPS/GNSS data (GPS-A), the team's specific interest is persistently monitoring deep seafloor tectonic plate movement to better measure its change and shape before and after earthquakes.

The Princeton geophysicists, using DBV's innovative system and method for seafloor geodesy, employ either Temporary or Continuous Deep Ocean Geodetic Sensors

(T-DOGS and C-DOGS) which measure seafloor tectonic plate movement at any ocean depth, using very low power, and for very long-term deployments more accurately and economically than present methods. (T-DOGS are recoverable and are for deployments up to 3 years. C-DOGS are for 30-50 years and are not intended to be recovered.) SeaTrac's SP-48 autonomous platform will transit desired acoustic survey data paths for up to 12 hours at a time, loiter over the DOGS to receive their telemetered data, and regularly send the data to shore via satellite. Test missions are planned initially for Puerto Rico in the Fall of 2022 and Bermuda in Spring 2023.

"This is a critical technology to enable seafloor geodesy at scale, and the overall success of the mission is highly dependent on how the USV performs," noted project technical lead Bud Vincent. "There are a huge number of USVs out there. We looked at all of their capabilities and maturities; from an



» SP-48 performs the seafloor geodesy duties for a fraction of the \$25-50K daily rate of a crewed oceanographic vessel. (Photo credit: SeaTrac)

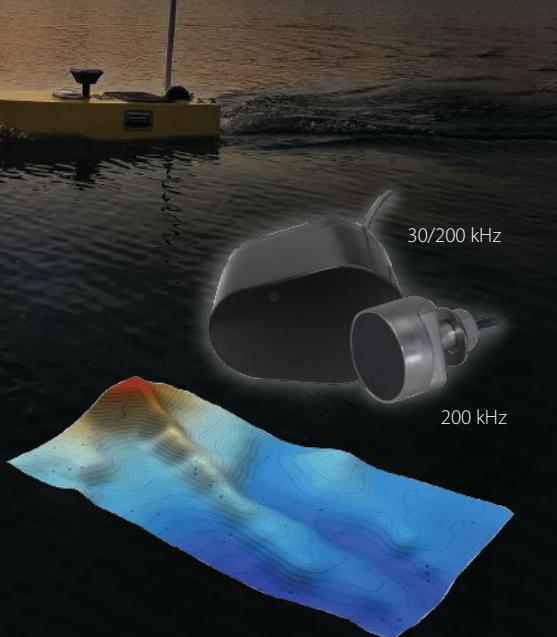
economic and technical standpoint, SeaTrac's stood out."

"Oceanographic research is more critical than ever and environmentally and economically we can't justify or afford to keep crewed ships at sea for months on end. Seafloor geodesy at scale is a perfect example of how autonomy can make long term data collecting sustainable in every sense of the word," notes SeaTrac's Director of Product & Business Development Hobie Boeschenstein.

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Photo and 3D Bathyscape courtesy of SimpleUnmanned, LLC



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» Moorings ready to be deployed from the back deck of the RRS James Cook. (Photo credit: Edward Pope)

STUDY REVEALS GIANT UNDER-WATER LAND-SLIDE BLOCKING MEGATONS OF CARBON

A new study led by scientists from the National Oceanography Centre (NOC) and Durham University has revealed evidence of a giant landslide in the Congo Canyon blocking megatons of organic carbon from being transported to deep-sea ecosystems.

Ordinarily, matter is transported along the canyon-channel from shallow to deep water by regular flows of sand and mud that behave like snow avalanches on land. In this case, scientists discovered that a huge landslide, equivalent in size to the largest landslide dams ever recorded on land, had slumped into the Congo Canyon and blocked it.

The blockage stopped the flow of material into deeper water, leading to a 150 m thick build-up of sediments, containing 5 megatons of organic carbon in the canyon axis. This unique discovery has impacts for the deep-sea ecosystems that depend on the flow of organic matter through the submarine channels to thrive.

COLLABORATION FOR TECHNOLOGY TRANSFER OF UNDERWATER DIGITAL SIGNAL PROCESSING TECHNIQUES

CSignum Ltd., a global leader in wireless underwater communications, asset digitization, and actionable insights for ocean and freshwater industries, has completed a two-month research project in underwater wireless communications with Newcastle University, renowned for its leadership in underwater acoustic communications research.

CSignum is preparing in coming months to commercially test and launch its HydroFi Modem, the first reliable point-to-point wireless radio communications system that enables the transmission of data through the water-air boundary. Led by Newcastle University Professor Jeffrey Neasham and CSignum CTO Mark Rhodes, the knowledge exchange and research project focused on increasing the HydroFi™ Modem communications data rate and transmission distances from underwater to above water receivers, as well as improving battery life for real-world deployments.

"We were able to significantly improve the amount of fixed data we could transmit in a shorter time by using a faster data rate," said CSignum CTO Mark Rhodes. "This means our modems are powered on for a shorter period and so will use less power to communicate a given data payload. This will be of great benefit in terms of how operators choose to allocate resources to remotely deploy and service the HydroFi modems and receivers in ocean observing, environmental monitoring, aquaculture, renewable energy, and oil and gas environments."

"In addition, we improved the HydroFi communication waveform, coding and receiver structure to deliver greater robustness against local sources of electromagnetic interference," said Professor Neasham of Newcastle University. "All radio systems need to be compatible with the electromagnetic environment generated by local elements of integrated systems and natural atmospheric sources. Another strength of the HydroFi Modem is that it is not affected by rough sea states,

turbid conditions, or shallow water splash zones."

CSignum intends to continue its successful collaboration with Newcastle University to enhance future versions of the HydroFi radio modem and incorporate resulting breakthroughs into the technology roadmap. On completion of the project, the collaborative team identified some clear ideas for future development in the areas of power consumption and advanced DSP techniques, which will further extend the product performance envelope.

As a result, CSignum and Newcastle University efforts will build on their respective IP portfolios. CSignum currently has 22 granted and in-force patents, with further pending patents, in such areas as bidirectional water-to-air and air-to-water wireless communications, automation, antenna design, remote command and control, adaptive bandwidth, redundancy and failover, and low power management. These technologies are designed to deliver sensor data through the water-air boundary, water column, seabed and subsea structures. As a result, operators in ocean observing, environmental monitoring, aquaculture, renewable energy, and oil and gas will be able to modernize their infrastructures with digitized, real-time data to make smart decisions.





» The robots are optimized for in-water hull cleaning of large ships.
(Photo credit: Armach Robotics)

ARMACH ROBOTICS IDENTIFIED AS SOLUTION TO WATCH

Armach Robotics has been shortlisted to compete in the Ocean Opportunity Lab and World Ocean Council's (WOC) The Bio-fouling Innovation Challenge. This is the first competition of its kind, born from an initiative to encourage the industry to embrace creative and innovative solutions around the effects and costs of biofouling within the ocean, maritime and renewable industry, and to restore biodiversity.

Armach is one of 34 companies whose innovative products and services were evaluated by a global jury of experts, and has been selected, along with nine other companies, as "Solutions to Watch" having introduced the world's first autonomous system capable of proactive in-water cleaning and inspection, independent of coating type, in support of the worldwide goal of decarbonizing in shipping. The in-water robots are built on Greensea's fully open architecture platform OPENSEA, the most powerfully integrated control and navigation technology available in the market today, operating in over 2,500 vehicles.

The robots offer proactive in-water cleaning capability, optimized for large ships, without magnetic robot adhesion to the ship's hull, and the ability to clear 2,400 sqft (222 sqm) of hull per hour. They are man-portable, weighing around 66 lbs (30 kg), making it a convenient solution to implement, supporting vessel owners and operators' need to keep their fleet at their optimal condition, therefore benefiting from fuel savings, operational efficiency and fleet readiness, as well as benefiting from hull intelligence and maintaining a lower environmental impact.

Shipping is responsible for at least 2.5% of the world's total CO₂ emissions, and the IMO has set a target to reduce emissions by 50% by 2050. Ship owners and operators, increasingly under pressure to plan and manage vessel efficiency, are looking for new technologies as part of their strategy to reach the targets set reliably, scalably and cost effectively.



NOAA RELEASES STONY CORAL DISEASE RESPONSE PLAN

The NOAA Strategy for Stony Coral Tissue Loss Disease: An Implementation Plan for Response and Prevention is an initiative to help scientists study potential causes, understand how the disease spreads, identify high-risk locations and vessels at risk of transporting the disease, develop new treatments and diagnostic tools and evaluate the vulnerability of Pacific coral species. The strategy also increases the local capacity for disease response by supporting field training, citizen science and coral rescue efforts.

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CGG JOINS UK CONSORTIUM PROJECT ASSESSING ECOSYSTEM IMPACT OF OFFSHORE WIND FARMS

CGG is acting as a special technical partner in an innovative consortium research project led by Bangor University to identify opportunities that benefit biodiversity and the conservation of species around offshore windfarms whilst also supporting windfarm developers to design long-term environmental monitoring strategies.

The project will utilize data supplied by Mona Offshore Wind Ltd. (a joint venture between EnBW and BP), ENI, Ørsted, RWE and The Met Office among others. The £2 million, four-year ECOWind-ACCELERATE project is funded by the UK Natural Environment Research Council (NERC) and The Crown Estate, with support from the Department for Environment, Food and Rural Affairs (Defra) as part of the ECOWind program.



» CGG will provide high-performance computing resources, from its global capacity of 310 petaflops, for complex climate and sediment transport modelling. (Image credit: CGG)

CGG will provide high-performance computing resources, from its global capacity of 310 petaflops, for complex climate and sediment transport modelling to determine the impact of offshore windfarms and climate change in the East Irish Sea. In addition, CGG will provide machine learning (ML) expertise drawing on experience from previous research projects with Bangor University on the use of ML for automated species identification, substrate and habitat classification in the Irish Sea to map benthic habitats, natural capital and biodiversity net gain/loss in this area.

Analysis of seabed properties including grain characterization, mineralogy, geochemistry, and meiofaunal surveys will be performed by CGG's Geoscience Laboratories to ground-truth ML and substrate mapping data. Finally, CGG's Environmental Science subject matter experts will analyze the impact of offshore windfarms on fish behavior and the interaction between seabed habitat, predator and prey interactions and prey availability.

Professor David Viner, Head of Environmental Science, CGG, said: "With the deployment of offshore renewable energy accelerating, it is important to optimise the potential of the marine environment solution for renewable energy, and critical to understand and safeguard the ecosystem. The aim of this research is to deliver an understanding of how offshore wind deployment will affect the seabed and the wider marine ecosystem. CGG will have an important role to play by providing key resources including subject matter expertise, HPC and advanced technology to improve data resolution and analytics to enable our partners to harness renewable energy in an environmentally-responsible manner."

KONGSBERG HUGIN SUPERIOR INTEGRATED WITH SEEBYTE'S SEETRACK SOFTWARE

SeeByte has successfully integrated their multi-domain, command and control software with Kongsberg's HUGIN Superior Autonomous Underwater Vehicle (AUV).

The HUGIN Superior AUV System is the most capable commercially available AUV. Rated to 6,000 meters, it generates a superior data set coupled with the best position solution possible.

SeeByte's SeeTrack v4 offers optimal goal-based planning and interoperability with other SeeTrack users. Its Open Architecture allows integration with different sonars, sensors or behaviours.

Combining the two systems offers enhanced operator situational awareness across single or multi vehicle operations with optimal planning, monitoring and post mission analysis results on a single user interface.

SeeByte's Business Development Manager for Defence, Robert Johnson, said: "This Interoperability between autonomous systems is a great challenge in the underwater domain. We are delighted to work with Kongsberg to successfully integrate SeeTrack with the HUGIN Superior AUV and offer a best-of-breed solution for our customers."



» Kongsberg Hugin Superior AUV in use. (Photo credit: Kongsberg)

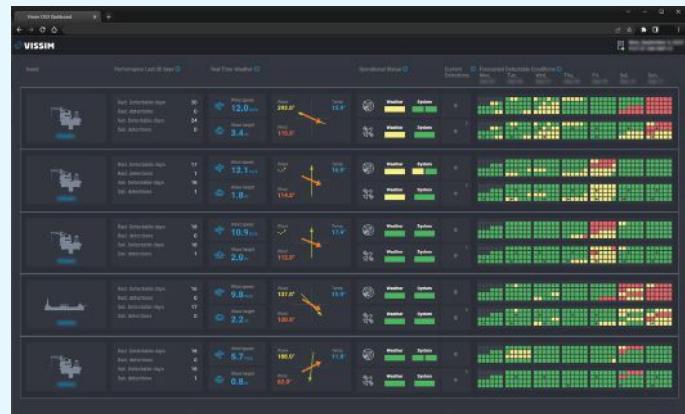
VISSIM RAMPS UP OIL SPILL MONITORING APPROACH FOR AKER BP

Norwegian technology supplier Vissim is to develop an expanded digital platform for future oil spill monitoring and detection system on the Norwegian continental shelf.

Under the contract, Vissim will develop a software solution that integrates input from a number of different oil spill detection sources, including radars, satellites, sensors on subsea production equipment, and combine them into one, complete easy-to-understand visual overview.

"The system will provide an integrated 24/7 real-time visual overview of all Aker BP's oil spill monitoring and detection tools and systems. This upgrade gives Aker BP easier access to oil spill detection and awareness concerning different detection technologies, which underlines the company's dedication to safe and responsible operations on the NCS," said Håvard Odden, director of Vissim's North Sea operations.

The regulatory requirement for oil spill monitoring and detection is that operators shall possess detection technologies which



» Mock-up of how the 24/7 real-time visual overview.
(Image credit: Vissim)

combined makes them independent of weather conditions and that non-functional systems shall be registered.

The new software is an easily configurable web-based solution for any oil and gas assets and will be applied to Aker BP-operated assets on the Norwegian continental shelf. The software system will also integrate meteorological data to allow Aker BP to plan for so-called compensating measures in connection with the company's offshore operations.

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THERE'S NEVER BEEN A BETTER TIME TO BE PART OF THE BLUE ECONOMY

After two years of a 100% virtual BlueTech Week, TMA BlueTech™ will return to an in-person forum in sunny San Diego from November 14-18, 2022. Registration is now open, and you're encouraged to secure your spot today.

Executive Director Matt Classen explains why anyone interested in the ocean, water, sustainability, and the maritime sector cannot miss this seminal conference: "BlueTech Week has a reputation for bringing together the brightest minds across academia, government, and industry to further the mission of creating a cleaner planet and promoting economic prosperity. With recent economic studies, we know that dollars invested in our sector result in better jobs and more pronounced economic growth, both locally and globally."

SAN DIEGO: A HUB FOR INNOVATION

As Matt points out, San Diego is quickly becoming the Silicon Valley of BlueTech—and he has the numbers to prove it. This summer, the San Diego Business Journal covered "The San Diego Maritime, Water, and BlueTech Economy in 2020" report and shared with the community why BlueTech is an essential driver of sustainable economic growth for the area, with significant growth potential for high-paying jobs.

The takeaways say it all: "Despite Covid, the BlueTech sector saw a 163% growth in blue jobs." In the San Diego region alone, the blue economy sector boasts 4,300+ individual businesses and comprises 9% of total employment for the region. Businesses in the Blue Economy sector of San Diego generated \$16.2 billion in 2020, for a total estimated economic impact of \$37.9 billion.

These facts make the San Diego region one of the world's hotbeds for innovative BlueTech. It also makes it the perfect host location to welcome guests and local companies to embark on a singular mission: To open commercial opportunities, create a cleaner planet, and facilitate global economic prosperity by providing forward-thinking solutions to current critical ocean and water challenges.

OFFSHORE WIND & SHIPPING IN FOCUS

There's something for both returning and new attendees at BlueTech Week 2022. For a quick taste of past conferences and a sneak preview of the upcoming edition, visit: <https://www.youtube.com/watch?v=AoREqJxPvlg>.

This year there will be two areas of focused concentration: the offshore renewable energy market in California and the sustainable commercial shipping sector.

"Through the power and influence of the BlueTech Week forum, we intend to direct and accelerate the actual trajectory of these two sectors. We are bringing together the most relevant players in the world (policymakers, owners/operators, and contractors) to identify where these two markets are heading, where critical partnerships are taking form, and where potential opportunities lie,"

- Matt Classen

PANEL DISCUSSIONS

Additionally, BlueTech Week will feature an updated state-of-play in various other fascinating and highly relevant sustainable BlueTech sectors. Panels include top minds in government policy, industry, and academia across:

- Space Applications Technologies for the Ocean and Water Spaces
- Freshwater Technologies
- Ocean-based Data Technologies
- Building Capacities for BlueTech Innovation
- Blue Workforce Development
- Environmental Monitoring and Prediction
- Defense Sector

Enough said? Then Matt welcomes you to join BlueTech Week 2022 and to truly connect, influence, and accelerate the future of the sustainable blue economy. Register to attend BlueTech Week 2022 today, and don't forget to visit the event's LinkedIn page to learn more about the confirmed speakers, sponsors, and other attendees set to make this a memorable week.

For more information, visit: www.BlueTechWeek.org.



» BlueTech Week has a reputation for uniting leaders academic, government, and industry sectors to advance the sustainable development of the blue economy. (Photo credit: TMA BlueTech)

MIT RESEARCHERS BUILD A BATTERY-FREE, WIRELESS UNDERWATER CAMERA

The high cost of powering an underwater camera for a long time, by tethering it to a research vessel or sending a ship to recharge its batteries, is a steep challenge preventing widespread undersea exploration.

MIT researchers have taken a major step to overcome this problem by developing a battery-free, wireless underwater camera that is about 100,000 times more energy-efficient than other undersea cameras. The device takes color photos, even in dark underwater environments, and transmits image data wirelessly through the water.

The autonomous camera is powered by sound. It converts mechanical energy from sound waves traveling through water into electrical energy that powers its imaging and communications equipment. After capturing and encoding image data, the camera also uses sound waves to transmit data to a receiver that reconstructs the image.

Because it doesn't need a power source, the camera could run for weeks on end before retrieval, enabling scientists to search remote parts of the ocean for new species. It could also be used to capture images of ocean pollution or monitor the health and growth of fish raised in aquaculture farms.

"One of the most exciting applications of this camera for me personally is in the context of climate monitoring. We are building climate models, but we are missing data from over 95 percent of the ocean. This technology could help us build more accurate climate models and better understand how climate change

impacts the underwater world," said Fadel Adib, associate professor in the Department of Electrical Engineering and Computer Science and director of the Signal Kinetics group in the MIT Media Lab.

Going battery-free

To build a camera that could operate autonomously for long periods, the researchers needed a device that could harvest energy underwater on its own while consuming very little power.

The camera acquires energy using transducers made from piezoelectric materials that are placed around its exterior. Piezoelectric materials produce an electric signal when a mechanical force is applied to them. When a sound wave traveling through the water hits the transducers, they vibrate and convert that mechanical energy into electrical energy.

Those sound waves could come from any source, like a passing ship or marine life. The camera stores harvested energy until it has built up enough to power the electronics that take photos and communicate data.

To keep power consumption as a low as possible, the researchers used off-the-shelf, ultra-low-power imaging sensors. But these sensors only capture grayscale images. And since most underwater environments lack a light source, they needed to develop a low-power flash, too.

They solved both problems simultaneously using red, green, and blue LEDs. When the

camera captures an image, it shines a red LED and then uses image sensors to take the photo. It repeats the same process with green and blue LEDs.

Even though the image looks black and white, the red, green, and blue colored light is reflected in the white part of each photo, Akbar explains. When the image data are combined in post-processing, the color image can be reconstructed.

Sending data with sound

Once image data are captured, they are encoded as bits (1s and 0s) and sent to a receiver one bit at a time using a process called underwater backscatter. The receiver transmits sound waves through the water to the camera, which acts as a mirror to reflect those waves. The camera either reflects a wave back to the receiver or changes its mirror to an absorber so that it does not reflect back.

A hydrophone next to the transmitter senses if a signal is reflected back from the camera. If it receives a signal, that is a bit-1, and if there is no signal, that is a bit-0. The system uses this binary information to reconstruct and post-process the image.

The researchers tested the camera in several underwater environments. In one, they captured color images of plastic bottles floating in a New Hampshire pond. They were also able to take such high-quality photos of an African starfish that tiny tubercles along its arms were clearly visible. The device was also effective at repeatedly imaging the underwater plant *Aponogeton ulvaceus* in a dark environment over the course of a week to monitor its growth.

Now that they have demonstrated a working prototype, the researchers plan to enhance the device so it is practical for deployment in real-world settings. They want to increase the camera's memory so it could capture photos in real-time, stream images, or even shoot underwater video.

They also want to extend the camera's range. They successfully transmitted data 40 meters from the receiver, but pushing that range wider would enable the camera to be used in more underwater settings.

» *This battery-free, wireless underwater camera could help scientists explore unknown regions of the ocean. (Photo credit: MIT)*



OFFSHORE WIND'S CONTRIBUTION TO NET-ZERO GOALS WILL RELY ON DIGITAL TECHNOLOGY

By Akselos

Offshore wind is growing, but not quickly enough. While the industry is booming, it is currently not adding enough capacity to hit net-zero targets required to stave off the worst of climate change. If we are to hit the International Energy Agency (IEA) target of net-zero global emissions by 2050, 80 GW must be built annually from now until 2050.

Nevertheless, the offshore wind industry has the potential to drive us to a clean energy future. According to the IEA, the sector could generate more than 18 times today's global electricity demand. Also, 2021 was a record year for the industry, with almost 21 GW of capacity added globally, up from 6.1 GW in 2020. However, it is essential to realize that anything achieved in the next five years will have an exponential knock-on effect in the subsequent two decades as improvements

build upon each. So with more than 90% of offshore wind still to be built to meet the 2050 target, the industry must start adding capacity right now.

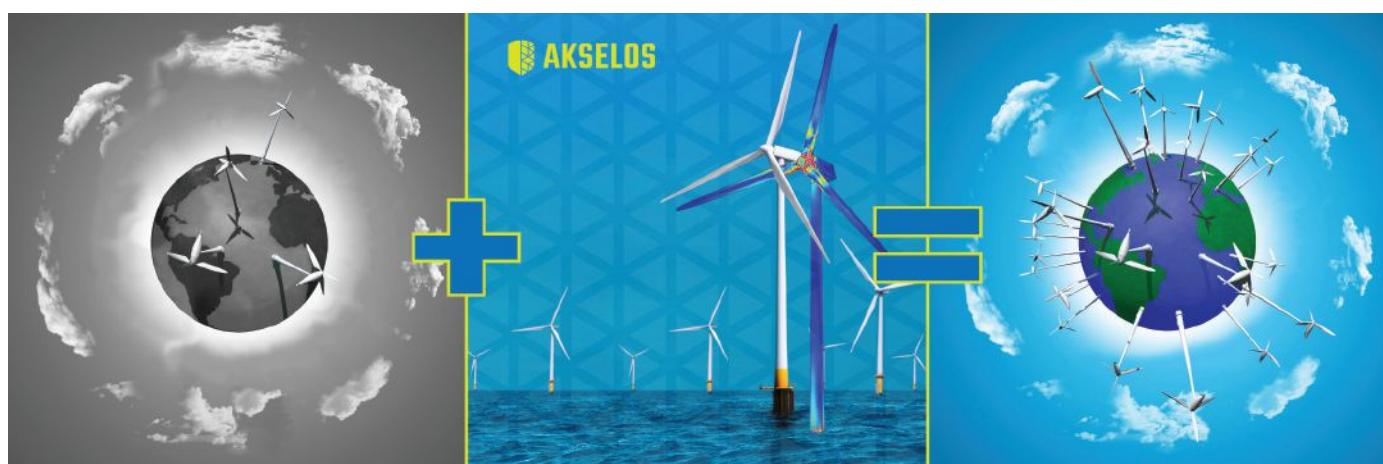
To reach net-zero targets, the offshore wind industry must overcome several significant barriers to growth. Firstly, the technology is still more expensive than other renewable energy sources, such as solar. Solar Levelized Cost of Energy (LCoE) has decreased around four times as fast as offshore wind in the last decade, which has super-charged its adoption worldwide. Next, the permitting process for offshore wind is slow and over-regulated, taking up to eleven years to go from leasing to installation. Finally, wind turbines' sheer scale and weight keep costs high as vast amounts of expensive raw materials are required for construction. Unfortunately, the price of these raw materials is currently soaring.

DOUBLE-DIGIT WEIGHT REDUCTION

One way the offshore wind industry can overcome its barriers to growth is by designing and building leaner, more effective structures that are cheaper and quicker to produce and use fewer raw materials.

Recognizing this need, Akselos and Lamprell started a partnership to create a 'digital thread' for offshore wind structures. The intent was to use advanced modelling capabilities to develop significantly cheaper and leaner designs, which could then be fed with real-time data from wind structures during operations to monitor the state of the asset.

Two projects have already been completed as part of the partnership, leading to significant achievements demonstrating



» Akselos and Lamprell are working together to advance modelling capabilities to develop cheaper, leaner offshore wind structures.
(Image credit: Akselos)



» The software enabled the team at Lamprell to reduce the weight of the jacket by almost 250 tons without structural compromise. (Image credit: Akselos)

the potential for industry improvements. In the first project, Lamprell used Akselos' advanced engineering simulation technology to model a 14 MW jacket foundation weighing almost 2,000 tons.

Using the software, the team at Lamprell found they could reduce the weight of the jacket design by almost 250 tons while fulfilling the exact structural requirements. Instrumental to this optimization effort was the capability to analyze the entire foundation (the beams and joints of the jacket and the transition piece) in one single model at square cm level or even smaller.

These results are significant as, if applied globally, the industry could use almost 1.5 million tons of steel per year less, which is a CO₂ reduction equivalent to taking more than half a million passenger cars off the road.

IMPROVEMENTS FOUND IN WIND TURBINE OPERATIONS

The second way offshore wind can overcome its barriers to growth is by using digital technology to improve operational efficiency. This was the focus of Akselos and Lamprell's second project, which aimed to demonstrate how engineering simulation software can give better visibility into the operations of offshore wind technology to improve performance.

In this project, Lamprell used Akselos' software to build a structural digital twin of a shore-based crane used for jacket assembly. Nineteen sensors were installed on the crane to calibrate and validate the structural model and its simulations. During the crane use, relevant data, such as loads, were directly fed into the digital twin to determine how they impacted structural performance. The project has three significant results:

1. The digital twin was proven to yield accurate simulations at the highest level of detail (cm/mm level).
2. More structural simulation power enabled significantly better integrity understanding and removed undue conservatism. Lamprell managed to lift 30% more weight than the design capacity, meaning the same crane can carry more weight and make more lifts.
3. The speed and fidelity of the structural simulation enable a near real-time view of how structural life is consumed, allowing informed decisions on where to inspect/maintain/strengthen the structure.



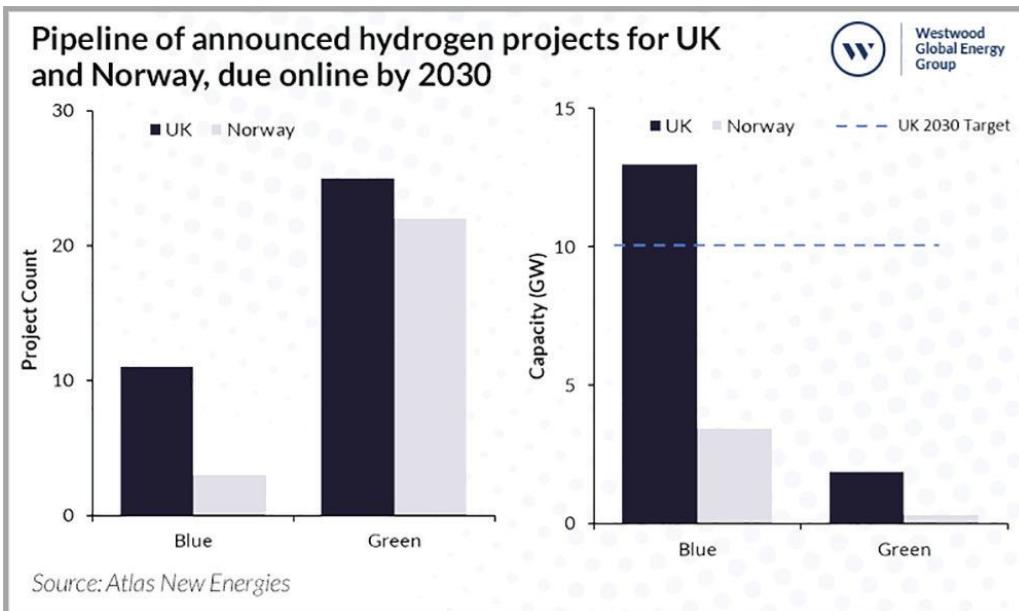
» The projects demonstrated the value of integrating digital twins to improve asset planning decision making. (Image credit: Akselos)

CONSEQUENTIAL RESULTS

Combined, the results of the two projects show how powerful simulation technology, alongside the ability to process data from the field in near real-time, can provide actionable information to help the offshore wind industry grow to reach net-zero targets. There is a huge opportunity to design leaner, more efficient structures to reduce costs, positively contributing to the energy transition. Moreover, if simulation technology can significantly reduce the weight of jacket foundations, there is likely room for improvements elsewhere. Engineers could also optimize additional wind turbine components—such as the tower and rotor blades.

The completed projects have demonstrated the value of embracing innovative technologies, such as digital twins, to understand assets better and make informed decisions. Looking further afield, the offshore wind industry could embrace other technology, such as drone technology, to scale even faster. The future of offshore wind is bright, and a bold change in mindset to embrace innovative technology can drive it to hit net-zero targets.

For more information, visit: www.akselos.com and www.lamprell.com.



» Key Wells to Watch 2022. (Image credit: Wildcat, Westwood Analysis)

CURRENT PIPELINE OF BLUE HYDROGEN PROJECTS PROJECTED TO EXCEED 2030 TARGETS IN THE UK

Latest analysis from Westwood Global Energy Group (Westwood), the specialist energy market research and consultancy firm, has revealed that blue hydrogen projects account for over 16 GW of total announced hydrogen capacity in the UK and Norway, equivalent to approximately 90% of the hydrogen projects total for the same region. The UK alone accounts for 13 GW capacity.

Further analysis shows that although there are four times the number of green

hydrogen projects than blue, projected hydrogen capacity will largely be driven by the latter. This will be a key catalyst in the development of hydrogen and carbon capture and storage (CCS) clusters.

David Linden, Head of Energy Transition at Westwood said: "Although considerable offshore wind projects are developing in Northwest Europe, hydrogen projects are emerging at an unrivalled pace. The scale of blue hydrogen developments makes them a necessity to ensure 2030 regional targets are met—in fact, the current pipeline of announced capacity for UK projects would exceed targets if all achieved their planned start-up dates."

"This rate of change is representative of what we can expect as the energy transition gathers momentum. We are seeing increasing numbers of energy stakeholders diversifying their portfolios—and we are moving in-step. In doing so, we are able to support our clients to focus on what matters and better understand the growth of emerging energy sources, as well as the developing convergence of

existing oil and gas and new energies for improved decision making."

These findings follow the launch of Atlas New Energies; an integrated market intelligence solution covering energy clusters, offshore wind, hydrogen, CCS and related oil and gas infrastructure in the UK and Norway. Harnessing Westwood's unmatched depth of data and heritage in the Northwest European region, the tool allows users to access and interrogate a database of over 250 new energies projects in the UK and Norway, providing greater transparency and a fuller understanding of the opportunities for companies.



**Westwood
Global Energy
Group**

FUGRO'S GEO-DATA SUPPORTS DEVELOPMENT OF DENMARK'S LARGEST OFFSHORE WIND FARM

The collected Geo-data will be used to inform the design, fabrication and installation of the main wind farm components including turbine foundation, inter-array and export cables. With a planned capacity of 1,000 MW, Thor will be Denmark's largest offshore wind farm to date, producing enough green electricity to supply the equivalent of more than one million Danish households.

Fugro will be mobilizing multiple vessels from its industry-leading fleet, including Fugro Scout which has already begun investigations at the wind turbine locations, approximately 22 kilometers from Thorsminde. Vessels will be equipped with Fugro's SEACALF® Mk V DeepDrive® system for seabed cone penetration tests (CPTs) and Fugro's innovative Blue Snake™ geotechnical system which integrates CPT and sampling technology to enable safe, efficient and high-quality data acquisition along the wind farm cable routes. The Geo-data will be used to understand soil

behavior under the various turbine loading areas, as well as inform the design, installation and protection of the inter-array cables and the main export cable that connects the offshore substation with the onshore grid.

All work will be managed through Fugro's cloud-based Geo-data engagement platform. With the ability to provide near real-time deliverables to RWE and the project team, the platform increases collaboration, facilitates faster decision-making and accelerates timelines on critical milestones.

Günther Fenle, Project Director Thor Offshore Wind Farm, RWE Renewables, said: "We are looking forward to using the data collected by Fugro to start the design works for the main components of our Thor Offshore Wind Farm. With Thor, we have two projects off the Danish coast and this means that RWE is making a major contribution to Denmark's energy transition. Denmark has very favorable



» Fugro has begun geotechnical site investigations at RWE's Thor offshore wind farm development. (Photo credit: Fugro)

wind conditions and has ambitions to deploy even more offshore projects off the Danish coast—and as RWE we want to be part of this development."

Dennis Koenen, Fugro's Global Director Geo-data Acquisition Marine Site Characterization, added: "We're proud to be delivering state-of-the-art solutions that support the responsible design and installation of offshore assets. With a range of specialized vessels and equipment, we are committed to supporting Denmark's energy transition and we're proud to work with RWE as they prepare for future developmental phases of this project."

We're Rising In The East

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COMMODITY CHAOS INCLUDES POLITICIZATION AND WEAPONIZATION OF OIL AND GAS



By G. Allen Brooks
*Expert Offshore Energy Analyst
 & ON&T Contributor*

CRUDE OIL:

It is hard not to blink your eyes at oil futures price quotes given their recent volatility. Oil prices had been in a steady decline since peaking in June, driven by government decisions to open the faucet at the Strategic Petroleum Reserve adding to supply and demand destruction from high gasoline and diesel prices but have become more volatile in recent weeks. Politicization of energy has involved the use of the SPR to manipulate gasoline pump prices is the antithesis of the reserve's purpose, which is to protect the country from a supply disruption. Officials ignore that insurance policy since they perceive lower consumer prices to be in their best interest given the upcoming elections.

The politicization of energy extends beyond oil supply manipulation and includes policy actions and rhetoric. The current administration has no qualms overturning existing energy policies embedded in law, as well as ignoring mandated rules if results produce desired outcomes. Jawboning the oil industry easily becomes threatening but exposes the raw political motives of overriding operational

realities. Adding to those pressures is that the economy's outlook continues to worsen with a recession possibility growing. Just how severe might a recession be and how much oil demand might be sacrificed is unknown?

Around the world, energy, especially crude oil, has become a political weapon. In Europe, countries striving to help ally Ukraine and weaken rival Russia, are banning the purchase of its oil and refined products, as well as capping the price the world will pay. However, these moves eventually will harm citizens if world oil supplies cannot rebalance quickly in an era of limited availability. Additionally, in Europe's push to influence the future climate, countries are actively banning the future sale of fossil-fueled vehicles adding to demand destruction calculations.

Each issue, shaped by daily comments and economic data points, shifts commodity trader sentiments about oil. Sentiments swing from optimism for future oil demand to fear of significant demand destruction. Sometimes, the news is so disconcerting that traders want to throw up! In those days, oil prices drop dramatically, sending commentators seeking historical analogs only found in the 1980s and 2015.

Winter's duration and severity will be equally as important as the global economy's health in determining the direction and level of oil prices for the rest of 2022. The Bank of England's sudden monetary policy reversal, shifting from tightening to easing, has reversed the collapse of the British pound's value. More significantly, it may signal other central banks to shift from deflating to reflating their economies, even at the expense of stubborn inflationary pressures. Such a policy shift will have profound impacts on long-term economic growth prospects and energy markets, which may keep them supply-challenged for years leading to higher-than-normal oil prices. The news flow will continue generating commodity chaos, but with an upward bias to prices after six months of decline.

NATURAL GAS:

Natural gas futures prices slid in September from the \$9 per thousand cubic foot level that dominated the last half of August to under \$7. Two forces contributed to the slide. First, traders reconsidered



» Sentiments swing from optimism for future oil demand to fear of significant demand destruction.



➤ Europe's gas supply options this winter are limited, as Russia continues to use gas as a weapon of war.

supply tightness as the U.S. entered its seasonally weaker air conditioning demand phase and temperatures nationwide moderated.

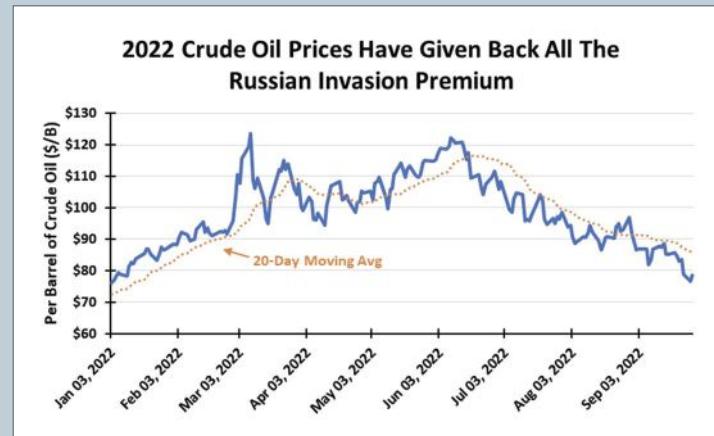
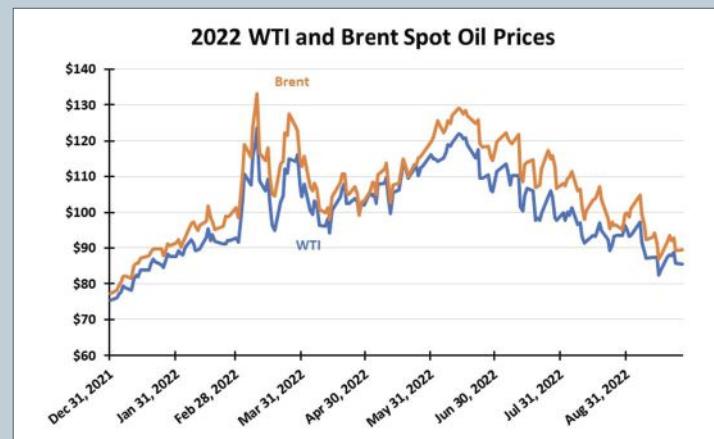
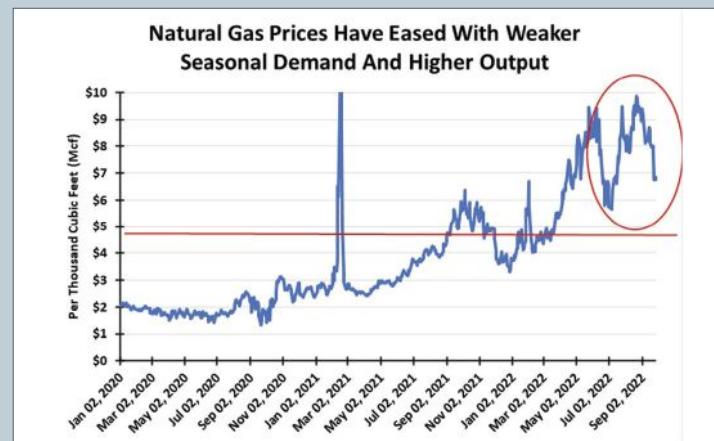
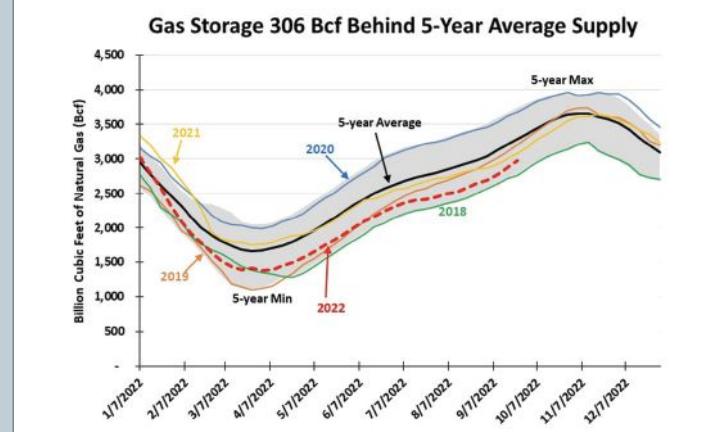
Secondly, European countries announced they had reached their mandated winter gas storage levels ahead of schedule easing their frantic pace of purchasing liquefied natural gas cargos, much of which was coming from America.

In the traditional shoulder months for natural gas demand, prices ease as storage is in the final topping-up phase and winter heating demand has yet to kick in. At the same time, domestic gas production has been ramping up. Since the end of May, gas output has climbed by four percent or nearly four billion cubic feet per day to 98.8 Bcf/d. As usually happens when gas production grows, traders view an improving supply/demand balance and ease off the push for higher gas prices to entice more supply for winter storage.

With our LNG exporting terminals working at capacity, any easing in gas demand takes the pressure off gas prices. The announcement that Freeport LNG, the export terminal that experienced an explosion and fire in early summer, will resume operations in early October and reach full export capacity by December will add to gas demand, as the feedgas flow to this terminal has been offline since June. That additional supply eased the rebuilding of domestic gas storage without boosting prices substantially higher. The restart of the export terminal will support gas prices and possibly lift them.

Europe's demand for LNG may have eased, but the recent leaks in the Russia-to-Germany Nord Stream pipelines, whether by sabotage, faulty welds, or an accident, may reverse that easing. Europe is facing the reality it may not have any Russian gas available this winter, although it continues to receive gas from pipelines passing through battle-torn Ukraine, and Turkey. Russia may be using gas as a weapon of war in a push to win the Ukrainian struggle. Europe's gas supply options are limited, although the continent is making progress in building new LNG terminals and hooking up floating ones, a colder than expected winter will cause undo human suffering.

Europe is asking much of its people. They face high energy prices. They are being forced to conserve energy through government mandates that make their lives less comfortable, as they also watch with fear that their jobs may disappear as companies can no longer operate given the high cost of energy. These concerns spilled out recently with energy protestors across Germany chanting they need Russian natural gas. Is civil unrest the next stage for global natural gas markets? If so, expect U.S. gas prices to remain volatile and influenced not only by domestic weather, power demand, and LNG export forces but also by global sentiment and news about gas price inflation.



DOI TAKES STEPS TO STRENGTHEN OFFSHORE SAFETY STANDARDS

The Department of the Interior has announced a new proposed rule to ensure offshore oil and gas operations on the Outer Continental Shelf are conducted with the utmost safety and oversight standards. This proposed rule from the Bureau of Safety and Environmental Enforcement (BSEE) builds on reforms instituted by the Department since the Deepwater Horizon tragedy that killed 11 offshore workers, caused billions of dollars of damage, and made lasting impacts to the environmental landscape in the Gulf of Mexico.

Proposed revisions to the 2019 Well Control Rule, which will be in the Federal Register this week, focus on well integrity and blowout prevention. These innovations will help protect human lives and the environment by incorporating the latest technology and the lessons learned from operator experience and incident data since the current rule was adopted.

The Department is proposing the revisions after concluding its review of the current rule in accordance with President Biden's Executive Order 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis.

"Protecting human lives and the environment has always been BSEE's highest priority, and this proposed rulemaking will further ensure safe and environmentally responsible offshore energy production," said BSEE Director Kevin M. Sligh Sr. "These proposed revisions to the Well Control Rule are the result of knowledge and experience gained by stakeholders and BSEE since the 2019 rule was implemented. They will protect workers' lives and the environment from the potentially devastating effects of blowouts and offshore oil spills."

In the immediate aftermath of the Deepwater Horizon incident in 2010, BSEE adopted several recommendations from multiple investigation teams to improve the safety of offshore energy operations, leading to the publication of the 2016 Well Control Rule. In May 2019, BSEE published a final rule that weakened certain safety provisions. Today's proposed rule would revise some of the items that were amended or rescinded in 2019.



» Oil platforms Ellen and Elly. (Photo credit: BSEE)

To further protect human lives and the environment, the Department is proposing revisions that would:

- Require blowout preventer systems (BOPs) to be able to close and seal the wellbore to the well's kick tolerance design at all times;
- Remove the option for operators to submit failure data to designated third parties and instead require the direct submittal of failure data to BSEE;
- Require failure analysis and investigations to start within 90 days instead of 120 days;
- Require independent third parties to be accredited by a qualified standards development organization;
- Specify that surface BOPs on existing floating facilities must follow the dual shear ram requirements when replacing an entire BOP stack;
- Require that remotely operated vehicles be capable of opening and closing each shear ram on a BOP; and
- Require the operator to provide test results to BSEE within 72 hours after completion of the tests if BSEE is unable to witness testing.

Publication of the proposed rule also initiates a 60-day public comment period. Members of the public may submit comment on the proposed rulemaking until November 14, 2022.

ALLSEAS WINS MAJOR OFFSHORE GAS PIPELINE CONTRACT IN MEXICO

Allseas has been awarded a substantial construction contract by TC Energy for a major offshore pipeline delivering natural gas to southeast Mexico.

Allseas' pipelay vessels will install the 36-inch pipeline, which will run approximately 700-kilometers south along the coast from Tuxpan connecting the ports of Coatzacoalcos and Dos Bocas.

The Southeast Gateway pipeline is the first major natural gas infrastructure project to

emerge from a new strategic alliance between TC Energy and Mexico's state utility CFE.

Pipelay is expected to commence end of 2023, with the pipeline in service by the mid-2025.

Southeast Gateway is Allseas second pipeline in Mexico. In 2017, the company installed the 685 km-long Sur de Texas-Tuxpan pipeline, which moves natural gas supply from basins in Texas to southern Mexico.



» Pipelay vessels are due to begin operations by the end of 2023. (Photo credit: Allseas)

API AND OFFSHORE OPERATORS COMMITTEE TO DEVELOP STANDARDS FOR OFFSHORE WIND

The American Petroleum Institute (API) and Offshore Operators Committee (OOC) have signed a memorandum of understanding (MOU) to develop standards and guidance for offshore wind energy development.

"The natural gas and oil industry has decades of offshore operating experience under highly technical and complex conditions," said API Senior Vice President of Global Industry Services Anchal Liddar. "It's a natural progression to apply this expertise to the wind sector and reinforces API's leadership in developing standards to ensure safe and environmentally conscious operations across the broader energy industry."

"Our members wanted to build on the significant effort put into API RP 75, fourth edition, by a broad range of offshore safety management experts and develop a similar standard on safety management systems (SMS) for offshore wind applications," said OOC Executive Director Evan Zimmerman. "This collaboration will enable companies engaged in offshore oil and gas development to utilize the same management systems and associated interfaces for our rapidly growing offshore wind market."

Under the MOU, both parties will leverage their expertise and existing natural gas and oil industry standards to develop a SMS standard for offshore wind operations and assets. The initial recommended practice (RP) would provide guidance for establishing, implementing, maintaining and continually improving a SMS for U.S. offshore wind operations. As part of an ongoing relationship, the two groups plan to develop additional guidance and standards on offshore wind energy and other related topics.

The RP would build off API RP 75, Safety and Environmental Management System for Offshore Operations and Assets. API RP 75 provides systemic guidance for establishing, implementing, maintaining and continually improving Safety and Environmental Management Systems (SEMS) for offshore natural gas and oil operations. The third edition of API RP 75 is incorporated into the Bureau of Safety and Environmental Enforcement regulations mandating that offshore natural gas and oil operators implement SEMS and have their SEMS audited by an independently accredited auditing firm.

As the world's premier standards setting organization for the natural gas and oil industry, API has developed more than 800 rigorous standards that enhance safety, operations and environmental protection across all segments of the industry. There are approximately 275 API standards for offshore natural gas and oil operations, including covering fixed offshore platforms, drilling operations, floating production systems and subsea equipment. Many API standards have the potential to be modified and applied to offshore wind operations.



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THE ROAD TO WAVE ENERGY COMMERCIALIZATION



By Marcus Lehmann,
CEO and Co-Founder,
CalWave



and Julie Mai,
Head of Communications,
CalWave

Wave energy is a renewable resource unlike any other. It's notoriously reliable, predictable, and energy-dense, serving as an important missing piece to the clean energy puzzle. For all its promise, unlocking the power of ocean waves remains a tantalizing quest for energy developers.

While the first known wave energy patent was filed by French polymath Pierre-Simon Girard in 1799, it wasn't until the first decade of the 21st century that pilot-scale deployments demonstrated success for systems capable of providing utility-scale power. Even more importantly, a number of promising companies are nearing commercialization, which could create momentum for a wave energy market capable of meeting upwards of 30% of global electricity demand in the coming years on our road to netzero.

CalWave, a California-based wave energy developer, has now validated/proven its

award-winning technology in the open ocean and is continuing to advance forward in the marine energy industry's efforts to demonstrate and deploy utility scale technologies connected to the grid.

A NEW GENERATION OF TECHNOLOGY

CalWave's xWave™ technology takes on the form of a submerged pressure differential wave energy converter. The device is anchored to the seafloor and can operate at a range of different water depths and distances from shore. As waves pass overhead, the water level above the device rises and falls, creating a pressure gradient that causes the device to orbit from its moored position. Generators within the device resist this relative motion and convert it into electricity that is then transported back to shore via a subsea cable.

Not only does the xWave's submerged design enable optimal performance by capturing energy from multiple degrees of freedom, but it also allows for protection

from aggressive swells and storms that don't contribute to total generated power meaningfully. The system's unique wave load management mechanisms for minimizing extreme wave loads and promoting survivability are comparable to pitch and yaw control in wind turbines.

As for survivability in the ocean's corrosive environment, the xWave utilizes the same materials and techniques as other vetted offshore technologies. The system's hull is protected by environmentally acceptable anti-corrosion and anti-biofouling coatings, in addition to sacrificial anodes, which add cathodic protection against corrosion for uncoated surfaces.

PROGRESS AT SEA IN 2022

In July 2022, CalWave successfully concluded its open-ocean wave energy pilot after 10 months of continuous operation off the San Diego coast. The pilot unit, named x1™, deployed in September 2021 and represented a scaled-down version of CalWave's x100™, 100 kilowatt



➤ CalWave concluded its 10-month open-ocean wave energy pilot in July 2022. (Photo credit: CalWave)

system. The project was supported by a US Department of Energy (DOE) award with the goal of demonstrating CalWave's scalable and patented xWave technology as a cost-effective, sustainable solution for power generation. Initially, the demonstration was contracted to run for six months, but was extended for further data collection based on high reliability of the system and the need for zero interventions during operations.

Not only does the demonstration represent California's first at-sea, long-duration wave energy project, but it also serves as a critical step toward proving wave power as a commercially viable renewable resource.

CalWave's pilot verified its xWave system as effective for overcoming the key challenges of performance, reliability, survivability, and cost. The xWave system validated the efficiency of its novel control mechanisms, achieving its intended state of fully autonomous operations in November 2021 and demonstrating over 99% system uptime throughout the deployment. A fully submerged design enabled the technology to survive several major storms, including two representative of the largest storms in a typical 10-year period. The xWave's novel wave load management mechanisms allowed for rapid and effective reduction of storm loads on all parts of the system, ultimately proving that structural overdesign is not needed for performance and cost-efficiency. The advanced controller and onboard sensors enabled continuous health monitoring and remote inspections through a web-based portal. A subsea cable exported the power and data generated to the Scripps Institute of Oceanography research pier.

Environmental monitoring data was also gathered in collaboration with the Pacific Northwest National Laboratory's Triton Initiative, and the third-party findings reported no visual or acoustic impacts of the technology on surrounding marine ecosystems.

THE NEXT STEPS FOR CALWAVE

In January 2022, CalWave was awarded the single largest award of \$7.5 million from the U.S. Department of Energy's latest \$25 million commitment to accelerate ocean energy development to further develop their xWave technology for use on local energy grids and microgrids.

CalWave has been contracted to build a 100 kilowatt version of the xWave architecture for a two-year deployment off the coast of Oregon at PacWave South, the nation's first accredited, grid-connected, pre-permitted wave energy test facility.

OPPORTUNITIES FOR SCALING & ACCELERATION

CalWave is committed to providing reliable, cost-effective wave energy technology for sustainable energy access, and is continuing to follow the US DOE's product commercialization roadmap to de-risk and scale the xWave.

While testing wave energy converters in real ocean conditions is essential for ensuring that devices will operate as expected when deployed without requiring significant capital expenditures or additional time for commissioning, moving beyond the demonstration stage will be the next big hurdle for developers to overcome.

At this inflection point, it's important to consider the economic and social opportunities for both public and private sectors alike in scaling proven wave energy technologies to a size that makes them economically viable.

» **Offshore wind and wave energy can serve as complements to boost power availability, reliability, and cost benefits.** The opportunity to combine wind and wave farms should be explored as a means of increasing the combined capacity factor of technologies while sharing the same electrical export infrastructure for year-round baseload renewable energy production.

» **Public policy is creating favorable conditions for wave energy industrialization.** For example, the US Inflation Reduction Act provides investment certainty for new marine energy infrastructure. This recently signed legislation creates a 10-year investment tax credit (ITC) / production tax credit (PTC) framework for marine energy projects, offers parity for marine energy under the existing PTC framework, with ITC opt-in, through 2024, and lowers the threshold for projects to qualify for the PTC from 150 kilowatts to 25 kilowatts.

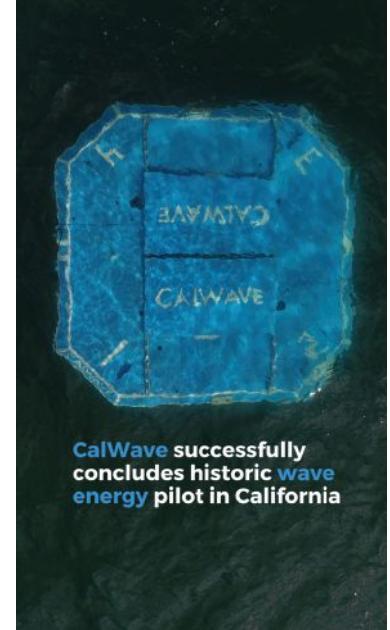
» **Wave energy can become a reliable job creation machine.** Despite the lingering effects of COVID-19 and the growing energy crisis, worldwide renewable energy employment increased by 700,000 new jobs, reaching 12.7 million last year, according to the International Renewable Energy Agency. For wave energy to reach its projected penetration rate, millions of local jobs will need to be created.

» **Implementing wave energy at scale will help close the emissions gap and support achievement of the world's sustainable development goals.** Ocean-based clean energy solutions are projected to displace 1.9 gigatons of greenhouse gas emissions annually by 2050. Wave energy will presumably make up the majority of sector displacements as the largest untapped, power-dense resource on the planet.

For more information, visit: www.calwave.energy.



» CalWave concluded its 10-month open-ocean wave energy pilot in July 2022. (Photo credit: CalWave)



CalWave successfully concludes historic wave energy pilot in California

AQUATERRA AND SEAWIND TO DEVELOP WORLD'S LARGEST OFFSHORE FLOATING WIND AND GREEN HYDROGEN PROJECT

Aquaterra Energy, a leader in global offshore engineering solutions, recently announced an agreement with Seawind Ocean Technology, a leading turnkey supplier of floating and bottom fixed offshore wind assets, to co-develop the world's largest offshore floating wind and green hydrogen production project, named HyMed, with 3.2 GW of production expected by 2027 in Italian ultra-deep waters.

The project is currently in its first phase of permitting, with the grid connection and the environmental impact assessments well under way. The wind and hydrogen offshore assets are planned to be developed and constructed by both Aquaterra Energy and Seawind in Italy, opening up thousands of qualified jobs. Aquaterra Energy will provide its offshore engineering and green hydrogen production expertise to ensure the right approach and solutions are chosen to drive the development forward. This will be complimented by Seawind's multiyear expertise on floating offshore wind technology. The collaboration will provide a unique offering and act as a template for future offshore renewable energy projects between the companies including a highly impactful 300 MW exclusively hydrogen production project in southwest Greece named "Icarus."

Initial field development of the first asset called HyMed is expected to produce 3.2 GW of electricity, of which more than 1 GW will be green hydrogen once production units are fully operational. The project partners expect to transport the green hydrogen onshore by pipeline or by vessels to global markets when complete. Hydrogen is at the heart of the energy transition in Europe and this project will leverage the wind electricity and hydrogen markets, starting in Italy.

Anne Haase, Renewables Director at Aquaterra Energy said: "With governments and business recognizing the value of hydrogen as a vital resource for net zero initiatives, energy security, and guarding against volatile natural gas prices, we are hugely excited by the opportunities for production presented by this new partnership. Seawind's fully

integrated and scalable floating wind model offers a clear path to cost-effective industrial scale production—and we are delighted to be able to provide the final piece of the production puzzle for it."

The project will enable Aquaterra Energy to build on expertise established through its previous work on a fully-scalable offshore green hydrogen production model, and apply it to Seawind's unique approach to floating offshore wind, which could significantly accelerate the production process.

Dimitrios Moudouris, CEO at Seawind Ocean Technology said: "We are pleased to partner with Aquaterra Energy in these highly impactful projects in Italy and Greece. We consider the Mediterranean to be the best area where significant offshore wind projects can be developed and cross-border synergies can be made, serving Europe and MENA. Aquaterra Energy has displayed its expertise and commitment to green hydrogen through existing projects and we identified an experienced partner to enable us to accelerate our ambitious offshore wind and hydrogen project development strategy."

"Aquaterra Energy has developed the most advanced and highly reliable offshore green hydrogen production concept in the market, understands the wider offshore energy marketplace and the range of options and solutions to off-take offshore green hydrogen. Culturally, we feel that Seawind and Aquaterra Energy are a strong fit as our partners as they possess the agility and specialist knowledge to complement our approach to scalability and to accelerate the energy transition. At Seawind we are focused and committed to our vision and mission; to redefine the offshore wind industry."



INEOS AGREES FID ON SOLSORT O&G FIELD DEVELOPMENT IN DANISH NORTH SEA

INEOS and its partners in the Solsort Unit, Danoil and Nordsøfonden, have agreed on Final Investment Decision regarding the development of the Solsort West field in the Danish part of the North Sea after having received the approval of the development from the Danish Energy Agency.

The Solsort development consist of two wells. The Solsort oil and gas will be produced via the Syd Arne installation operated by INEOS. First oil and gas from Solsort is expected in Q4 2023. The production from Solsort will

be a valuable contribution to Danish and European energy supply and self-sufficiency. When Solsort starts production the gas from INEOS will cover up to 10% of the Danish gas consumption.

David Bucknall, CEO of INEOS Energy, said: "The sanction of the development of Solsort fits well with our overall investment strategy in Denmark of optimizing already existing infrastructure to support security of supply and at the same time investing into storage of CO2 to support the green transition. There

will be a need for oil and gas for many years to come but at the same time we need to find new and green solutions. INEOS has the ambition to provide both."



» Syd Arne installation. (Photo credit: INEOS)



» Bourbon's new wind division plans to serve fields from 250 MW – 1 GW. (Photo credit: Bourbon Wind)

BOURBON SETS UP NEW WIND DIVISION DEDICATED TO OFFSHORE WIND

After more than 10 years of installation of the main floating wind farm prototypes in Europe, Bourbon has announced the setup of a new division dedicated to offshore wind. This division will support the group's ambition to become a major player in the entire value chain: pre-studies, transport and installation services, field maintenance, floaters repair and personnel transport.

This new division will lead Bourbon's strategy and the implementation of its ambitious wind development plan to serve fields from 250 MW to 1 GW by 2030. Bourbon Wind will coordinate all the group's activities in this field, creating important cross-functional synergies:

- Bourbon Subsea Services for development studies, turnkey construction contract tenders (EPCI), as well as subsea inspection services (ROV);
- Bourbon Mobility for personnel transportation tenders (CTV);
- and Bourbon Marine & Logistics for ship management, maintenance services (SOV) as well as logistics base management.

The division will be headed by Patrick Belenfant (member of the Group Executive Committee), who has 30 years of experience in the energy and subsea sectors. He and his team initiated the first floating wind turbine installation off the coast of Portugal in 2011.

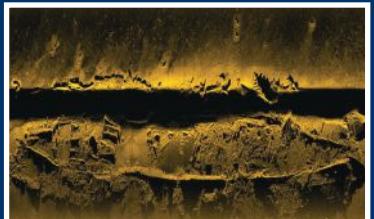
"With our unique experience in building, installing and maintaining prototypes and pilot farms, our ambition is to actively participate in the development of the floating wind industry with our current and future partners. We have a detailed understanding of the maritime constraints and risks for the installation and management of wind turbines. By creating this division, we will focus more on the industrial challenges of large-scale wind farms deployment," said Patrick Belenfant, CEO of Bourbon Wind.

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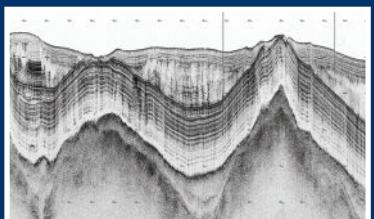
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SONAR SYSTEMS

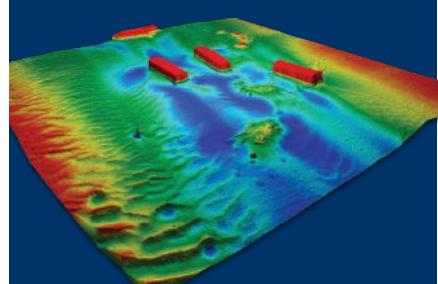
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BAKER HUGHES, MOCEAN ENERGY AND VERLUME SIGN TRIPARTITE MOU

Baker Hughes, Mocean Energy and Verlume have signed a triparty memorandum of understanding (MoU) to identify and discuss potential opportunities for collaboration on integrated wave energy and subsea energy storage solutions for the emerging subsea clean energy market.

In the drive towards lower carbon operations, the MoU will explore the opportunities for integrated wave energy, energy storage and power delivery solutions to facilitate the electrification of subsea assets as well as the utilization of renewable energy within harsh, deep-sea environments.

Over an initial two-year period, the MoU will see the three parties utilize and share their combined capabilities within the subsea market to enable the deployment of a reliable, uninterrupted power supply located at point of use for cost-effective and market-competitive electrical power solutions. This could be within temporary, permanent or back-up use cases, including for charging systems for underwater vehicles and subsea production control systems.

Within the scope of the MoU, Baker Hughes will bring its expertise as a leader in the design and manufacture of subsea production equipment, by supplying subsea hardware including controls

systems, power systems and other ancillary equipment. Verlume's scope of supply will focus on the design and delivery of its Halo subsea energy storage system and Mocean Energy will be concentrated on the design and delivery of its Blue Star wave energy converters.

All parties are currently involved in Renewables for Subsea Power, a project combining Mocean Energy's wave energy

converter and Verlume's Halo to deliver low carbon power and communication to subsea infrastructure such as Baker Hughes' subsea controls equipment. This project, which will undergo onshore testing in late 2022, is a demonstration of the collaboration which has already taken place between the three signatories, and the types of opportunities that can now be further explored as part of the MoU.



» L-R: Richard Knox of Verlume, Romain Chambault of Baker Hughes, and Cameron McNatt of Mocean Energy.

C-KORE DEPLOYS SUBSEA TESTING UNIT NO. 600 IN THE GULF OF MEXICO

C-Kore Systems recently deployed their 600th subsea testing tools. This milestone event occurred for an installation campaign in the Gulf of Mexico, one of C-Kore's growing markets and included their new Subsea Optical TDR tool.

C-Kore's subsea testing units have gained worldwide acceptance with both operators and contractors for the cost-savings the tools provide,

the reduction in offshore personnel required for testing and the simplification they bring to subsea operations.

So far C-Kore tools have been responsible for the installation of 50 assets (umbilicals) and have been used to find more than 230 faults in existing subsea fields for a total of 10,000 days of tool hire. The company is pleased to have continued to grow its customer base to over 70 clients

by combining cost-saving technology with exceptional customer service.

This mobilization included a wide range of the company's testing tools. Their latest product, the Subsea Optical TDR unit now allows customers to easily test their fiber optic lines subsea. The C-Kore Cable Monitor units saves customers significant time and money by providing quick and accurate readings on the insulation

resistance and continuity of electrical lines. The Subsea TDR unit localizes faults with an accuracy of 15 cm, and the Pressure Monitor data-logs the hydraulic pressure of the umbilical hoses.



» C-Kore's Subsea Optical TDR tool. (Photo credit: C-Kore)

DECOM ENGINEERING DIVES INTO SUBSEA CHOPSAW DEVELOPMENT

Decom Engineering (Decom) is developing a new lighter Chopsaw capable of cutting piping and infrastructure in excess of 30" following a successful project on the Pioneering Spirit heavy-lift vessel on behalf of offshore contractor Allseas.

Decom was part of the project team commissioned to remove Repsol Norge's 30,000-tonne Gyda platform in the North Sea—providing cutting expertise to safely remove conductors from the seabed.

The decommissioning specialist's C1-24 Chopsaw conducted clean cuts on 20" conductors as part of a wider campaign to remove and transport the Gyda's platform jacket to Aker Solution's disposal yard in Norway.

Conductor removal is a new market for Decom and following the Gyda workscope the firm has invested in developing an updated Chopsaw which will be manufactured primarily from aluminum and capable of operating in more restricted spaces.

Sean Conway, Decom Engineering Managing Director, said: "The lessons learned from working on the Gyda project was extremely valuable and we appreciate Allseas' willingness to support new technologies and young innovative companies.

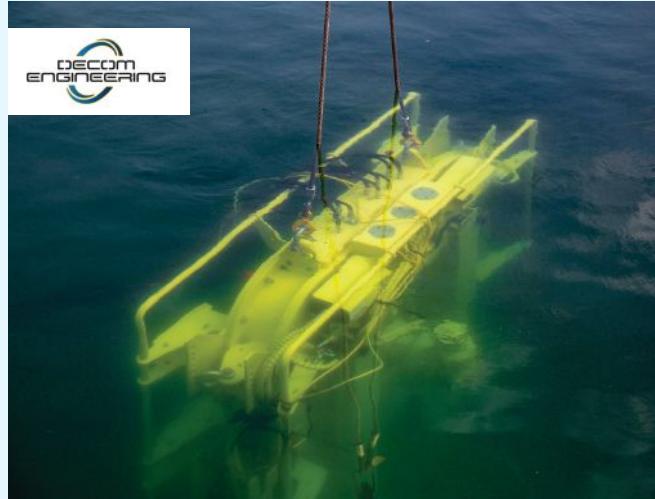
"We believe we can offer contractors involved in conductor removal operations safe, efficient and environmentally friendly cutting options in what is often challenging conditions. We have committed to adapting our C1-24 Chopsaw design to be even more versatile and the updated model will be capable of cutting a minimum of 30" infrastructure, with the weight of the saw significantly reduced due to a high aluminum content.

"The main challenge on this type of project is the tight space in between each conductor but the new saw has been designed with this in mind. The weight-saving measures also reduce the need for buoyancy, in addition to being self-supporting when attached to the conductors."

Decom has designed and developed a range of cold cutting saws which have been deployed on a variety of energy sector decommissioning projects in the North Sea, the Gulf of Thailand and offshore west Africa.

Recent technical trials at the National Hyperbaric Centre in Aberdeen have demonstrated that Chopsaws can perform cutting operations in water depths of up to 800 meters and are adept at accessing difficult to access subsea infrastructure.

Headquartered in Northern Ireland, earlier this year Decom invested £250,000 on a 6,000 sq ft equipment testing and storage base near Aberdeen to target North Sea clients. The facility is managed by decommissioning sector expert Andy Clucas, who was recently appointed to build relationships with potential UKCS customers.



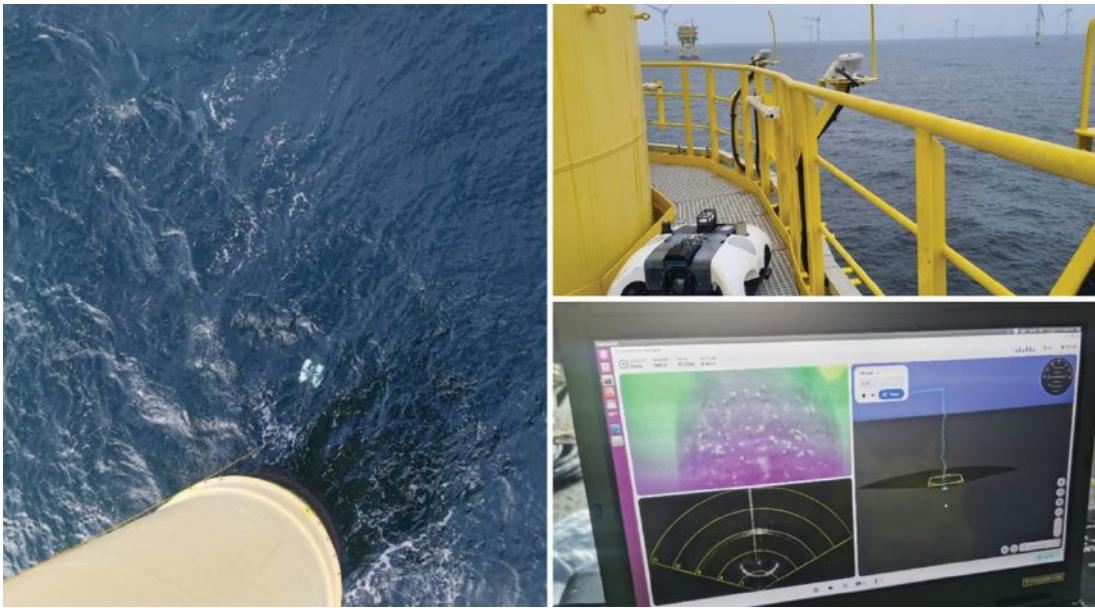
» Decom Engineering's C1-24 chopsaw undergoing trials at the National Hyperbaric Centre, Aberdeen. (Photo credit: Decom)



» Decom Engineering Chopsaw deployed on the Gyda platform removal project. (Photo credit: Decom)



» A close-up of the Chopsaw. (Photo credit: Decom)



» A.IKANBILIS is a hovering AUV designed and manufactured by BeeX in Singapore and provided to European customers by Subsea Europe Services. (Photo credit: BeeX/Subsea Europe Services)

TRIALS OF HAUVE CONDUCTED AT NORDSEE ONE OFFSHORE WINDFARM

Trials of the state-of-the-art A.IKANBILIS Hovering Autonomous Underwater Vehicle (HAUVE) conducted by Nordsee One GmbH and supported by manufacturer BeeX Pte Ltd and European partner Subsea Europe Services GmbH at the Nordsee One offshore wind farm in the German North Sea have demonstrated true autonomous operation of an underwater inspection vehicle for the first time ever.

The trials, which took place this September, have proven an important milestone in the development and application of the unique A.IKANBILIS, which features an advanced AI-powered Autonomy Engine that enables true 'launch and leave' operation for diverse underwater inspection tasks. With tethered or untethered operations, A.IKANBILIS optimizes today's standard recurring underwater inspection workflows, reducing associated equipment and manpower costs, while increasing capacity and safety.

During the trials, the Nordsee One team tasked an A.IKANBILIS HAUVE to inspect monopile foundations including Impressed Current Cathodic Protection (ICCP) anodes and Cable Protection Systems (CPS). On launch, the vehicle was able to complete its objectives without a human in the loop, autonomously choosing the safest, fastest and most effective way to approach its mission parameters. The ability to make these decisions without operator input is possible due to the AI continuously learning from the suite of tightly integrated sensors, allowing intelligent adaption to complex and changing environments, such as tides, currents and visibility.

The inspection was carried out flawlessly and independently of any large on-site support vessels usually required for ROV- or diver-based underwater inspections, and with minimal specialised

personnel in attendance. The geo-referenced reporting of the monopile condition and 3D CPS inspection was provided to the client in near real-time via an integrated cloud-based platform, reducing the typical weeks long wait for traditional reports to mere seconds.

Jan Schmökel, Balance of Plant Engineer at Nordsee One GmbH, said: "While we hear a lot about remotely-operated and autonomous technologies for marine data acquisition and underwater inspection, this is the first time we have witnessed a platform actually think and react accordingly to ensure an optimal approach based on the prevailing conditions. The speed and quality of the data reporting are unprecedented, and we are delighted to be trialling these innovations to achieve maximum value at our windfarms."

Grace Chia, Co-Founder and CEO of BeeX said: "The unprecedented growth in Offshore Wind is key in meeting the world's energy demands in a sustainable way. By 2025, we expect BeeX's fully autonomous systems to help wind farm developers and operators reduce costs and risks to a fraction of today's, from consenting to end-of-life."

Sören Themann, CEO of Subsea Europe Services, the European sales and service partner for BeeX said: "The unique Autonomy Engine enables cost-efficient, launch and leave, carbon-neutral autonomous operation that will help the wind energy industry to install and maintain a huge influx of underwater infrastructure planned before 2030. This first demonstration on an operational wind farm is the launchpad for mainstream application within a few short years, enabling more asset owners to lower their costs, risks and carbon footprint."

VOYIS INTRODUCES REVOLUTIONARY INSIGHT NANO COMPACT LASER SCANNER ULS 100

Voyis Imaging Inc. (Voyis) established itself as a pioneer of subsea inspection technology with the commercialization of the first underwater laser scanner, the ULS-100.

With over a decade of successful projects completed worldwide, Voyis has now decided to fuse customers' feedback with the latest sensor technologies to deliver the next generation compact underwater laser scanning product—with higher data resolution, faster data capture, and greater control than ever before. The Insight Nano is the latest addition to Voyis' Insight laser scanner family.

The Insight Nano has a compact and robust design capable of generating high-resolution 3D modelling in the most difficult-to-reach places, whether

the target is on the ocean floor or in a municipal water pipeline. The Insight Nano provides operators with a complete visual understanding with dimensional accuracy for confident decision making in every inspection environment.

The Insight Nano is the pinnacle of compact 3D laser scanning without requiring any auxiliary sensors and capable of continuous high-speed 360-degree scanning. This robust sensor integrates seamlessly with ROVs and Crawlers, enabling its use in areas humans would otherwise be unable to reach.

Capable of generating point clouds with a sub-millimeter resolution in real-time, the Insight Nano is an essential tool for customers requiring immediate results. Point cloud models generated by the



» This Insight Nano sensor integrates seamlessly with ROVs and Crawlers. (Photo credit: Voyis)

Insight Nano will enable operators to perform predictive maintenance by creating accurate Digital Twins of subsea assets. In addition, it will offer peace of mind by providing a deeper understanding of the current state of your critical infrastructure.

The revolutionary Insight Nano includes four times greater resolution than its predecessor, with 2064 data points per laser line, offering the world's highest resolution compact laser scanner, and is ideally suited subsea inspections and surveys that require confident decision making in confined spaces.

Enabling Better & Faster Maritime Decisions

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- Long Range
- High Capacity
- Edge Compute
- Minimal Footprint
- Unmanned Operations

DATA MANAGEMENT

- Browser Based Visualization
- Cloud Based Accessibility
- Edge Data Mobility
- Search, Retrieve & Share Capabilities
- Multi-format Compatible

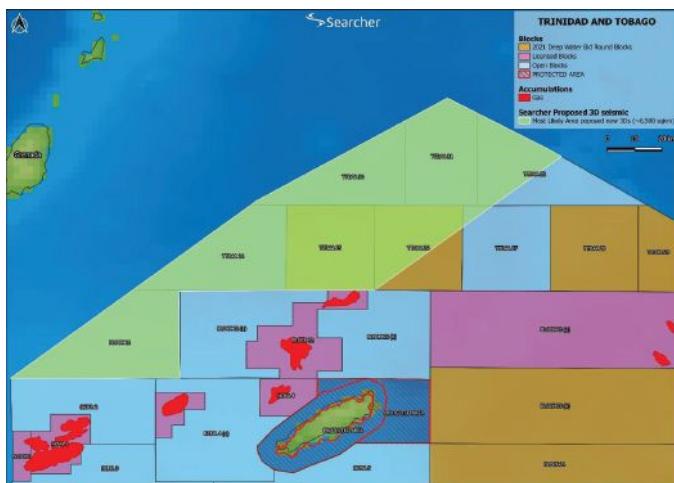
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TERRADEPTH

SEARCHER SEISMIC AWARDED MULTI-CLIENT 3D ACQUISITION IN TRINIDAD & TOBAGO

Searcher Seismic, a leading provider of global multi-client geoscience data, has announced the approval by the Government of the Republic of Trinidad and Tobago of Searcher's 6,500 km² Tobago Trough 3D acquisition project.

Off the North Coast of Tobago lies the Tobago Trough, a Tertiary basin where high quality shallow marine sandstones have been found to reservoir giant gas reserves. Exploration and appraisal in the late 1990s brought the North Coast Marine Area (NCMA) gas fields (Hibiscus, Poincettia and Chaconia) into production, with gas being exported via Trinidad and Tobago's Atlantic LNG infrastructure.



» The Tobago Trough, a Tertiary basin off the North Coast of Tobago.
(Image credit: Searcher Seismic)

Subsequent development of the shore-face sand reservoirs has been tremendously successful, however very little exploration in the Tobago Trough has been undertaken to back-fill these now produced reserves. 2D seismic in this basin indicates that additional sequence stratigraphically controlled shoreface, channels and pro-delta fans lie in stratigraphic and structural stacked traps in the Tobago Trough, however, 3D data is required to delineate and explore for these targets.

The strategy of exploring this area to provide future development options that will feed into Trinidad and Tobago's LNG infrastructure is to increase LNG production into the growing global market where LNG provides tactical and strategic support to energy security. Additionally, LNG gas that replaces the use of coal for power generation is critical to global low carbon energy sustainability initiatives. Searcher is therefore leading the hunt for low-carbon energy in Trinidad and Tobago by seeking new gas resources close to the existing LNG hub.

Mr. Alan Hopping, Searcher's GM of Business Development, said: "Modern 3D seismic acquired in the Tobago Trough will offer such a security of assessment that the exploration of the prospectivity can be undertaken in a planned and considered manner. This will maximize investment efficiency and ensure production is optimized within the LNG export-infrastructure."

The LNG trains comprising the Atlantic LNG facility have a production capacity of 15 mtpa of LNG. "The opportunity to explore shallow targets in Tertiary Deltas for seismically visible gas is a rare and exciting opportunity today, which we are happy to pursue with the aid and support of the authorities in Trinidad and Tobago," added Mr. Hopping.

Searcher's acquisition is planned as a 6,500 km² wide-tow long streamer acquisition and processed through to Pre Stack Depth Migration. The acquisition will commence as soon as an environmental impact assessment is complete and is currently scheduled for Q1 2023. Data will be available in Q4 2023 in time for the next Deep Water Licensing Round.

TECHNIPFMC AWARDED SUBSEA CONTRACT FOR SHELL'S JACKDAW DEVELOPMENT

TechnipFMC has been awarded a significant engineering, procurement, construction and installation (EPCI) contract by Shell plc for the Jackdaw development, located in the United Kingdom North Sea.

The tieback will use pipe-in-pipe technology, which is designed for high pressure, high temperature use.

Jonathan Landes, President, Subsea at TechnipFMC, commented: "We're excited to embark on this significant project together in the UK North Sea. Our strong technical record and our ability to design, engineer, construct and install were key to our success in winning this award."



» Shell's Shearwater platform in the North Sea. (Photo credit: Shell)

NEW UNDERWATER DRONES BEING DEVELOPED BY LEIDOS

Leidos is developing several new unmanned underwater vehicles (UUVs) that will feature advanced artificial intelligence (AI), sensing capabilities and more.

These vessels, along with Leidos-developed unmanned surface vessels (USVs) *Seahawk* and *Sea Hunter*, can perform a growing number of jobs without hazarding human divers.

They will feature technology to support military and commercial activities alike. U.S. adversaries are collectively spending billions each year in the undersea domain, including unmanned platforms, threatening U.S. forces and undersea infrastructure.

"We're in the middle of a momentous change in warfare," said Leidos executive and retired Rear Admiral Nevin Carr. "The shift toward autonomy, especially naval AI, is potentially as impactful to the future of warfare as the advent of aviation 100 years ago."

Leidos is currently developing *Viperfish*, which will be one of the most densely packed and technologically advanced underwater vehicles ever built, according to Leidos Maritime CTO and retired Navy officer Chuck Fralick.

Viperfish, based on the L3Harris Iver4 900 UUV, will support the U.S. Navy through oceanographic sensing, data collection, mine countermeasures and more.

"Over the last few years, we've reached a place where we can realize the promise of UUVs by integrating reliable AI, powerful lithium batteries, synthetic aperture sonar sensors (SAS) and greater onboard processing power," Fralick said. "We believe *Viperfish* will be an elegant confluence of all of those pieces at just the right time for the U.S. Navy."

Along with Nauticus Robotics, Leidos is also developing a larger UUV (pictured above)



» A larger UUV being developed by Leidos and Nauticus Robotics for undersea exploration jobs. (Photo credit: Nauticus Robotics)

for undersea exploration jobs that can be dangerous or impossible for human divers.

"Both vessels are significant projects for Leidos, which is one of the leaders in autonomous oceangoing systems," Carr said.

Both experts said that over time, UUVs will be capable of completing longer and more challenging missions, adapting fluidly to changing parameters and mitigating subsystem failures.



SENSORS FOR:
Ocean, Harbors
Intracoastal
Lakes, Ponds
Wave Tanks

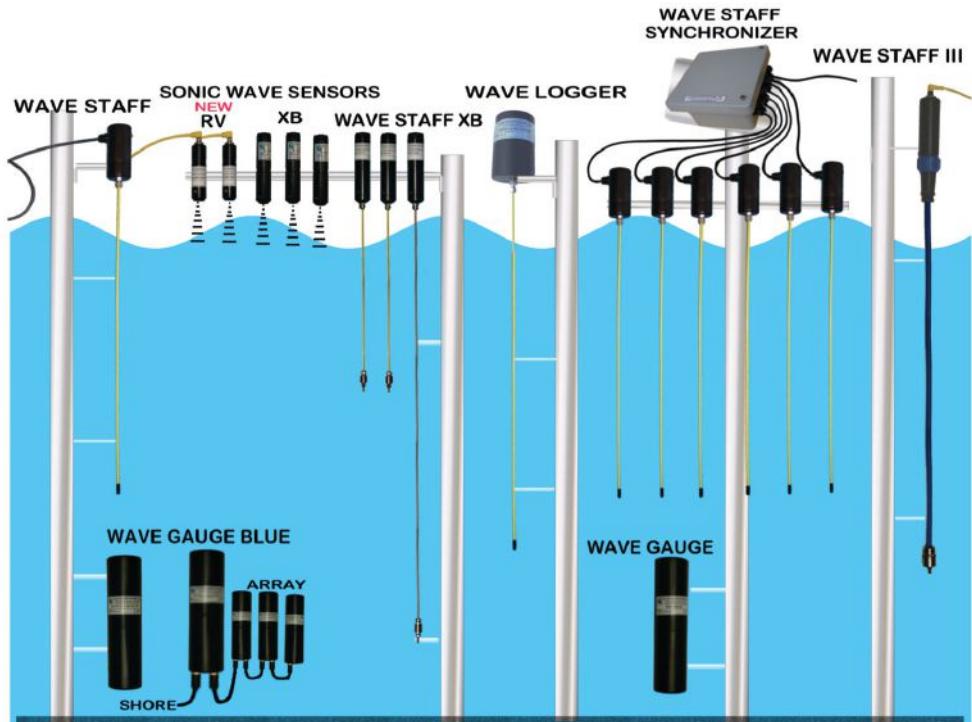
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Tides
Levels

DATA VIA:
Cable
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Wireless

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MODUS SUBSEA SERVICES AWARDED WORLD-FIRST RESIDENT SUBSEA DRONE CONTRACT BY EQUINOR

Modus Subsea Services, a world leader in the application of Hovering Autonomous Underwater Vehicles (AUVs/subsea drones), has achieved a world-first contract with Equinor for the provision of underwater intervention drone missions at their Johan Sverdrup field.

Modus has been awarded the ground-breaking contract after a comprehensive and competitive tendering process wherein the business highlighted its technological and operational capability.

The contract, which will run from 2023 to mid-2024, is for underwater intervention drone operations for the Johan Sverdrup field, a pioneer in the use of new technologies, and will see one of Modus' Saab Sabertooth HAUVs resident in field for a significant period. The offshore operations will involve in-field autonomous surveys and light interventions with over the horizon control from Modus' Command

and Control Centre at its head office in Darlington, UK.

Modus has been working on subsea residency with its fleet of HAUVs for some time and has accelerated its development in this area following a successful trial scope with Equinor in November 2021.

Residency, where the vehicle remains docked with a subsea docking station for charging and data transfer, will provide carbon-zero survey and IMR solutions that will improve sustainability, efficiency, safety and decision-making in the sector.



» One of Modus' Saab Sabertooth HAUVs.
(Photo credit: Saab Seaeye)

Ash Sheppard, Modus' Chief Strategy Officer said: "This is a significant and exciting contract award for Modus and I am proud of what was a real team-effort throughout this process. In recent months we have been transforming our business to focus exclusively on the next generation of subsea survey and IMR solutions and this project has been a key strategic target for us. Equinor is leading the way on tech solutions as part of its commitment to a low-carbon future and this contract has the potential to drive a paradigm shift in the industry."

Nick Tompkins, Modus CEO said: "This project will further demonstrate the major benefits of resident UIDs and we are excited to work with Equinor to provide a sustainable route to vastly improved operational regularity, consistent ultra-high-quality data, significantly reduced OPEX spend and increased safety."

TMC SUBSIDIARY NORI COMMENCES MONITORING OF THE ENVIRONMENTAL IMPACTS OF PILOT NODULE COLLECTION SYSTEM TRIALS

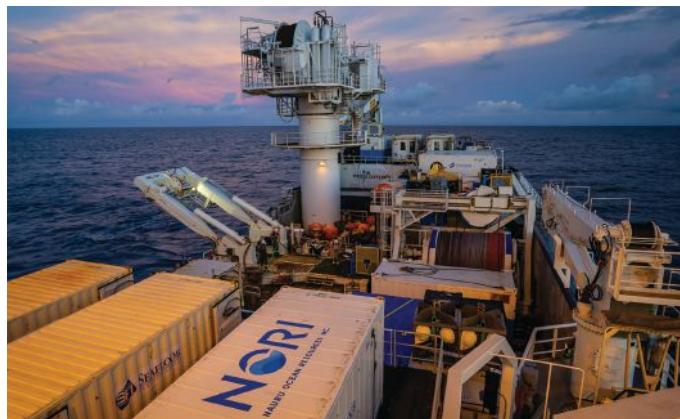
The Metals Company (TMC) recently announced details of the next phase of an extensive environmental baseline and impact monitoring campaign in preparation for the Company's subsidiary NORI's ongoing pilot nodule collection system trials in the NORI-D area of the CCZ.

Scientists recently conducted pre-disturbance monitoring studies on a sub-section of the NORI-D exploration area to establish an environmental baseline before NORI's offshore strategic partner, Allseas, tests a system consisting of a prototype nodule collector at the seafloor connected to a riser system to bring nodules to the surface production vessel, *Hidden Gem*.

Researchers use a range of high-tech equipment including bespoke tools developed by MIT, Scripps and Sequoia Scientific to characterize the behaviour of sediment plumes generated by the prototype collector on the seafloor; three dedicated moorings, current meters with acoustic modems to provide real-time seafloor current data and a large array of other specialized equipment which together represents the most extensive suite of instruments ever deployed for a single program in the deep ocean.

Having established a baseline of the NORI-D collector test area, scientists will proceed to monitor the environmental impacts of deployment and testing of the fully integrated nodule collection

system. They will also undertake post-collection surveys to compare the status of the environment before and after the test. The data collected, together with many terabytes of existing baseline data collected by NORI throughout 16 offshore campaigns, will form the basis of NORI's application to the International Seabed Authority (ISA) for an exploitation contract, which the Company expects to submit in the second half of 2023.



» Testing an integrated nodule collection system is a milestone event for the progression of ocean mining. (Photo caption: TMC)



CHECK THE TECH

BOATY MCBOATFACE: AUTOMATING MARINE SURVEY OPERATIONS

One of the more notorious Autonomous Underwater Vehicles (AUVs) in the field today is *Boaty McBoatface*, a name shared with the other five units in the National Oceanography Centre's (NOC) fleet of Autosub Long Range (ALR) vehicles. Within the *Boaty* (as the ALRs are affectionately known) fleet are two depth ratings, three of the ALRs are rated 1,500 m, and three at 6,000 m. They can travel thousands of kilometers to collect critical marine data on long-endurance missions—lasting several months—with the presence of a support vessel. *Boaty* is able to surface periodically and transmit data back to mission control via a satellite link.

BOATY AT A GLANCE

| | |
|---------------|---|
| Vehicle Type | » AUV category known as an Autosub Long Range (ALR) |
| Depth rating | » 6,000 m |
| Length | » 3.62 m long |
| Weight | » 700 kg |
| Mission range | » 2,000 km |
| Deployment | » Vessel or shore |
| Home | » National Oceanography Centre (NOC), Southampton, UK |

NORTH SEA DEPLOYMENT

One of *Boaty*'s most recent deployments was to conduct critical research on end-of-life oil fields off the coast of Shetland, UK. The campaign was designed to help monitor and protect the marine environment in the North Sea and support the offshore energy sector's transition towards net-zero targets.

The Autonomous Techniques for InfraStructure Ecological Assessment (AT-SEA) project, led by the NOC, seeks to test and validate the use of submersibles like *Boaty* for high-tech, low-impact environmental monitoring at target oil and gas structures in the region, including those in the decommissioned North West Hutton and Miller oilfields. The project team believe that this tech-inspired approach may eventually phase out some of the traditional surveying techniques used for environmental monitoring during the decommissioning process, which rely on dedicated vessels and teams of personnel offshore.

"The overall goal of the project is to improve the environmental protection of the North Sea at a reduced cost and impact to the environment. We aim to demonstrate how this leading robotic technology from the NOC could be used worldwide to support this crucial ocean monitoring," said Project lead for AT-SEA, Dr. Daniel Jones from the NOC.



» One of the five units in the NOC's fleet of Autosub Long Range (ALR) vehicles. (Photo credit: NOC)



» *Boaty* being towed to the launch site off Shetland as part of the AT-SEA project, testing high-tech AUVs for low-impact environmental monitoring of soon-to-be decommissioned O&G assets. (Photo credit: NOC)

THE PROSPECT OF REMOTE OPERATIONS

Boaty's capacity to autonomously gather data on the water quality, pollutants, and currents, as well as capture images of the seafloor safely and efficiently could lead to significant reductions to both emissions and overall operating costs.

"There are currently thousands of offshore oil and gas structures approaching the end of their operational life—approximately 500 in the UK alone—and this technology has the potential to redefine environmental assessment at decommissioning sites," added Jones.

Not only have recent ocean tech developments expanded the utility, range, and payload capacity of uncrewed assets like AUVs and USVs for marine survey and inspection, but economies of scale have drastically curbed the cost of either acquiring or leasing such vehicles, and this increased accessibility continues to support the viability of sustainable remote marine survey operations from a shore-based command.

Data from the North Sea will not only prove critical to the inspection of the environment around submerged structures and enable the detection of possible oil and gas seeps, but also to help the project team compare the efficiency and reliability of *Boaty*'s data acquisition to that of long-established industry standards.

ON&T is looking forward to reporting on the North Sea study once the data are made available.

NEXANS TO SUPPLY ØRSTED-EVERSOURCE OFFSHORE WIND FARM IN US

Nexans has announced the finalization of a second U.S.-based contract with Ørsted and Eversource to supply the export cable system for the Revolution Wind Farm.

Located more than 15 miles south of the Rhode Island coast and 32 miles east of the Connecticut coast, the project will connect the wind farm to the onshore grid.

The 704 MW Revolution Wind Farm will help both states achieve their ongoing commitments to develop offshore wind and address their energy needs, delivering electricity to more than 350,000



homes. By eliminating potential future emissions, the historic project will replace close to one million metric tons of carbon pollution—the equivalent of taking more than 200,000 cars off the road annually.

Revolution will be the third project to be delivered from our continuously expanding Charleston, South Carolina facility confirming Nexans leadership in the US market.

The agreement was signed in December 2019 to accelerate the energy transition in North America by bringing Nexans' industry-leading subsea cable technology to the U.S.

Ragnhild Katteland, Nexans' Executive Vice President, Subsea & Land Systems, stated: "Establishing our footprint in the United States and furthering our commitment to the U.S. offshore wind industry is at the core of our business operations. We have made several investments to deliver subsea transmission cables that are manufactured and installed in America, and the partnership with Ørsted and Eversource is the first step in bolstering supply chains with strong, local partners. We are committed to pushing the boundaries of what is possible as innovation is crucial to meet the needs of a territory as large as the United States. Closely aligning with our mission to electrify the future, Nexans is proud to support this important work in the clean energy sector and expedite our journey to net zero."

PRYSMIAN AWARDED TWO OFFSHORE WIND FARM SYSTEMS IN GERMANY

Prysmian Group has been awarded two major contracts for a total value in excess of €800 million including options by Amprion Offshore GmbH—a subsidiary of German transmission system operator Amprion—for the design, supply, installation, and commissioning of land and submarine cables for two offshore wind farm grid connection systems in Germany's North Sea, namely DolWin4 & BorWin4. The DolWin4 & BorWin4 projects will transmit together a power of 1.8 GW.

Prysmian will supply approximately 1,000 km of HVDC (High Voltage Direct Current) ±320 kV single core copper cables with XLPE insulation. The submarine cables will be produced in Pikkala, Finland and Arco Felice, Italy, and the land cables will be produced in Gron, France and Abbeville, USA. Prysmian will install the subsea cables with a variety of state-of-the-art vessels, ensuring lowest possible environmental impact. Delivery and commissioning for both projects is scheduled for 2028.

Each of the cable systems consists of 2 HVDC cables and can transmit 900 MW power. On the land side, the two systems run on a main part of the route in parallel trenches to the 300-km A-Nord underground cable corridor, a project awarded to Prysmian in 2020 by Amprion and which is currently in the execution phase. The subsea cables will run from the offshore platforms via the

national park "Niedersächsisches Wattenmeer", crossing the island Norderney before being connected to the onshore cables close to Hilgenriedersiel.

"This is Prysmian's first 320kV HVDC submarine project with Amprion Offshore GmbH, and remarks how Prysmian is consolidating its prominent role as a reliable partner in supporting Germany's energy transition, being involved in major infrastructure projects supporting growth of green energy usage. We are honored to work with Amprion to develop its first offshore wind project," said Hakan Ozmen, EVP Projects BU, Prysmian Group.

Prysmian is already playing an important role in supporting European energy transition, having been involved in key offshore wind farms projects like BorWin2, BorWin3, DolWin3, HelWin1, HelWin2, and SylWin1, Dolwin 5 (expected to be commissioned in 2023) in Germany; Borssele III & IV, Hornsea 2, Hollandse Kust Zuid 3 and 4 and Provence Grand Large in Europe, and Empire Wind in the US.

Prysmian
Group

OSBIT DELIVERS SWORDFISH CABLE TRENCHER TO JAN DE NUL

Osbit, the UK-based specialist offshore equipment supplier, has successfully delivered a state-of-the-art subsea trenching vehicle to Luxembourg vessel operator Jan De Nul.

The high-powered vehicle, named *Swordfish*, is a purpose-built cable burial tool for the efficient protection of the subsea cables that will be used on current and future wind farm projects.

Swordfish is powered by 1200kW of subsea electrical power, using a combination of direct drive and hydraulic distribution for maximum versatility in the application of the installed power to efficiently bury cables.

The vehicle can be quickly reconfigured into either jetting (high powered water fluidization of the seabed) or mechanical chain cutting modes to tackle a wide variety of soil conditions as found across

planned windfarms and export routes. In jetting configuration, versatile jetting tools and highly controllable water power allow high progress rates through sands and weak clays. In cutting configuration, high hydraulic drive power is supplemented by water injection to facilitate spoil transport to the high powered ejection system, all working together to achieve consistent progress through challenging soils.

A team of specialist Osbit engineers completed the detailed design, manufacture, assembly, and test of *Swordfish* in just over a year. The machine was delivered out of the company's assembly base at the Port of Blyth in Northumberland. Following its delivery, the trencher has been shipped to Belgium for mobilization and installation.

Neil Harrison, Director at Osbit said: "Our focused team of skilled engineers have performed tremendously and really pulled



» *Swordfish* can operate in either jetting or mechanical chain cutting modes. (Photo credit: Osbit)

together to produce a class-leading multi-purpose trenching vehicle in such a short space of time, despite ongoing global supply chain issues, and the hugely volatile market.

"We are pleased to offer the industry the best solution for their cable projects. A problem the industry is currently facing is that all the easy sites for wind farm installation are filled, and now installation companies require specialist equipment like *Swordfish* to tackle more challenging soil conditions, in an economical and efficient manner. This new piece of equipment has excellent capabilities and can operate in a wide variety of ground conditions.

"This project has enabled Osbit to further strengthen our exports of specialist equipment to mainland Europe and it has been great collaborating so closely with Jan De Nul Group throughout this project."

Jan Van De Velde, Manager Newbuilding Department at Jan De Nul Group, added: "The *Swordfish* makes the perfect addition to our existing fleet of trenching vehicles protecting the cables installed by our cable installation vessels. Thanks to its high power, *Swordfish* can bury the cables deeper and at higher progress rates. And thanks to its innovative mechanical chain cutting configuration *Swordfish* can also tackle more challenging soil conditions, including hard clays up to 400 kPa. The delivery of the *Swordfish* complements our Cable Installation Vessels *Connector* and *Isaac Newton*, arming Jan De Nul Group for the energy transition of tomorrow. We look back at a fruitful cooperation with Osbit Ltd. (UK) in completing this industry leading solution for cable burial projects."

HEXATRONIC GROUP ACQUIRES ROCHESTER CABLE

Hexatronic Group AB has signed a binding asset purchase agreement to acquire all business activities of Rochester Cable from TE Connectivity (TE) for an enterprise value of US\$ 55 million.

Rochester Cable is a recognized leader in the design and manufacture of electro-optical cables for operation in harsh environments. The cables are highly engineered to meet specific requirements in demanding industries such as oil and gas, sensing, defense, oceanographic, and subsea applications.

hexatronic

The agreement broadens Hexatronic's offering within fiber optic submarine communication cables to include dynamic working cables that can transmit electrical signals and power in addition to transmitting optical signals. The electro-optical cables can accommodate extreme water depths to 6,000 meters and connect a variety of sensors, equipment, and remotely operated vehicles.

Completion of the transaction is subject to regulatory approvals and is expected no later than March 31, 2023.



» Lumen establishes a new subsea fiber route between New York and Bude, Cornwall in the U.K. (Image credit: Lumen)

LUMEN INVESTS IN ITS SIXTH ON-NET ROUTE ACROSS THE ATLANTIC

One year after Lumen Technologies established a new subsea fiber route between the U.S. and France, the company is again significantly increasing network capacity and diversity.

Lumen is now investing in a fiber pair on Grace Hopper, a subsea cable system spearheaded by Google, between New York and Bude, Cornwall in the U.K. The Grace Hopper system will use Lumen landing station and infrastructure services at both locations.

"Data flow and capacity demands don't know boundaries. The bandwidth explosion across continents is real and we're meeting it head on by investing in new subsea cables," said Laurinda Pang, Lumen President of Global Customer Success. "The Grace Hopper system is part of Lumen and Google's long history of collaboration. Together, we're building communications infrastructures for secure and reliable delivery of digital enterprise and consumer services around the world. We are pleased to be using our landing stations at these locations, and excited to add another end-to-end intercontinental connection to the Lumen network—one of the most deeply peered networks in the world."

Lumen has owned and operated global subsea networks for more than 20 years.

The company has a comprehensive trans-Atlantic subsea portfolio with six on-net diverse fiber routes, including Dunant, a Google subsea system. Dunant connects Virginia Beach in the U.S. with Saint-Hilaire-de-Riez on the French Atlantic coast. Lumen has an on-net route utilizing Dunant between Richmond, Virginia and Paris, France.

Global businesses and wholesale providers will have access to secure, diverse trans-Atlantic network options connecting to Lumen's global 450,000 route fiber mile network.

The Wavelength capacity Lumen will offer on the Grace Hopper subsea cable can be scaled to meet increased customer demands for years to come while also supporting Lumen's own IP, Voice, and CDN networks.

According to the U.S. Chamber of Commerce, data flows are the lifeblood of the U.S.-Europe trade and investment partnership, with more data flowing between the two continents than anywhere else in the world. Data flows are essential to small and large businesses and support global financial systems, medical research, cybersecurity efforts, and burgeoning global demands for high quality content.

Lumen is taking orders now on Grace Hopper which will be active and ready to deliver services in October.



» Laurinda Pang, Lumen
President of Global Customer Success

ROTECH SUBSEA DELIVERS CHALLENGING WORKS AT NORTH SEA OFFSHORE WIND FARM

Rotech Subsea has completed key cable de-burial, cut and recovery works at North Sea offshore wind farm (OWF) for a global dredging and marine contractor.

Rotech Subsea deployed its state-of-the-art RS2-3 Hybrid CFE tool to complete the de-burial of approximately 500 m of cable, with its proprietary RSG-C tool completing the cable cutting at both ends and recovery to ship's deck.

Operating in water depths of 12-15 m, Rotech's RS2-3 was launched into the North Sea by vessel crane where it was suspended, traveling along

the half a kilometer of cable to complete de-burial operations. With a total excavation depth of 2 m required, the depth was monitored in real time using a tool-mounted sonar imager, with the de-burial completed in two passes.

Speaking about the successful operation, Rotech Subsea Director of Subsea, Stephen Cochrane, commented: "With hard soils expected, this promised to be a challenging project. In preparation we deployed an extra RS2 excavator to have on standby to give the option of using the tools in twin 'TRS2' configuration to give maximum

flow. Despite hard, sticky clay experienced, the works were carried out in just two passes, one with the RS2-3 hybrid solution, which boasts a maximum outlet pressure of 300kPa and a max jet flow of 4000L/s, and one pass with the TRS2 configuration capable of 8000L/s of flow."

Launched from the vessel stern, Rotech's bespoke RSG-C spread of equipment grabbed, cut and recovered the de-buried cable to deck successfully and safely.

Rotech Subsea's in-house research, development and engineering team has created a suite of 18 sector-leading non-



» RS2-3 Hybrid CFE tool was deployed to complete the de-burial of approximately 500 m of cable. (Photo credit: Rotech Subsea)

contact CFE, Suspended Jet Trenching tools. With enhanced capabilities, Rotech Subsea's CFE suite of tools is firmly established as the method of choice for offshore wind farm cable trenching and excavation in Europe and beyond.

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UNMANNED MARINE SYSTEMS TAKE CENTER STAGE IN KEY DEMONSTRATION EXERCISES IN 2022



By George Galdorisi

*Director of Strategic Assessments and
Technical Futures at the Naval Information
Warfare Center Pacific*

During the first two decades of the 21st century, due to the exigencies of land wars in the Middle East and elsewhere, there was a rapid acceleration in the development and deployment of unmanned aerial systems and unmanned ground systems.

Today, in an era of heightened great power competition, unmanned maritime systems have begun to take center stage, and are now clearly on a development path to full integration. Like their air and ground counterparts, these unmanned maritime systems are highly valued because of their ability to reduce the risk to human life in high threat areas, to deliver persistent surveillance over areas of interest, and to provide options to warfighters that derive from the inherent advantages of unmanned technologies.

PUBLIC POLICY PLEDGES

The U.S. Navy has been investing in unmanned maritime systems for many years and recently, in official documents, Congressional testimony, and speeches, Navy officials have signaled a desire to hasten this development. In March 2021, the Navy released its *UNMANNED Campaign Framework* to set out how it intended to use unmanned systems—of all denominations—in the conflicts of tomorrow.

Still, all of this was without a great deal of specificity and showed little more than

an intention to harness this new technology. That changed dramatically in July of this year when the U.S. Chief of Naval Operations, Admiral Michael Gilday, released his *Navigation Plan 2022*. By publishing this document, he put a stake in the ground in announcing that the Navy of the future would be a "hybrid fleet" comprised of 500 vessels, including 350 crewed ships and 150 unmanned maritime vessels.

This is a sea change in Navy force structure plans that is without precedent in recent history and promises to have profound implications for the U.S. Navy over the coming decades.

While not broadcast as explicitly as the U.S. Navy CNO's *Navigation Plan 2022*, other nations have been leaning heavily into increasing the number of unmanned maritime systems in their fleets.

U.S. TECHNOLOGY DEMONSTRATIONS

What has given impetus to these plans in many navies has been an ongoing series of exercises, experiments, and demonstrations in which unmanned maritime systems have successfully performed an increasingly ambitious and complex series of missions, leading to greater confidence among parties that deem them instrumental to future at-sea missions.

Column space does not allow for a full cataloging of all these events over the past several years. That said, two that stand out as exemplars for international



» USV MANTAS operating with the U.S. Navy during IMX 22. (Photo credit: U.S. Navy)

cooperation in the development of unmanned maritime systems are International Maritime Exercise 2022 and Autonomous Warrior 2022. Both exercises advanced the science and the art of speeding efforts to make these emerging technologies part of the operational "kit" of several navies.

International Maritime Exercise 2022 (IMX 22), held under the auspices of U.S. Naval Forces Central Command, Commander Task Force 59 in the Arabian Gulf, focused on the integration of manned and unmanned vessels and included operations with a number of regional partners. Navies and Coast Guards of these nations worked to fully explore the capabilities of unmanned systems such as the Saildrone, the MARTAC MANTAS and Devil Ray, and many other USVs from participating nations.

This is how the Commander U.S. Naval Forces Central Command/Commander U.S. Fifth Fleet, Vice Admiral Brad Cooper, described the exercise: "Sixty nations are participating. Ten of those nations are bringing unmanned platforms. It is the largest unmanned exercise in the world...We're taking off-the-shelf emerging technology in unmanned, coupling with artificial intelligence and machine learning, in really moving at pace to bring new capabilities to the region."

What is noteworthy about CTF-59 operations in the Arabian Gulf is the fact that IMX22 was not a "one-off." Rather, manned-unmanned integration operations in the Arabian Gulf continue, with plans for IMX23 and beyond.

ROBOTICS DOWNTUNDER

Soon after IMX22, the Australian Defence Force (ADF) began Exercise Autonomous Warrior 2022 (AW22). This Royal Australian Navy-led, two-week exercise was built around a simulated, next-generation naval battlespace. Its purpose was to test and evaluate uncrewed, robotic, and autonomous systems in Jervis Bay, in the nearby East Australian Exercise Area, and the skies above.

Part of the impetus for AW22 was the Australian government's *Robotics Roadmap* which called for the ADF to cross-leverage robotic systems and AI. The report noted: "Robotics can be the force multiplier needed to augment Australia's highly valued human workforce and to enable persistent, wide-area operations in air, land, sea, subsurface, space and cyber domains."

AW22 participants included Australia, New Zealand, the United Kingdom, and the United States, and featured a total of thirty autonomous systems. The unmanned surface vehicles that were part of this two-week exercise included the Saildrone, MANTAS, and Devil Ray featured in IMX 22, the Atlas Elektronik ARCIIMS, the Elbit Systems Australia SEAGULL, and the Ocius Bluebottle.

AW22 showed the value of common hull, mechanical and electrical systems (HME) that the U.S. Congress is keen to ensure that the U.S. Navy takes into account when it designs and procures unmanned maritime systems. One demonstration featured the 12-foot MANTAS being carried by the 38-foot Devil Ray, something made possible due to their common HME systems.



» USV MANTAS operating with U.S. Coast Guard during IMX 22. (Photo credit: U.S. Navy)



» USV Devil Ray operating during AW 2. (Photo credit: Dave Meron)



» USV Devil Ray carrying MANTAS during AW 22. (Photo credit: Dave Meron)

FUTURE DEVELOPMENT

Looking ahead to 2023, world navies are keen to bring both commercial-off-the-shelf (COTS) unmanned maritime systems, as well as other USVs in various stages of development, not only to demonstrate their own capabilities, but to also learn best practices by observing the operations of unmanned maritime systems of other nations. These efforts are virtually certain to accelerate the development of these USVs, and for the U.S. Navy, advance their goal of a 500-ship Navy.

MIND TECHNOLOGY COMPLETES SUCCESSFUL DEMONSTRATION OF SEA SERPENT

MIND Technology, Inc. recently completed a successful demonstration of its Sea Serpent low-cost anti-submarine warfare system as a part of the U.S. Navy's Coastal Trident 2022 exercise. For the demonstration the system was deployed from an Unmanned Surface Vehicle (USV) and successfully executed an autonomous mission to detect a realistic underwater target.

Sea Serpent is based on MIND's commercially developed SeaLink seismic streamer technology which is used worldwide for seismic surveys. Sea Serpent can be used for harbor security, maritime domain awareness, or ASW (anti-submarine warfare) and

provides a cost-effective, highly capable, low-power, robust, and scalable solution that can be easily customized to an individual end-user's requirements.

This system also provides a rapidly deployable subsea intelligence, surveillance, and reconnaissance capability from fully autonomous platforms.

Rob Capps, MIND's President and CEO, stated: "We believe this illustrates the versatility of our technologies and our ability to adapt our existing technology to new and unique applications. The primary aim of this experiment was to demonstrate that the Sea Serpent is a viable ASW

product that can be rapidly, easily, and reliably deployed from a small USV. We intend to take what we learned from this exercise to continue improving

the Sea Serpent system, and we're confident that this will represent a significant utility to the U.S. and other allied navies in the future."



» MIND Technology Sea Serpent Towed Arrays are ideal for smaller and medium USVs. (Image credits: MIND)

KRAKEN DEMONSTRATES KATFISH TOWED SAS IN ROYAL NAVY WISEX DEMONSTRATION

Kraken Robotics Inc., Canada's Ocean Company™, recently participated in the Royal Navy's (RN) WILTON Industry Show and Experiment (WISEX) on the ranges in Kilbrannan Sound off Campbeltown, Scotland.

WISEX provides an opportunity for industry to showcase new systems for consideration by the RN. With live demos and sea trials, the RN are better able to understand the demonstrated technology including software, sensors, and effectors necessary to implement a highly reliable Mine Hunting Capability (MHC).

For these trials, Kraken teamed with Elbit Systems UK to demonstrate the KATFISH™ High Speed Towed Synthetic Aperture Sonar System integrated to their Seagull 12-meter Uncrewed Surface Vessel (USV). The goal of the trials was to survey two distinct ranges with dimensions of 600 m x 4 nm where the RN placed several Mine Like Objects (MLOs) to be searched for by WISEX attendees. The ranges were selected to replicate real world search areas of complex bathymetry and strong currents. During the trials, the

Kraken KATFISH™ was launched, operated, and recovered in varying surface conditions including Sea State 4. Live, high resolution SAS data was wirelessly transmitted to a shore-based operators' station over several kilometers, where operators found all MLO targets in real time during the missions.

"The Royal Navy has established WISEX to allow industry to demonstrate their autonomous mine countermeasures systems, in the challenging naval exercise areas of the west coast of Scotland," said Commander Ben Stait. "This demonstration is part of the Mine Hunting Capability programme,

which is at the forefront of next generation maritime autonomous systems. The Royal Navy is grateful for Kraken Robotics participation and excited by the capability they demonstrated as the program develops into its next phase."

KATFISH™ is a high speed, actively stabilized Synthetic Aperture Sonar (SAS) towfish that operates at speeds up to 10 knots. The high-speed capability, and constant resolution of KATFISH™ greatly increases Area Coverage Rates (ACR) by providing more useable data for MCM missions than traditional Side Scan Sonars. KATFISH™ provides real time high-resolution ACR of up to 4 km²/hr with 3.3 cm x 3.0 cm constant resolution across ranges up to 200 m per side with simultaneous 3D bathymetry. *1.9 cm x 2.1 cm constant resolution available with post-processing.

Along with increased ACR, the ability to transmit high resolution data wirelessly enables operators in remote stations to identify targets as the USV mission is underway, therefore reducing the overall MCM timeline.



» The demo of Kraken's KATFISH offshore Scotland replicated search operations for MLOs. (Photo credit: Kraken)

UNMANNED SYSTEMS TESTED BY THE SWEDISH NAVY DURING EXERCISE

Enforcer III is Saab's test platform for development of autonomous functions. It is a converted Combat Boat 90, equipped with navigation and communication systems, sensors, cameras and lasers for navigation. The platform was recently tested in a joint trial between Saab and the



» Enforcer III is an unmanned platform ideal for advanced reconnaissance missions.
(Photo credit: Saab)

Swedish Navy in the southern Baltic Sea.

Unmanned technology is under rapid development and future Swedish corvette divisions could be made up of a combination of manned and unmanned platforms. The unmanned platform makes the manned platform more efficient and reduces the risks to units and staff. *Enforcer III* contains techniques for improved navigation support and possibilities to operate it unmanned. It can be used for advanced reconnaissance. This is when you send the boat out on long distances and it delivers useful information with assistance from radar and camera.

For security reasons there is a crew onboard during the tests, but the boat's operations are directed from the corvette HMS *Nyköping*. The targets discovered by *Enforcer III* are sent to Saab's staff on the corvette, and they then transfer it to the ship.

"We have used *Enforcer III* tactically for advanced reconnaissance. We are then able to be more withdrawn and radar silent. That makes my ship far more difficult to localize for the enemy," said Viktor Tornerhjelm, commanding officer of HMS *Nyköping*.

"A risk assessment is made every time you send out a boat and today we always have people onboard. But we see that it is now possible to send unmanned boats out in higher risk scenarios. The Swedish Navy is examining how autonomous platforms can fit in with their existing operations and that is where we come in to create the technology and the possibilities. We look forward to receiving feedback from the exercise," added Jens-Olof Lindh, Project Manager at Saab.



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Floating Wind USA

San Francisco, CA » November 8-9
<https://events.reutersevents.com/renewable-energy/floating-wind-usa>

TMA BlueTech Week

San Diego, CA » November 14-18
www.tmabluetech.org/bluetech-week

SPE Brazil Subsea Symposium

Rio de Janeiro, Brazil » November 29-30
<https://subsea-symposium.spebrasil.org/>

Conf on Historical and Underwater Archaeology

Lisbon, Portugal » January 4-7, 2023
<https://sha.org/2023-conference-lisbon/>

Trinidad & Tobago Energy Conference

Trinidad & Tobago » January 23, 2023
<https://energynow.tt/events/tamt-energy-conference-2023>

Floating Wind Solutions

Houston, TX » Jan 30 – Feb 1, 2023
www.floatingwindsolutions.com

Blue Innovation Symposium

Newport, RI » January 24-26, 2023
www.blueinnovationsymposium.com

Oceanology Int'l Americas

San Diego, CA » February 14-16, 2023
www.oceanologyinternationalamericas.com

Subsea Tieback

Galveston, TX » Feb. 28 - Mar. 2, 2023
www.subseatiebackforum.com

US Hydro

Mobile, AL » March 12-16, 2023
www.thsoa.org/us-hydro

Canadian Underwater Conference & Exhibition (CUCE)

Halifax, Nova Scotia » March 26-28, 2023
www.underwaterconference.ca



EUROPE

Int'l Wind Congress

Berlin, Germany » November 7-8
<https://windcongress.com/>

Marine Autonomy & Technology Showcase

Southampton, UK » November 8-10
<https://noc.ac.uk/news/marine-autonomy-technology-showcase-2022>

Offshore Energy

Amsterdam, The Netherlands
 » November 29-30
www.offshore-energy.biz/offshore-energy-2022

Wind Power Finance & Investment Summit EU

London, UK » December 6-7
<https://windfinancesummit.com/>

EERA DeepWind

Trondheim, Norway
 » January 18-20, 2023
<https://www.deepwind.no>

Subsea Expo

Aberdeen, UK
 » February 21-23, 2023
www.subseaexpo.com

Offshore Pipeline Technology Conference

Amsterdam, The Netherlands
 » Feb. 28 - Mar. 2, 2023
<https://informaconnect.com/offshore-pipeline-technology/>

Ocean Business

Southampton, UK
 » April 18-20, 2023
www.oceanbusiness.com



OTHER REGIONS

Telecoms World Asia

Bangkok, Thailand » November 2-3
www.terrapinn.com/conference/telecoms-world-asia/index.stm

Int'l Conference on Coastal Engineering

Sydney, Australia » December 4-9
www.icce2022.com

Asia-Pacific Deep Sea Mining Summit

Singapore » December 12-13
www.asia.deepsea-mining-summit.com

IEEE Underwater Technology

Tokyo, Japan » March 6-9, 2023
https://conferences.ieee.org/conferences_events/conferences/conferencedetails/49729

SubOptic

Bangkok, Thailand
 » March 13-16, 2023
www.terrapinn.com/exhibition/suboptic

Gastech

Singapore » September 11-14, 2023
www.gastechevent.com

Mozambique Gas & Energy Summit

Maputo, Mozambique
 » September 13-14, 2023
www.mozambiqueenergysummit.com

Eastern Mediterranean Conference

Cyprus » November 28-30, 2023
www.emc-cyprus.com

2022

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| OCTOBER Editorial: Sept. 19 Ad: Oct. 06 | » OFFSHORE ENERGY Offshore & Floating Wind Europe / November 2-3 Int'l Wind Congress / November 7-8 □ Floating Wind USA / November 8-9 □ TMA BlueTech Week / November 14-18 | Editorial Topics: Sector Diversification, Seabed IMR, Sensor Innovation, HSSE, Decommissioning, Oil Spill Response, Renewables Product Focus: Marine survey, oil spill response, renewable energy technologies, geotechnical services |
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| MARCH Editorial: Feb. 20 Ad: Mar. 10 | » UNCREWED VEHICLES Ocean Business / April 18-20 | Editorial Topics: Remote Marine Survey, Seafloor Mapping, Harbor Security, Long-Range Ocean Research, Coastal Monitoring Product Focus: USVs, AUVs, LARS, UAVs, Sonars, Propulsion and Positioning Systems |
| APRIL Editorial: Mar. 20 Ad: Apr. 7 | » MARITIME DEFENSE & SECURITY | Editorial Topics: Coastal Surveillance, Mine Countermeasures (MCM), Anti-Submarine Warfare (ASW), Search & Recue, Submarine Cable Infrastructure & Protection Product Focus: USVs, XLUUVs, AUVs, ROVs, Amphibious Vehicles, MCM, ASW |
| MAY Editorial: Apr. 14 Ad: May 5 | » GREEN ENERGY TRANSITION | Editorial Topics: Offshore Wind Infrastructure & Supply Chain, Subsea Batteries, Wave Energy Systems, At-Sea Automation, CCS Systems, Hydrogen Product Focus: Offshore Turbines, Supply Vessels, Underwater Batteries, Subsea Connectors, Submarine Cables, Renewable Energy Systems |
| JUNE Editorial: May 22 Ad: June 9 | » UNDERWATER SENSOR TECHNOLOGY & IMAGING | Editorial Topics: Underwater Navigation, Marine Archaeology, Environmental Coastal Monitoring Product Focus: ROVs, Lights, Cameras, Manipulators, Towed Arrays |
| JULY Spotlights: June 27 Ad: July 7 | » UNCREWED VEHICLES BUYERS' GUIDE □ | Editorial Topics: Special Edition |
| AUGUST Editorial: July 24 Ad: Aug. 11 | » OCEAN OBSERVATION, DATA, & COMMUNICATIONS | Editorial Topics: Oceanography, Meteorology, Remote Sensing, Telemetry, Data Processing, Seafloor Mapping, Cloud-Based Data Storage Product Focus: Marine Observation Systems, Buoys, Drifters, Marine Research Vessels, Subsea Nodes, CTD, Acoustics, Biosensors |

TRITECH JOINS GENERAL OCEANS AS

Tritech International Limited has been announced as the latest company to become part of General Oceans AS, an umbrella company specializing in underwater technology and headquartered in London.

The deal will see Tritech joining Nortek, Reach Robotics and Strategic Robotic Systems as part of the common holding company General Oceans AS. It is anticipated that this exciting partnership will be beneficial to all parties and will open up new opportunities for Tritech, its customers, and the rest of General Oceans AS.

David Bradley, Managing Director at Tritech, commented:

"We are delighted to be joining General Oceans AS. The synergies with the other companies in the existing partnership are obvious and our

expectation is that Tritech can contribute to making a difference in the world of ocean technology by bringing its sensors to the group. The opportunity to grow together through these synergies and ultimately making the subsea industry that bit safer for all involved is exciting and a welcome challenge to all of us at Tritech."

Tritech was founded in 1991 and has become a market leader in underwater technology. Tritech is known for designing and manufacturing robust, reliable underwater sensors including multibeam imaging sonars, mechanical scanning sonars and cameras, as well as offering 24-hour support for those products, 365 days a year.

With this exciting change of ownership, customers can expect the same quality products from Tritech, tools that can be relied

GENERAL OCEANS GROUP OF COMPANIES ACQUIRES TRITECH



upon in the most extreme environments on the planet. Tritech will continue to offer the same high level of customer service and support and this partnership with General Oceans is expected to open up Tritech's global sales network even more.

Tritech's purpose, values, and vision for the future are closely aligned with those of General Oceans and it is expected that they will continue to make working in water safer through shared projects and expertise.

Atle Lohrmann, founder of Nortek

and General Ocean's President said:

"As the second acoustic sensor company to join General Oceans, we believe that Tritech's strong brand recognition, solid quality tradition, and highly reputed customer support will expand and enhance our ability to provide outstanding products to our customers. We are delighted to know that we can now collaborate with the proud people at all levels within the Tritech organization, including production, development, and sales."



SPE OFFSHORE EUROPE CELEBRATES 50 YEAR ANNIVERSARY

SPE Offshore Europe 2023 celebrates 50 years since the first edition was held in 1973 at Aberdeen University. The theme of the milestone event, being held at P&J Live, Aberdeen from September 5-8, 2023, is 'Accelerating the transition to a better energy future.'

The 2023 event has four key pillars—energy security, energy transition, future talent and innovative technology—around which the content and features including show floor theatres will be based.

The conference and executive committee will be chaired by 2022 SPE President, Kamel Ben-Naceur. Ben-Naceur has more than 35 years of global energy industry experience having held positions including chief economist at ADNOC (UAE's national energy company), director for sustainability, technology and outlook at the International Energy Agency (IEA) and a number of senior roles at Schlumberger. He is currently CEO of Nomadia Energy Consulting where he advises

on sustainable energy policies and global and regional energy economics and outlooks.

The call for papers for the technical programme is now open with abstracts invited for submission under oil & gas, digital and net zero topics by February 13, 2023.

"SPE Offshore Europe 2023 is a unique platform to showcase the latest technical views and developments within the industry. With the overarching theme of 'Accelerating the transition to a better energy future', the event aims to deliver a contemporary yet balanced technical program, covering new areas of interest as well as making time for more long-established topics. We anticipate exciting discussion and debate as the industry steps up to the energy transition challenge," said Ben-Naceur.

Jonathan Heastie, Portfolio Director – Energy & Marine at RX (Reed Exhibitions), co-organizer with the Society of Petroleum Engineers (SPE) said: "SPE Offshore Europe

has been championing North Sea leadership, technology and innovation for 50 years. The event continues to evolve alongside industry and our changing world and the 2023 show promises an impactful conference and show floor reflecting the topics and technology that are motivating the industry as it transitions to a sustainable energy future. September 2023 will be a celebration of 50 years of Offshore Europe in Aberdeen and we look forward to sharing plans over the coming months."



» The call for papers for SPE Offshore Europe 2023 is now open. (Photo credit: Reed Exhibitions)

HYDROSURV EXPANDS PRODUCTION FACILITIES TO MEET DEMAND FOR USVs

Exeter-based HydroSurv has moved into brand new facilities to deliver expansion in production capacity for its state-of-the-art Uncrewed Surface Vessels (USVs) for hydrographic and environmental data collection.

Located centrally in Exeter's Marsh Barton industrial estate, HydroSurv's new 600 ft² premises incorporate facilities for design, manufacturing and the final assembly of USVs from 2.8-8.6m in size, enabling the company to efficiently scale deployment of its technology.

The new base in Exeter currently hosts 15 employees, with the company expecting headcount to increase to more than 30 over the next 12 months.

Founder & CEO, David Hull said: "These new facilities mark our continued investment and commitment to the development and deployment of Uncrewed Surface Vessel technology. As our team has grown steadily over the past year, it was obviously only going to be a matter of time before we ran out of space. Everyone is excited and optimistic about the way the venture has grown, and these new workspaces will enable us to increase our efficiency and strengthen our production capacity for the future."

CSA OCEAN SCIENCES OPENS NEW OFFICE IN SURINAME

CSA Ocean Sciences Inc. (CSA), an international marine environmental consultancy, has opened a new corporate office in Suriname to help meet the growing demand for expert marine environmental, geophysical, and geotechnical services in Latin America, most notably from the offshore energy sector amid increased exploration and drilling activity in the Guyana-Suriname basin.

To date, CSA has successfully completed over 100 multidisciplinary projects in the region, 60 in Suriname alone, all designed to equip offshore energy developers with scientifically robust marine survey analysis and local mitigation guidance throughout the exploration and production (E&P) life cycle, from pre-exploration permitting and environmental baseline surveys (EBSs) to post-drill environmental and social impact assessments (ESIAs). The move to establish a brick-and-mortar presence in Suriname follows CSA's most recent environmental assessment program offshore Suriname, much of which was supported by the company's long-established Trinidad and Tobago office.

The Suriname office, located in the capital city of Paramaribo and managed by Mr. Dennis Rusland, previously of the Institute for Green Economy in Suriname, will provide clients with the full range of specialist resources offered at each of CSA's other international hubs, including the company's operational headquarters in Stuart, Florida. As well as ESIAs and EBSs, CSA will offer deep

HydroSurv entered the ocean technology sector in 2019 as a new designer and builder of innovative USVs. The company has grown sustainably over the past three years and now operates offices in both the UK and Canada.



» HydroSurv's David Hull (CEO) & Ian Godfrey (COO) in the new facility. (Photo credit: HydroSurv)

ocean geospatial survey and analysis, E&P risk and compliance management, and spill response services, all supported by expert survey personnel, as well as Marine Fauna Observers (MFOs) and Passive Acoustic Monitoring (PAM) professionals. A comprehensive catalog of equipment and instrumentation designed for deep-sea exploration on the continental and outer continental shelf will also be maintained.

"We are delighted to announce this important milestone in CSA's continued expansion into Latin America," said CSA CEO Kevin Peterson. "Over many years of working in Suriname and collaborating with Mr. Rusland, CSA has acquired a detailed and intimate understanding of both the permitting requirements and operating regulations that govern offshore development in the region. By establishing a more permanent presence in the country with rapidly deployable teams and technologies on the ground, I am confident that CSA's extensive in-field experience of delivering best-in-class marine survey services will translate into further data-led operational efficiencies for the Surinamese oil and gas industry."



» Paramaribo, the location of CSA's Suriname office.

KONGSBERG MARITIME APPOINTS NEW PRESIDENT

Lisa Edvardsen Haugan has been appointed as the new President of Kongsberg Maritime, the largest business area of KONGSBERG. She takes the helm after Egil Haugsdal.

Haugan has long and extensive experience from both the defense and civil business area in Kongsberg Gruppen ASA (KONGSBERG), including having been EVP Finance at Kongsberg Maritime and Finance Director at Kongsberg Protech Systems. She currently heads the Deck Machinery & Motion Control division of Kongsberg Maritime.

"Following a thorough process to recruit a new leader for Kongsberg Maritime, I am proud to be able to announce that Lisa has accepted the job. She has held several key roles in KONGSBERG and has made a true difference to the company for many years. Lisa has extensive international experience and knows the Kongsberg Group and our industries by heart. Among the highly talented candidates eligible for this role, I must admit that I am satisfied that we found the best candidate from within our own ranks," said CEO of Kongsberg Gruppen, Geir Håøy.



» Lisa Edvardsen Haugan. (Photo credit: Arild Brun Kjeldaas)

Haugan has played a significant role in the integration and restructuring of Commercial Marine, a business area acquired from Rolls-Royce plc in 2019. This has been Kongsberg Gruppen's largest acquisition to date. Kongsberg Maritime has experienced significant growth over recent years and today has over 7,000 employees spread across 32 countries.

"Lisa has proven high capacity and a strategic mindset. I am confident that with her long industrial experience she is the right person to further develop the global maritime leadership position we have. We have a big task and responsibility to continue developing new, green technology

for the ocean economy," continued Håøy.

Speaking of the appointment, Ms. Haugan said: "I am both proud and happy for the trust I have been given through this appointment, and not least I am humbled by the societal mission Kongsberg Gruppen has as a world-leading maritime company. We are a complete technology and equipment supplier to the maritime industry. Our employees enable operations at the bottom of the sea, in arctic waters, in the busiest

ports and under the harshest weather conditions. I am looking forward to leading the team with the very best experts who will drive forward sustainable solutions in close collaboration with our customers."

Her predecessor, Mr. Egil Haugsdal, has led Kongsberg Maritime since 2016. Under Haugsdal's leadership, Kongsberg Maritime has shown good results, developed several world-leading innovations and been a driving force both globally and in the Norwegian maritime cluster.

Haugsdal will continue as President of Kongsberg Maritime until Haugan takes over in November 2022.

ADMIRAL SIR GEORGE ZAMBELLAS JOINS TERRADEPTH AS STRATEGIC ADVISOR



» Admiral Sir George Zambellas

Terradepth has announced that Admiral (ret.) Sir George Zambellas, the former First Sea Lord of the British Royal Navy and senior industry executive, will join Terradepth as a Strategic Advisor.

Sir George Zambellas will bring his vast maritime domain knowledge to help Terradepth explore and develop new relationships and opportunities in the global geospatial ocean data and maritime markets.

As the First Sea Lord, he was the force behind Unmanned Warrior, the first multi-national exercise featuring real-life, large-scale interoperability of maritime-focused technologies, which has become the model for numerous follow-on operational development initiatives. As a civilian, Sir George is deeply involved in the technology ecosystem and is in senior executive or advisory positions with a select group of companies.

"We are honored to have Sir George on the Terradepth team. His intellect, energy, and experience are indispensable in creating opportunities and keeping us strategically focused. We're extremely lucky to have him as an advisor," said Joe Wolfel, Founder and CEO of Terradepth.

DAMEN'S ALL-ELECTRIC RSD-E TUG 2513 WINS 'TUG OF THE YEAR'



Damen's first, all-electric, 70-ton bollard-pull harbor tug, which was delivered to New Zealand's Ports of Auckland earlier this year, has won the prestigious 'Tug of the Year' at the 2022 International Tug and Salvage Awards ceremony, held last night in Istanbul. Sparky is Damen's first tug to be fully electric and can undertake two or more assignments before being recharged, which takes just two hours.

"We are delighted that this revolutionary vessel has received recognition this way," said Damen's Michiel Hendrikx, Area Director Asia Pacific. "Our thanks go out not only to all for voted for it, but particularly to Ports of Auckland. It was their confidence in us and their cooperation over the past six years that has made Sparky such a success. Together we have created a vessel that we hope will be the first of many which will make significant contributions to reducing emissions in ports and harbors."

It was that cooperation and attention to detail that ensured that every aspect of the compact RSD-E Tug 2513's design and engineering is optimized for efficiency and sustainability. Eight battery packs installed in two insulated, temperature-controlled battery rooms, one on each side of the vessel, not only makes the best use of the space available, it also has the added benefit of delivering maximum redundancy. With the lifetime of the battery system in this application estimated to be approximately 30,000 cycles, it is the same as the estimated working life of the vessel.

Sparky is highly innovative in other ways. The advanced RSD design together with the high degree of automation make it exceptionally efficient. The quality of the human machine

interface and the Praxis centralized alarm, monitoring and control system, which is connected to the Damen Triton remote monitoring system, ensure maximum efficiency and safety. The RSD-E Tug 2513 is also designed for the lowest total cost of ownership over its lifetime. In the right circumstances, the total cost of ownership will be equal to or lower than that of a diesel-powered RSD Tug 2513.



» RSD-E Tug Sparky. (Photo credit: Damen)

MACARTNEY APPOINTS NEW GLOBAL BUSINESS MANAGER, CONNECTIVITY

MacArtney has appointed Paul Anthony as the new Global Business Manager, Connectivity, with effect from October 1, 2022.

This appointment is a step in MacArtney's global strategy for its connectivity business to build on the company's status as one of the major industry players and to support its growing global market share.

"MacArtney wants to build on our global position, reach and collaboration, working with clients and industry specifiers,

through harmonizing and developing our connectivity product portfolio," said Paul Anthony.

Mr. Anthony, who joined MacArtney in December 2021 as Senior Sales Manager, Connectivity, is a qualified engineer with 30 years of experience working in industrial markets, including oil and gas and elastomers. Such a background means he can discuss the technical aspects of connectors and ancillary applications on the same level as the customer and in

considerable depth, along with a deep understanding of the market.

"Our goal is to provide quality, cost-effective and reliable connectivity solutions through the SubConn® and TrustLink brands. Furthermore, using our historical partnerships, we have the ability to design and deliver custom cable assemblies and complete connectivity systems for our customers," Mr. Anthony added.

"Our business evolves based on customers' needs, and

appointing a Global Business Manager is a logical move," commented Rasmus F. Bonde, MacArtney CCO. "Paul's long experience in connectivity made him a natural choice when he joined us in December 2021.



» Paul Anthony



SPECIAL EDITION

[Print & Digital]

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