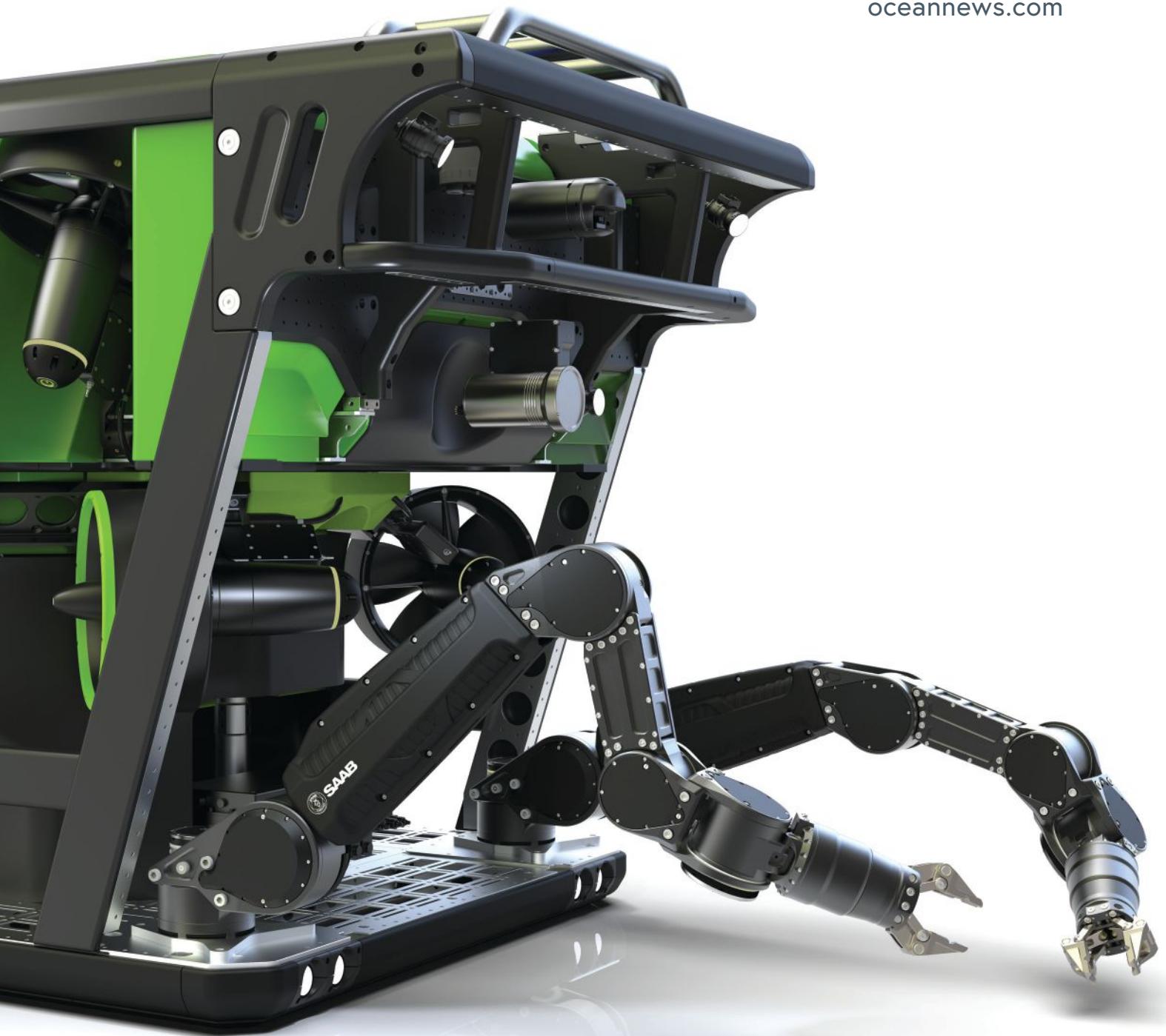


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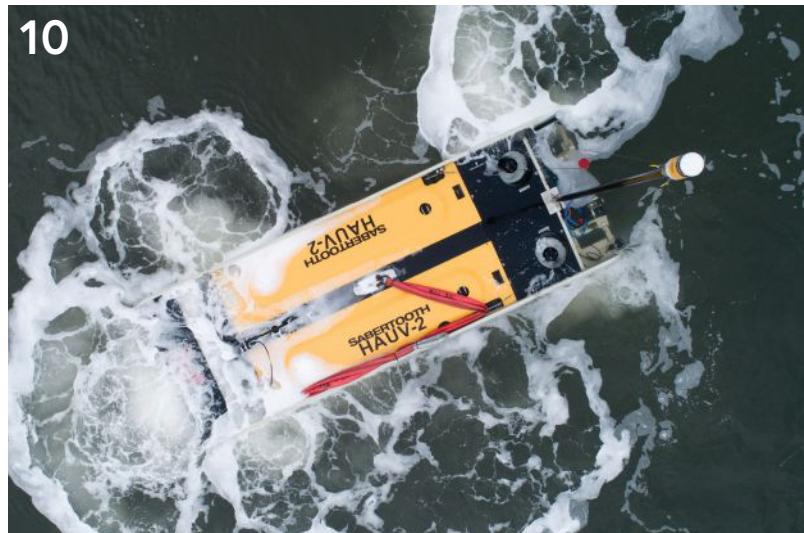
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10



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ON THE COVER:

Saab Seaeye's highly agile and responsive eWROV ensures a greener approach to remote offshore operations, whether managed from an onshore control, subsea resident location, or an uncrewed vessel. (Image credit: Saab Seaeye)

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[WITH THANKS - Ed.]

Increasingly central to the prospect of a thriving and sustainable Blue Economy is the successful exploration and application of green energy solutions in the offshore domain. In short, this shift relies on two unwavering sector-wide commitments: first, an accelerated focus by developers to integrate renewable energy sources into long-term planning; second, a concerted drive to design and field efficiency-focused technologies that safeguard a less carbon-intensive future.

In May's edition of ON&T we profile some of the headline acts taking center stage in the green energy transition, from electric underwater robotics to subsea batteries to the collaborative programs needed to bring about meaningful change. Our special thanks this month go Saab Seaeye, Southwest Electronic Energy (SWE), NLA International, and Acteon.

Happy reading!

editor@oceannews.com

Ed Freeman



SMART SUBSEA SOLUTIONS

Delivering data in most adverse conditions: underwater acoustic modems with advanced communication technology and networking

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Published by

Technology Systems Corporation

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Ocean News & Technology ISSN# 1082-6106

is published 10 times a year in print and digital by Technology Systems Corporation, 8502 SW Kansas Ave, Stuart, FL 34997, telephone 772-221-7720. Copyright ©2023 Technology Systems Corp. All rights to editorial content are reserved. No article, photograph, or illustration may be reproduced in whole or part without the written permission of the publisher. Unless otherwise stated in writing by the contributor, all images submitted to TSC may be used in other promotional materials belonging to TSC without permission. Subscriptions are free to qualified individuals or companies. For all others, call TSC for subscription information.

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SUBSEA ENVIRONMENTS: IS BATTERY TECHNOLOGY STUCK IN A TIME WARP?

**By Simon Partridge**

Chairman

covelya
GROUP

Modern processors developed for mobile phones and image processing possess incredible capability but consume as little as a few watts of power. These devices can be turned on intermittently to process vast quantities of data, and shut down again to save power, with systems relying on low power processors for continuous operations.

ALWAYS ON, ALWAYS CONNECTED?

Why is this important? Underwater sensing and detection systems should ideally be persistent: always on and always connected. Unfortunately, cables are expensive to build, lay and maintain, and are open to sabotage. The alternative—battery operated systems, are limited by the size, power, and weight requirements to power the sensors and processing.

To address this challenge, today's state-of-the-art options are non-rechargeable primary Lithium cells at approximately ten times the price of alkaline batteries, and while rechargeable Lithium-ion cells have advanced, they still don't offer the same power density. Today, about the best we can do is power long endurance uncrewed underwater vehicles (UUV) missions for up to twenty days. A long way from the persistence requirement of being always on, always connected.

Unless, that is, we make use of Edge computing.

DATA HARVESTING

Underwater acoustic communications have improved both in terms of reliability and to some degree range. However, speed and range are still limited by physics—the speed of sound in seawater is 1,500 m/s (this is not dissimilar to dial up internet ~50kbit/s we all used in the 1990s).

It's not all bad news—free space optical communications underwater run at the speed of light, or 299,792,458 m/s. Granted, light doesn't penetrate far through the ocean, particularly if it isn't very clear. So, speed and range is limited in practice to about 200 Mbit/s (50 to 200 m, clear and dark

waters) but as fast as 1 Gbit/s at 6 m distance or so.

What this means is subsea devices can now record vast quantities of sensor data, and process some or all of it in-situ, with acoustic communications providing long range over-the-horizon control and transfer of small amounts of data such as battery life remaining, real-time detection events, and parameters and quantities of data for quality control.

Then, as appropriate, optical communications can be used to offload gigabytes of data to autonomous underwater drones as and when they manoeuvre into close proximity using laser based optical communications.

TODAY'S POSSIBILITIES

One of Covelya's companies, Sonardyne, is now deploying real devices subsea based on these combined technologies for continuous five-year operations, all powered from the same cheap alkaline batteries used to power up torches.

In addition, the Edge processors enable users to develop their own applications, pre-install and select them or even download them into the seabed devices via the acoustic link. The spare processing power can then be spun up to reduce the data into manageable information sets, small enough to offboard via the acoustic communications link. This is exactly what Sonardyne's new Origin Acoustic Doppler Current Profilers (ADCPs) are now offering across a range of applications, with surface ships, or better USVs, being used as the surface gateways.

So, although advances in underwater power for cableless devices is disappointing, Edge computing, improvements in acoustic and optical communications, together with reliable surface and underwater drones are opening new opportunities for persistence sensing and detection systems for a range of applications. Always on and always connected.

We Don't Need A Bigger Boat

Introducing newest and most advanced vessel for nearshore offshore wind surveying, NV5's R/V Shackleford from Geodynamics, an NV5 company.

Nearly 73' long, the R/V Shackleford has been designed specifically for site development and cable surveys for offshore wind and telecommunications for extended 12h or limited 24 hour operations. Learn more about the Shackleford and its robust survey systems by scanning the QR Code below.



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» The world's first roaming and hovering autonomous vehicle with added ROV functionality, Saab's Sabertooth allows fully flexible dual operations from a single platform. (Image credit: Saab Seaeye)

| FEATURE |

FULL GREEN AHEAD FOR SUBSEA ROBOTS



By Ryan Lumsden

Sales and Business Development Manager



As the world transitions to greener energy solutions, electric underwater robots are ideally placed to support the oil and gas industry's transition towards a sustainable future, whilst also helping advance the widening range of burgeoning renewable energy enterprises.

Intrinsically, electric robots are 'green-ready' and in harmony with the transition towards green energy that will continu-

ously evolve through constant innovation and adaptation.

Electric is the future for sustainable underwater operations. Electric technology offers significant growth in onshore controlled operations where vehicles can operate from subsea docking stations or lightly manned or unmanned vessels, and where all-electric robots offer the reliability and reduced maintenance needed for long-term deployment underwater.

Faced with a wide range of energy producing sectors and carbon managing systems, each with their particular operational challenges, intelligent and flexible robotic systems offer increasingly higher levels of operational capability, reliability, and maintainability.

EFFICIENCY IS POWER

Easy to operate and maintain, more agile and responsive, acoustically quieter, and environmentally cleaner with minimal oil, electric robots have long been in the forefront of sustainability. Their sheer efficiency means they pack in more power, intelligence, and functionality for their size which alone saves CO₂ emissions and costs.

For operating in the renewables sectors, including wind, wave, and tidal energy, along with newly emerging sectors such as floating solar arrays, powerful, low-profile, highly maneuverable robots can master the strong currents and turbulent waters typical of the shallow waters in these sectors.



» Power-matched to hydraulic systems, electric work systems, like Saab's eWROV, are more agile, more eco-friendly, and designed for onshore control from both offshore resident locations and unmanned vessels. (Image credit: Saab Seaeye)

REMOTE, RESIDENT, AUTOMATED

All market segments can benefit from savings in sustainability and operating costs by increasingly automating the inspection and maintenance of submerged structures and their surroundings.

Key to achieving this is remote control from onshore command centers where robots are deployed from resident seabed docking stations, or from lightly manned, or unmanned vessels, resulting in a considerable reduction in the environmental cost of support vessels and crew transfers.

Making this possible are significant advances in underwater technologies, led by key breakthroughs such as the Sabertooth, the world's first and only roaming and hovering autonomous vehicle with added ROV functionality that allows fully flexible dual operations from a single platform. The system also demonstrates that robot systems can operate from a subsea docking station for charging and mission control.

This innovative development makes residency viable and greener subsea undertakings possible.

It also heralds a future where the notion of ROVs and AUVs will cease to exist to be replaced with transformative robots that can roam, hover, reside, and perform all underwater tasks remotely, and automatically.

Towards that goal is a new generation of powerful electric work vehicles.

Power matched to hydraulic systems, full-size electric work vehicles such as the Seaeye eWROV, are more agile and more eco-friendly.



» Tooling will match advancing robot technologies by creating systems such as Seaeye's eM1-7 electric work manipulator, power matched to hydraulic yet more reliable for extended remote submersion and has intelligent joints for greater precision. (Image credit: Saab Seaeye)

Designed for onshore control from both offshore resident locations and unmanned vessels, these ultra-capable and flexible, powerful electric work robots will play an important role in future autonomous vessel fleets that will empower progress towards a greener future.

Able to remain at sea for long durations, such systems can operate in either manual or supervised autonomous mode with human oversight and flexibility in-built for increasing levels of autonomy and automation as technology evolves over time.

SYSTEM RELIABILITY

Electric robots have a long-proven reputation for reliability. They are trusted to perform in challenging and hostile conditions consistently—even in the highly corrosive environment of nuclear storage ponds.

Whilst on mission electric robots must provide clear and enhanced information to operators, while independently managing each device on the vehicle, including auto redundancy that can keep the vehicle working even if faced with multiple

equipment failures or damage.

Continuous comprehensive internal monitoring provides system reliability with predictive indications to assist with pre-emptive maintenance planning, allowing for longer-term remote deployment underwater.

TOOLING ADVANCES

To match the potential offered by robotics to advance the sustainability offered by autonomous and remotely operating robots, tooling resources must meet the challenge. Such developments in robotic engineering include the pioneering electrification of tooling. The Seaeye eM1-7 is an example where an all-electric work-class manipulator has been created, power matched to hydraulic, but is more reliable and dexterous as each joint has a smart distributed microprocessor for intelligent, intuitive, and precision arm control.

Tooling trending towards an all-electric future is creating partnerships to develop industry standard tooling and ancillary systems aimed at innovative solutions for electric robotic vehicles.

POWERING THE FUTURE

Sustainable power sources are in development to harness natural energy, such as wave and tidal current systems. Efficient electric robots are ideally suited to harnessing these new power sources.

Such solutions are important for eco-responsible power and essential for providing charging to resident systems thereby substantially reducing the number of supply ship vessels at sea and the risk to human life.

For more information, visit:
www.saabseaeye.com.

WETS Demonstration



» Wave energy powering a Sabertooth autonomous vehicle operating in seabed residency mode has been seen as a major renewable energy breakthrough. Pioneering the concept was C-Power's SeaRAY Autonomous Offshore Power System (AOPS), which provides offshore power, energy storage and real-time data communications for resident marine systems. Trials took place at the US Navy's Wave Energy Test Site (WETS) in Hawaii.

EXAIL LAUNCHES NEW INS AND DVL SYSTEM

Exail has launched a new all-in-one system that combines the best of inertial navigation and Doppler Velocity Log (DVL) technologies, the Rovins 9 DVL. With this new tightly integrated system, Exail is now able to provide manufacturers of subsea vehicles with a highly accurate and reliable subsea navigation solution.

Highly compact for easy vehicle integration, the Rovins 9 DVL combines, in a single housing, Exail's advanced fiber-optic based INS with a Nortek DVL. This integration of raw sensor data from both INS and DVL provides operators with highly accurate position, velocity, and attitude information, even in challenging subsea environments.

"By merging the INS and DVL complementary measurements, the resulting navigation data becomes much more precise and accurate than either system used alone. The ability to connect external sensors such as pressure sensors through the satellite connectors available on the system, provides even greater accuracy," said Maxime Le Roy, INS Product Manager at Exail. "The Rovins 9 DVL greatly simplifies the work of subsea operators in the field. The system can be easily integrated into a variety of subsea vehicles,



» All-in-one system that combines the best of inertial navigation and Doppler Velocity Log (DVL) technologies. (Image credit: Exail)

including ROVs, AUVs and tow fishes, thanks to its unique compact horizontal design and plug-and-play feature."

The Rovins 9 DVL is an ideal choice for AUV manufacturers and e-ROV operators seeking to save watts without compromising on data processing power. It operates on low power consumption and is highly resistant to high pressure and harsh environments. It can be deployed down to 6,000 meters.

TELEDYNE GEOSPATIAL RELEASES CARIS CLOUD TO SUPPORT S-100 PRODUCTION

Teledyne Geospatial recently announced the release of three new applications on its CARIS Cloud platform—the CARIS Bathymetric Data Service, S-57 ENC Service, and Chart Data Service.

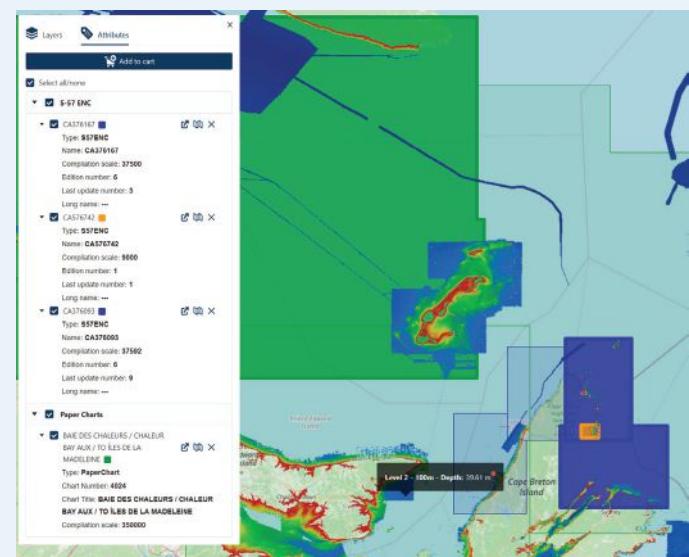
The robust and scalable CARIS Cloud allows for the management, processing, and distribution of hydrospatial data, all from one platform. Leveraging CARIS Cloud accelerates and automates product delivery, enabling hydrographic offices to focus on planning and implementing the transition to S-100. Teledyne has implemented the findings from several pilot projects with CARIS customers for this solution and CARIS Cloud turnkey applications have been tested to get the most up-to-date and authoritative hydrospatial information securely and promptly to stakeholders.

The S-57 ENC Service and Chart Data Service streamline the distribution of S-57 ENCs and digital "paper" charts from the production environment to stakeholders.

The CARIS Bathymetric Data Service is an innovative cloud hosted data service, which automates the generation and distribution of bathymetry products including S-102. This ready-to-use solution integrated with CARIS' trusted Bathymetric DataBASE Suite and simplifies the journey of hydrographic offices transitioning to S-100 by the year 2026.

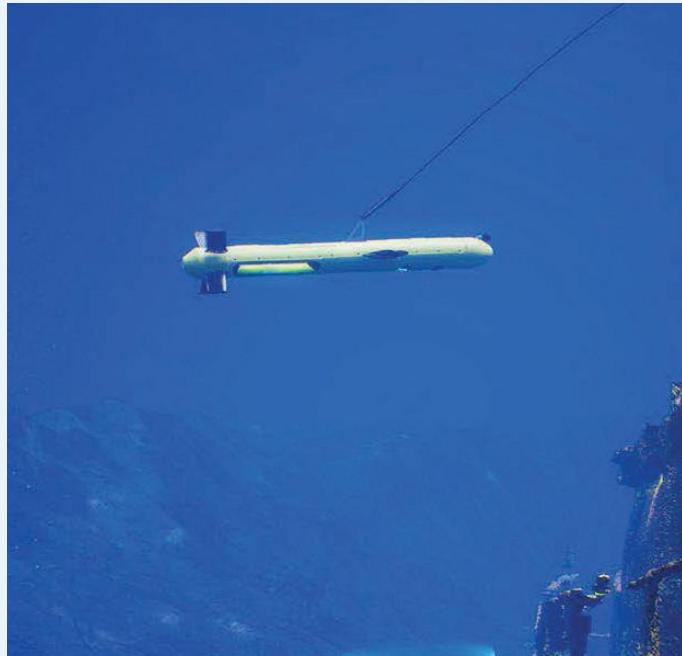
Teledyne Geospatial unifies the hardware and software expertise of both Teledyne CARIS and Teledyne Optech. The new group provides customers with innovative integrated solutions. Offerings

include turnkey systems, lidar and sonar integrated workflows and a range of systems and solutions that support holistic, precision data collection.



» CARIS Cloud demonstration account populated with PDF paper chart, S-57 ENCs and Non-Navigational Bathymetry. (Image credit: Canadian Hydrographic Service)

EIVA INTRODUCES REMOTELY OPERATED TOWED VEHICLE FOR USV SYSTEMS



EIVA has launched a new remotely operated towed vehicle (ROTV): ViperFish. This all-in-one sensor platform is tailored for autonomous unmanned surface vehicle (USV) systems. With its compact, streamlined design and precise 3D control, ViperFish can safely survey narrow, hard to reach areas, with stable sensors close to the seabed for optimal data collection.

ViperFish uses the same electronics and flight control as the industry leading UXO survey sensor platform, ScanFish. This means that many of ViperFish's components are proven with thousands of hours documented in the field. In addition, the 3D towed platform is integrated with several high-quality sensor options: Wavefront Solstice MAS, EdgeTech 2205 SSS, R2Sonic MBES, OFG Hypermags Sonardyne SPRINT-Nav Mini, and more.

"We have incorporated input from USV providers, survey companies and their end clients as we seek to streamline all aspects of operating ViperFish from survey planning to data delivery—to be able to meet the needs of autonomous USV systems," said Martin Kristensen, VP Hardware Development, EIVA.

» Viperfish enables the collection of high-resolution data even in narrow areas. (Image credit: EIVA)

DALHOUSIE UNIVERSITY RECEIVES GRANT TO STUDY OCEAN'S ROLE IN CLIMATE CHANGE

As recently announced by the Hon. François-Philippe Champagne, Canada's Minister of Innovation, Science, and Industry, at Concordia University in Montreal, Dalhousie University will receive \$154 million from the Canada First Research Excellence Fund (CFREF) grant program.

The program, *Transforming Climate Action: Addressing the Missing Ocean*, will bring together researchers at Dalhousie and its academic partners—Université du Québec à Rimouski, Université Laval, and Memorial University—to embark on the most intensive investigation ever into the ocean's role in climate change to ultimately deliver benefits to Canadians, communities and the economy.

Transforming Climate Action brings together more than 170 researchers at the four partner universities, spanning diverse disciplines such as oceanography, atmospheric science, Indigenous scholarship and knowledge, engineering, data science, maritime law, immigration policy, and social justice.

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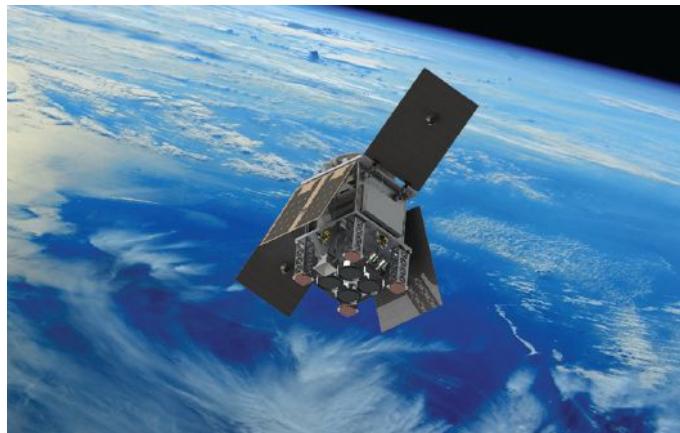
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SPACE PROGRAM TO DELIVER UNIQUE VIEW OF EARTH'S OCEANS

The pioneering HydroGNSS mission concept has been selected by the European Space Agency (ESA) as its second Scout mission, a new program aiming to deliver innovative science and technology through a novel agile framework embracing the concept of New Space.

The National Oceanography Centre (NOC) has co-led ESA HydroGNSS since the very beginning as part of the original proposing team and is currently leading the development of two of the operational HydroGNSS processors. This key outcome will generate a wealth of new environmental data to be made freely and publicly available to a wide user community including policy makers, academia, industry, and the general public.

Courtesy of its state-of-the-art technology, unprecedented sensor performance and global coverage, ESA HydroGNSS will provide a unique view of our oceans using an innovative technique called GNSS-Reflectometry based on reflected navigation signals. NOC scientists are playing a critical role in the mission by calibrating satellite data and translating these into essential climate variables such as ocean winds and sea ice extent that are key to improving our understanding of our environment and quantifying human impact on climate change.



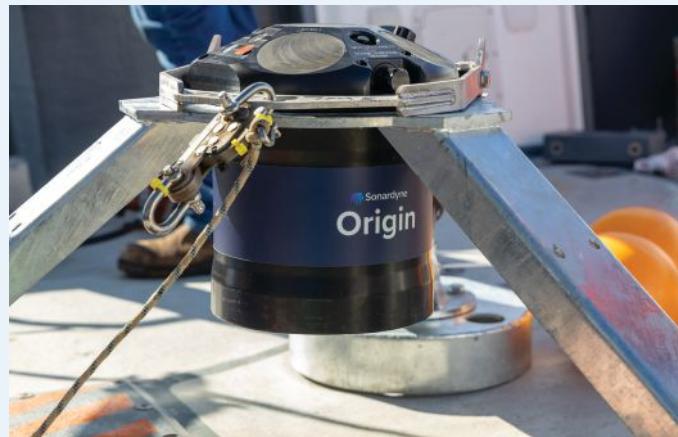
» HydroGNSS will provide a unique view of oceans using GNSS-Reflectometry. (Image credit: ESA)

Giuseppe Foti, NOC's Principal Investigator of the ESA HydroGNSS mission, said: "HydroGNSS is an ambitious international project offering a clear opportunity for further strengthening collaboration between intergovernmental organizations, industry and science partners across Europe and beyond, whilst at the same time demonstrating our growing ability to deliver new science in a cost-effective and agile manner."

With the development of the first HydroGNSS satellite already underway, this second twin satellite will now be built in parallel so that they can be launched together with lift-off planned for 2024.

SONARDYNE SELECTED FOR THE SMART SOUND CONNECT SUBSURFACE PROJECT

Sonardyne has been selected to provide a subsurface communications and navigation network for the Smart Sound Connect Subsurface (SSCS) Project. Sonardyne will partner with the University of Plymouth and Plymouth Marine Laboratory (UK) to install, operate, and manage an underwater acoustic communications and navigation network that will link to the existing surface assets.



» Preparing Origin 600 ADCP for deployment. (Image credit: Sonardyne)

Located in the city of Plymouth and the waters in and around Plymouth Sound, SSCS builds on the existing Smart Sound Plymouth infrastructure that underpins the National Centre for Coastal Autonomy. The £1.2 million initiative, supported by funding from the Heart of the South West Local Enterprise Partnership, will further enhance the unique proving ground for businesses to test, trial, prototype, and commercialize new products and services.

During 2023, Sonardyne will provide nine navigation and communications nodes based on its 6th Generation (6G[®]) technology, which can be deployed on the seabed either as fixed or mobile networks. In addition, two integrated sensor nodes will be supplied to enable real-time reporting of key subsurface operational safety parameters, including water temperature and currents.

Sonardyne's new Origin 600 ADCP with integrated acoustic communications and onboard Edge processing will be at the heart of these. In addition, two gateways to the subsea networks will be provided: Firstly, a Ranger 2 GyroUSBL, which can be mounted on either a crewed or uncrewed surface vessel, will act as a mobile gateway, and secondly, a Mini-Ranger 2 system, which will be mounted on the L4 buoy as a fixed gateway. Sonardyne will also be providing a comprehensive training and support package.

NOAA AND OCEANX RENEW PARTNERSHIP TO MAP AND EXPLORE THE OCEAN

NOAA and OceanX recently renewed a memorandum of understanding to continue collaborating on ocean mapping, exploration and the advancement of ocean science. The three-year MOU identifies key priorities for collaboration, including:

- **Sharing of best practices for ocean exploration, mapping and data acquisition.** Increased cooperation on youth education and engagement programs to inspire a new generation of ocean champions, scientists, explorers, and communicators. Both NOAA Ocean Exploration and OceanX offer student opportunities to join at-sea science missions aboard their respective ocean vessels.
- **Collaboration on coral reef research, monitoring, and development of new uncrewed coral monitoring technologies.** Such collaboration can help scale up the collection of more comprehensive data needed to inform coral conserva-

tion at a time when coral is one of the most valuable and endangered marine habitats.

- **Development of data sharing processes** that will enable OceanX to make ocean mapping data gathered from its global missions aboard its research ship, *OceanXplorer*, available to various repositories, including the public ocean data managed by NOAA's National Centers for Environmental Information.
- **Standardization of best practices for obtaining and archiving environmental genetic samples from the ocean**, called environmental DNA, so the data can be used for multiple purposes including sustainable fishery management, research to develop medical treatments and conservation of marine ecosystems.

"We're excited about this renewed agreement NOAA is forging with OceanX," said

Jeremy Weirich, the director of NOAA Ocean Exploration. "We have much to share with each other that can propel our common goal of exploring the unknown mysteries of our ocean to better understand our changing environment and enhance appreciation for the importance of the ocean in our everyday lives.



» Data sharing processes will facilitate the integration of information gathered during OceanXplorer missions. (Image credit: OceanX)

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CHECK THE TECH

BACK TO (OCEAN) BUSINESS

From April 18 – 20, the National Oceanographic Centre (NOC) in Southampton, UK, once again played host to the ocean industry's cannot-miss exhibition and conference, Ocean Business 2023. Diversified Communications, the event organizer, has since reported record crowds—more than 5,000 attendees from over 80 countries and 300 exhibiting companies.

Returning to its more familiar springtime slot—the first edition since the out-of-season and rather pandemic-pinched autumn 2021 event—visitors were spoiled by three sun-filled days (anything but a given on the UK's south coast) during which ocean tech couldn't fail to dazzle.

MANAGING AUTONOMY

Interactive booths and dockside demos often eclipse some of the less tangible discussions that frame ocean tech confer-

ences—hardly a surprise given the engineering might on display—but Tuesday's *Sustainability for our Oceans Conference* demands reflection. Delegates from all corners of the ocean community gathered in the NOC's Henry Charnock Lecture Theatre to contemplate the current trends and pressing challenges facing technology development in a "changing" climate. The consensus was that an open dialogue and collaboration to building an "Ocean Enterprise" would remain key, but its import ever more heightened in the age of autonomy. Managing autonomy would dominate the rest of the day's conversation.

Following presentations from UTEC, Exail, and Sonardyne—a collage of validated use cases for uncrewed vehicles—it was time to pick the minds of representatives from the UK's Maritime and Coastguard Agency and Lloyd's Register and better understand the ongoing process to establish the appropriate standards and unfolding permitting

procedures for such craft. The Pan-Sector Workshop went on to identify, among other things, what the maritime industry could learn from the aviation market in its integration of autonomous systems.

An emerging thread was the stark reality that amid the rapid diversification of uncrewed assets, whether above, on, or below the waterline, more investment was needed (perhaps counterintuitively) in people. This was the focus of the final session, which stressed the urgency to attract, engage, and inspire future generations to the ocean sector, an enduring mission that was conveniently backed by a three-day *Ocean Careers Programme* running alongside the Ocean Business 2023 agenda.

EXHIBITION HALL

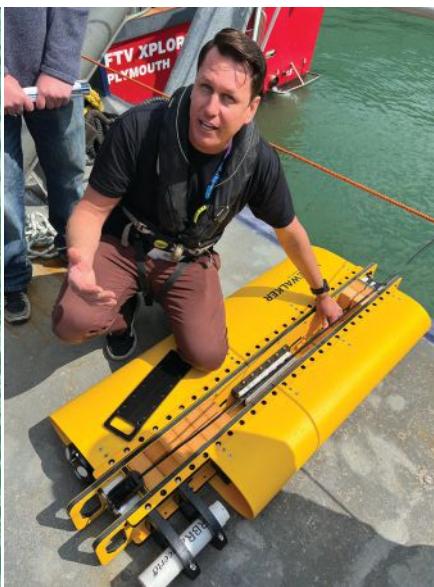
And so, to the showroom, and a colorful snapshot of an industry keen to capitalize on new technical innovations and integrate novel technologies into traditional ways of working. The buzz on the exhibition floor was palpable and, as tradition dictates, was made ever the more animated by a series of product launches, including Valeport's 6,000 m SWIFT profiler, Blue Robotics Blueboat USV, and Sonardyne's Origin 600 ADCP. New partnerships were also forged, including a significant collaboration between Saildrone and Seabed 2030 to accelerate global USV mapping ambitions.

ON THE WATER

USV technology continues to grab industry headlines and, arguably, the show in Southampton. With no shortage of USV platforms on display, Maritime Robotics ran a series of real-time deployments of their compact Otter Pro USV to show its seamless compatibility with KONGSBERG, Teledyne, and Norbit multibeam sonars. The Norway-based company also revealed details

» Maritime Robotics' demo of their Otter USV with integration of a KONGSBERG multibeam.





of its multipurpose, 9-meter, long-endurance Mariner X USV, fitted with a GNSS Compass, Class B AIS, Cameras, WiFi and LTE Modem, and a deck space for mounting of custom payloads.

CHCNav also had a number of USV units on site, including the APACHE6, a fully integrated lightweight platform optimized to support a NORBIT multibeam and LiDAR, making it a cost-effective, turnkey solution for rapid bathymetric survey.

BELOW THE WATER

It was aboard the RV *Callista* that onlookers got to sample Del Mar Oceanographic's (DMO) Wirewalker, a mobile vertical profiling system powered solely by surface waves. A length of wire is suspended from a small surface float, and at the deep end, a weight encourages the wire to move vertically, allowing the profiling system to ride the wire until the Wirewalker meets a mechanical turnaround bumper which in turn releases the cam, releasing the profiler to return to the surface. Sensor agnostic and able to support large custom payloads, the simplicity of the Wirewalker—no batteries required and a 500+ m depth range at a rate of 10 m per second—belie its broad range of applications.

TEST TANK

At the test tank, there was something of an ON&T exclusive, a 1-2-1 look at a brand-new

» Deep Trekker's latest edition to their portfolio of compact ROVs.

» Del Mar Oceanographics' Wirewalker, presented by the company's Sales Director, Chris Kontoes.

transportable and cleared for takeoff in the market.

"In designing the PHOTON ROV, we have responded to what we were hearing from the market. The demand from ROV users, mostly in the energy and industrial sectors, was for smaller, more agile models capable of accessing confirmed spaces. Thanks to our exceptional in-house engineering team, we were able to miniaturize an ROV platform to operate at up to 300 m depth and integrate a range of sensors, including a DVL, USBL, and sonar, into the same mission planning that we have on our other ROV products," added Macdonald.

THE FUTURE

With such an extraordinary array of engaging tech-inspired activities wrapped into a three-day event, Ocean Business 2023 was able to showcase an industry firing on all thrusters. Determining exactly where these thrusters are pointing is a tantalizing prospect but the steady integration of efficiency-defining ocean tech and a professional culture that embraces automation and the many benefits that increasingly "smart" technology promise are clear waypoints in the path to progress and discovering new ways of working.



PRISTINE DEEP-SEA CORAL REEFS DISCOVERED IN THE GALÁPAGOS MARINE RESERVE

Scientists have discovered extensive, ancient deep-sea coral reefs within the Galápagos Marine Reserve (GMR)—the first of their kind ever to be documented inside the marine protected area (MPA) since it was established in 1998. The reef, found at 400–600 meters (1,310–1,970 feet) depth at the summit of a previously unmapped seamount in the central part of the archipelago, supports a breathtaking mix of deep marine life.

Daniel Fornari, marine geologist, and Emeritus Research Scholar at the Woods Hole Oceanographic Institution (WHOI) is a co-lead on the expedition.

HOV aids reef research

Cresting the ridge of an unmapped submerged volcano, and stretching over several kilometers, the impressive reef structure was first recorded by Dr. Michelle Taylor (University of Essex, UK) and Dr. Stuart Banks (Charles Darwin Foundation, Ecuador) while diving in the human-occupied vehicle (HOV) *Alvin*. This is the first time *Alvin* has explored this region within the GMR.

The submersible recently completed upgrades that included improved high-qual-

ity still and ultra-high definition 4K video imaging systems, as well as enhanced sampling capabilities, which allowed for the stunningly clear video of the newly discovered reef sites, as well as the delicate sampling required of the reef. HOV *Alvin* is owned by the US Navy and operated by WHOI in coordination with the Naval Sea Systems Command (NAVSEA) as part of the NSF-funded National Deep Submergence Facility.

"Exploring, mapping and sampling the Galápagos Platform with *Alvin* and *Atlantis* represents an opportunity to apply 21st-century deep-submergence and seafloor mapping technologies and innovative deep-sea imaging techniques to reveal the beauty and complexity of the volcanic and biological processes that makes the Galápagos so unique," said Fornari, who has mapped and sampled the marine environment in the Galápagos for over 20 years.

Galápagos Deep 2023 expedition

Fornari, Taylor, and Banks are part of an international group of scientists onboard the US Navy-owned and WHOI-operated research vessel *Atlantis* that is undertaking the Galápagos Deep 2023 expedition.

Prior to this discovery, Wellington Reef off the coast of Darwin Island in the far north of the archipelago was thought to be among the few structural shallow coral reefs in the Galápagos Islands to have survived the 1982–83 El Niño event. The new discovery made during dives by scientists in the HOV *Alvin* shows that sheltered deep-water coral communities have likely persisted for centuries in the depths of the GMR, supporting rich, diverse, and potentially unique marine communities.

Scientific findings such as this help inform effective management and conservation actions. The discovery also comes at a time when the Eastern Tropical Pacific countries of Panama, Costa Rica, Colombia, and Ecuador are actively collaborating through a regional Marine Corridor (CMAR) initiative to protect and responsibly manage the ocean upon which we as people depend. Newly declared MPAs such as the Hermanadad Marine Reserve (HMR) now connect seamounts in Ecuadorian waters to offshore marine environments such as Costa Rica's Cocos Island National Park. Natural oceanographic and marine processes transcend national boundaries, which underscores the need for special measures that protect foraging grounds, migratory routes for marine life and sustain responsible fisheries.



» HOV *Alvin*'s manipulator arm collects samples from rocky outcrop at the crest of a ridge. (Image credit: WHOI)

NATUREMETRICS AND DOT TO COLLABORATE ON eDNA SAMPLING TECHNOLOGIES

NatureMetrics and Dartmouth Ocean Technologies (DOT) have announced a new partnership set to revolutionize the way marine industries can assess ecosystems by offering autonomous environmental DNA (eDNA) collection of from marine environments.

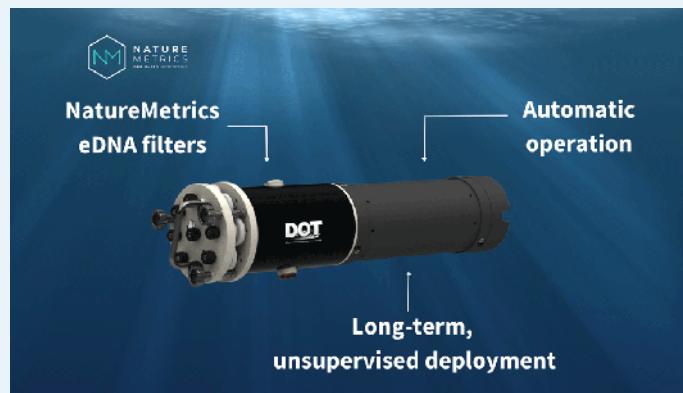
NatureMetrics' expertise in eDNA analysis, combined with DOT's innovative oceanographic instruments, will provide a comprehensive solution that will make a significant contribution to the global effort for marine industries to effectively monitor and manage biodiversity.

NatureMetrics operates at the forefront of eDNA analysis and has worked with clients across multiple sectors, including businesses and governments, providing them with the necessary tools to manage and conserve aquatic ecosystems using the latest NatureMetrics insights. DOT's instruments are designed to operate in challenging environments, including the deep ocean, providing researchers with real-time data that is critical to understanding the ocean's dynamics.

By combining their expertise, the two organizations can provide marine industries—from offshore energy industries to oceanographic and fisheries organizations—with the biodiversity mea-

surement tools they need to make informed decisions about how to manage their marine assets.

"This partnership represents a significant step forward in the practicality and benefit of eDNA technology to marine industries as we can now provide a broader range of sampling devices to unlock nature insights from a much wider range of marine ecosystems," said Dr. Samuel Stanton, Head of Marine at NatureMetrics.



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SEABED DATA COLLABORATION KEY TO A GREENER BLUE ECONOMY



By Andy Hamflett
Co-Founder and Director



NLA INTERNATIONAL

BLUE ECONOMY SOLUTIONS

As we pass the first third of the 2020s, the UN's decision to mark them as The Ocean Decade appears to be bearing fruit. Take The Nippon Foundation-GEBCO Seabed 2030 Project, for example, a collaborative international effort that aims to catalyze the mapping of the entire ocean floor by 2030. The data that continue to feed this global bathymetric map are critical to the study of ocean dynamics, offshore exploration, and a comprehensive policy agenda.

Recently the project—a joint initiative between The Nippon Foundation and the General Bathymetric Chart of the Oceans (GEBCO), itself a joint program of the International Hydrographic Organization (IHO) and the Intergovernmental Oceanographic Commission (IOC)—was formally endorsed as one of the first Decade Actions of the UN Decade of Ocean Science for Sustainable Development.

From a starting point of just 6% of seafloor coverage in 2017, the project surged to achieve 23.4% by June 2022 and—just this month—leapt further to 24.9%, the additional 5.4 million square km of new data equating to an area twice the size of Argentina. That 24.9% milestone, however—as significant as it is—also underlines how far there is still to go to achieve the 2030 target of 100% coverage.

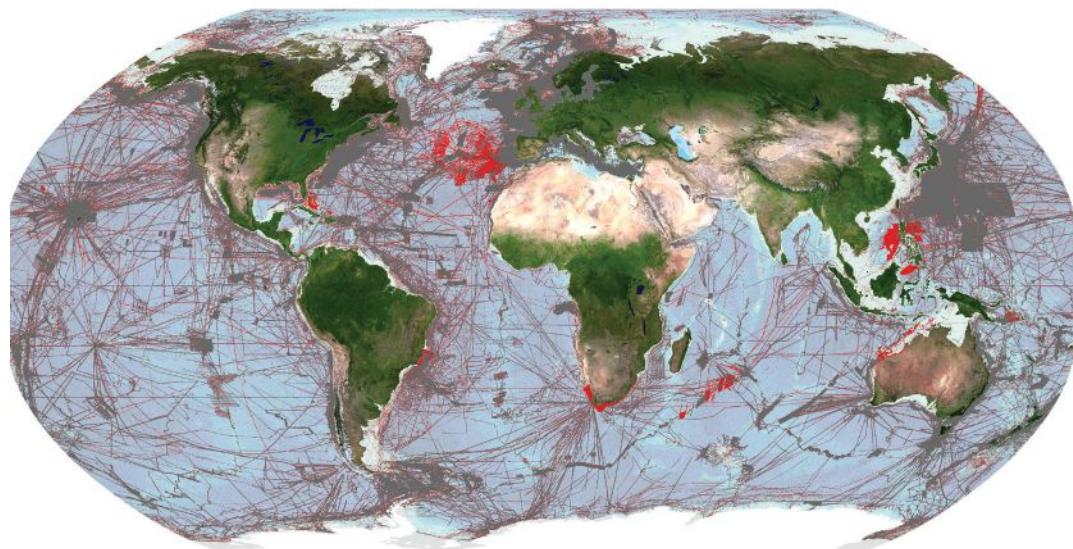
CROSS-SECTORAL APPROACH

With lots of hard work completed and essential infrastructure now in place—from overarching strategy to the establishment of a network of five centers in strategic locations globally—the platform for more progress is sound. To meet its ambitious objective, the Seabed 2030 project has highlighted strategic partnerships as being critical to success, encouraging ocean data collectors across all sectors to collaborate in as many ways as possible.

By means of example, academic partnerships have included activities with the Brazilian Program of Marine Geology and Geophysics (PGGM) a network of Brazilian academic and scientific institutions working to develop the understanding of the Brazilian continental margin and the adjacent ocean basin—the South Atlantic.

NGOs and not-for-profit organizations also have a powerful role to play, as evidenced by REV Ocean committing to contribute bathymetric data and to the sharing of innovative ways of mapping the ocean and managing the resulting data.

Engagement with governmental bodies is also critical. Most recently, efforts here have been typified by a memorandum of understanding with the Ministry of Information, Communications



» Areas of the global seafloor that are considered mapped within the GEBCO grid: grey regions depict the coverage of mapped areas within the 2022 release, red show additional coverage in the 2023 release.
(Image credit: Seabed 2030)

and Transport (MICT) for the Republic of Kiribati, and the National Mapping and Resource Information Authority (NAMRIA) of the Philippines.

Industry, too, has been proven instrumental to current progress. Not only do commercial enterprises collect a lot of bathymetric data for a variety of purposes, but they also push the boundaries of technological advancement, so that seafloor data can be collected faster, to higher resolution, and at reduced cost. Recent Seabed 2030 collaborations with industry have included a focus on innovative autonomous underwater vehicles (AUVs) (with ecoSUB Robotics); uncrewed surface vehicles (USVs) (with Saildrone); cloud-based, crowdsourced bathymetry (with Orange Force Marine); and data visualization exploration (with Terradepth).

GREEN TRANSITION

The underlying principle of this collaborative partnership approach is a reassuringly simple one: the more seabed data everyone contributes, the more benefit everyone derives—from academics to NGOs, from offshore planners to policy makers.

One perspective overarching each individual sectoral focus is the burgeoning, holistic prospect of the Blue Economy. The Blue Economy involves adopting an environmentally sustainable approach to the promotion and development of marine regions and resources. Continued investment in the Blue Economy as countries look to transition to a greener future—one that is significantly less carbon intensive and more resource efficient.

That means harvesting previously untapped renewable energy sources—wind, wave, tidal, and solar—from coastal and offshore environments, many previously uncharted.

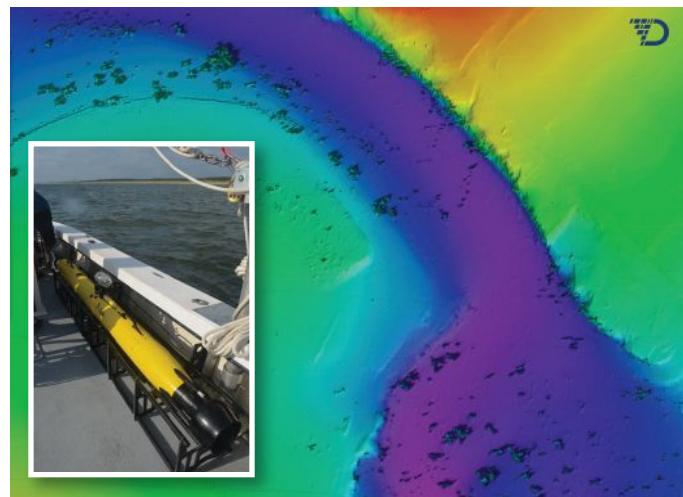
In this way, the Blue Economy and the so-called "Green Energy Transition" have become deeply interconnected, as knowing the depth and geophysical properties of the seafloor is essential to offshore planning and, subsequently, the safe, efficient, and responsible build out of offshore infrastructure.

SURVEYING AREAS OF INTEREST

Further scaling up of seabed data collection will only happen with a strategic approach. This is where the power of partnership goes beyond the hard bathymetric data itself, to converting the shared knowledge and understanding prevalent across each contributing sector into a unified, evidence-based strategy. The first harnessing



» Seabed 2030 Project Director Jamie McMichael-Phillips (left) and Brian Connan, VP of Ocean Mapping at Saildrone recently signed a MOU to collaborate on advancing ocean mapping technology in support of the Seabed 2030 mission.



» Visualization techniques are critical to gaining a better understanding of seafloor data captured by AUVs. (Image credit: Terradepth)

of such collective knowledge for the Seabed 2030 project came in 2021, when an initial online survey of views on seabed mapping attracted nearly 800 responses from professionals representing 90 countries.

The findings of that initial global survey highlighted a number of important themes—for example, that the main benefit of mapping the ocean floor was considered to be "to advance scientific understanding of seabed characteristics" (40% of respondents who were asked to express a ranked preference); that bathymetric data (82% of respondents) was the most desired geospatial information; that water depths less than 200 m (34%) and greater than 5,750 m (31%) were of greatest interest; and that an overwhelming majority of professionals (58%) wanted access to any data sets via an online marine data portal.

But that was just the beginning. Further analysis of the survey data, and engagement with a wide range of stakeholders, has led to more detailed understanding of needs, and the project is now looking to consolidate on that thinking with an additional survey.

The purpose of this new survey is to inform the development of a comprehensive benefits analysis of seabed areas yet to be surveyed. This in turn will lead to prioritization modeling to inform business case development for individual survey missions, so that Seabed 2030 and its partners can deliver on its mission to map our ocean seabed by the end of the decade.

The survey is intended to be addressed by bodies and agencies who discharge national, regional, and international responsibilities for seabed mapping and people engaged in the acquisition, production, and use of seabed mapping data, drawn from the global community of hydrographic and oceanographic authorities, and other government agencies.

To access the latest survey, please visit:
www.surveymonkey.com/r/S2030Survey.

For more information about Seabed 2030, visit:
www.seabed2030.org.

VOYIS INTRODUCES DISCOVERY VISION SYSTEM TO SUPPORT SMALL ROV PLATFORMS

Voyis has introduced Discovery Vision Systems to address the trade-off that is currently made between Piloting Cameras and 3D Inspection Cameras. Piloting cameras prioritize low latency video at the expense of the image data required for 3D model generation. Conversely, 3D cameras prioritize image data at the expense of piloting effectiveness, limited by a higher latency and smaller field of view. The Discovery is a vision platform without compromise, delivering 4K piloting video together with 3D data.

Voyis offers two versions of the Discovery: the Discovery Camera and the Discovery Stereo.

The Discovery Camera provides small ROV platforms with a compact imaging and lighting payload that streams both 4K low latency piloting video, as well recording crisp stills images for direct 3D modeling. By utilizing a large high-sensitivity sensor and wide-angle lens, it provides an ultra-wide field of view (130°x130°) for complete situational awareness without needing to tilt the camera.

The camera's 8-megapixel sensor with resolution-matched optics achieves true 4K video quality, along with lossless sensor zoom. The synchronized high-power Nova Mini lights provide an industry-leading 125,000 lumens of even illumination, increasing the operating range and feature detection capabilities of the vision system. Edge computing corrects visual inaccuracies in real-time and uses high dynamic range information to correct lighting that enables the stills images to be directly used for 3D modeling.

The Discovery Stereo brings true depth perception and real-time 3D modeling to ROV platforms operating at up to 4000 m depth. It maintains a wide field of view (75°x75°) and low latency for the piloting video stream, while onboard computing instantaneously calculates 3D depth maps for measurements and coverage monitoring. These depth maps are 3D point clouds calculated from feature matches between a pair of images at a single point in time, which can be displayed in a real-time rotatable video stream to



» Discovery Stereo is 4,000 m depth-rated and comes with four Nova Mini Lights. (Image credit: Voyis)

observe the changing 3D scene and allow the pilot to monitor the vehicle's position relative to the target. This depth perception has the potential to enable autonomous capabilities on newer robotic platforms, like manipulator automation or station keeping without seabed bottom-lock.

Both product versions come integrated with Nova Mini lights, as well as direct support of DDS (Data Distribution Service) and ROS2 (Robot Operating System). Support of these new robotics standards drastically simplifies vehicle integration and autonomy, while also improving system reliability.

The Discovery product line delivers a new level of situational awareness to ROV operations, achieving both high resolution video and real-time 3D perception for piloting, inspection, and autonomy applications. It is now possible for every subsea vehicle to see the depths like we see the surface.

"Voyis continues to lead innovation that enhances capability in underwater exploration and inspection applications. The Discovery Vision Systems represent a significant leap forward in the performance of ROV vision systems, delivering simultaneous 4K video and 3D data streams," said Voyis CEO Chris Gilson. "We believe this system will become the standard platform for underwater machine vision and autonomy, helping to advance a revolution in subsea robotics."



» The 300 m rated Discovery with two Nova Mini Lights. (Image credit: Voyis)

SUBNERO AND POPOTOMODEM PARTNER TO LAUNCH THE S1000-N

Singapore-headquartered Subnero and US-based PopotoModem have joined forces to create a powerful new underwater acoustic modem, the S1000-N. This modem combines the power of the Popoto's S1000 series modems and Subnero's underwater network stack (UnetStack).

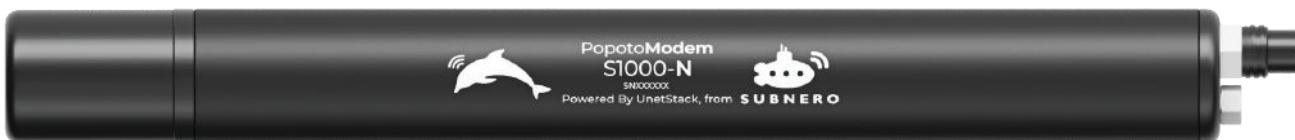
With the S1000-N, users can enjoy a data rate of up to 10240 bps over a range of 3+ km. Subnero's technology integration allows users to take full advantage of UnetStack, an underwater networking stack with features such as multi-hop

routing, fragmentation and reassembly, contention-free communication, and much more, providing users with a more reliable and efficient way to send data underwater. With a fully functioning network stack out of the box, the S1000-N offers users a powerful and affordable solution for underwater communications.

One of the key features of the S1000-N is its ability to operate at a low power draw, while still offering the benefits of a software defined modem. The S1000-N supports multiple computer languages for

interfacing (e.g., Java, Python, Groovy, Julia, C, JavaScript), and allows for customization at various levels. These features provide users with the ability to build and customize their applications.

The S1000-N provides the ability to transmit and record unique waveforms, allowing the unit to act as an acoustic data logger or general acoustic source. Overall, the S1000-N is an ideal solution for a variety of underwater applications, such as current and temperature measurement, pollution tracking, and other multi-node applications.



» The S1000-N can operate at a low power draw. (Image credit: Subnero/PopotoModem)

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BSEE REVISES REGULATIONS FOR DECOMMISSIONING OF OUTER CONTINENTAL SHELF INFRASTRUCTURE

To ensure offshore oil and gas wells, platforms, pipelines, and related infrastructure are decommissioned in a timely, safe, and environmentally responsible manner, the Bureau of Safety and Environmental Enforcement (BSEE) has published a final rule that specifies decommissioning requirements for rights-of-use and easement grant holders and formalizes BSEE's policies regarding performance by predecessors ordered to decommission Outer Continental Shelf facilities.

"If not properly decommissioned, offshore oil and gas infrastructure can become safety hazards, cause environmental harm, or become obstructions by interfering with navigation, fishing, or other uses of the Outer Continental Shelf," said BSEE Director Kevin Sligh.

"The revised regulations provide the certainty requested by industry about how BSEE pursues decommissioning compliance from affected lessees and grant holders, helping operators to plan for future decommissioning actions and improving industry's compliance with decommissioning obligations."

The final rule:

- Specifies right-of-use and easement holders accrue decommissioning responsibilities in the same manner as lessees, operating rights holders, and right-of-way grant holders.
- Establishes timeframes for recipients of BSEE decommissioning orders to take organizational measures and submit decommissioning plans in response.



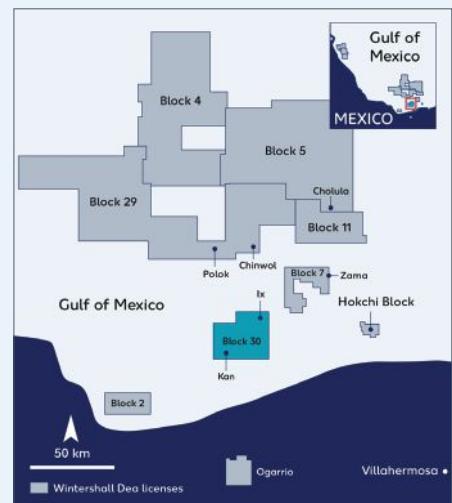
On Oct. 16, 2020, BSEE and the Bureau of Ocean Energy Management published a proposed rule entitled "Risk Management, Financial Assurance and Loss Prevention" (85 FR 65904); the new rule finalizes only the BSEE-related portions of that proposal. In response to the jointly proposed rule, BOEM and BSEE received 36 unique comments from various entities including individual companies, industry organizations, non-governmental organizations, and private citizens. Of those 36 commenters, 21 submitted comments on the BSEE provisions. BSEE evaluated all submitted comments, revised the proposed rule accordingly, and finalized certain BSEE-only provisions. BOEM intends to publish a revised BOEM-only proposed rulemaking to address financial assurance requirements of OCS lessees and holders of operating rights.

WINTERSHALL DEA AND PARTNERS MAKE SIGNIFICANT OIL DISCOVERY OFFSHORE MEXICO

Operator Wintershall Dea and its partners Harbour Energy and Sapura OMV have made a significant oil discovery on the Kan exploration prospect in Block 30, located in shallow waters of the Cuenca Salina in the Sureste Basin, offshore Mexico. Based on preliminary estimates the discovery may contain 200 to 300 million barrels oil equivalent in place.

"This important discovery at Wintershall Dea's first own-operated exploration well offshore Mexico is a great success," said Hugo Dijkgraaf, Wintershall Dea's Chief Technology Officer and Executive Board member responsible for global exploration. "It was one of the most contested blocks of Mexico's bid round 3.1 back in 2018. It is a significant step to extending our footprint in Mexico contributing to the development of a potential new hub in the shallow waters of the Sureste Basin," Dijkgraaf added.

Kan is the first of two commitment wells of Block 30 and located about 25 km off the Tabasco coast in water depth of around 50 m, and within a zone of several Miocene discoveries including the world class Zama discovery and the Polok and Chinwol discoveries, where Wintershall Dea holds significant working interests. The Kan well, drilled by the Borr Ran rig, reached a total depth of 3,317 m and found more than 170 m net pay sands of Upper Miocene with good petrophysical properties and high-quality oil. An updip sidetrack down to 3,087 m was carried out, and additionally approximately 250 m cores across the main reservoir sands were recovered.



» Wintershall Dea's license portfolio in Mexico's Sureste Basin. (Image credit: Wintershall Dea)

BP STARTS PRODUCTION AT THE ARGOS OFFSHORE PLATFORM IN GULF OF MEXICO

bp has successfully started oil production at its Argos offshore platform. With a gross production capacity of up to 140,000 barrels of oil per day, Argos is bp's fifth platform in the Gulf of Mexico and the first new bp-operated production facility in the region since 2008.

The semi-submersible platform ultimately will increase bp's gross operated production capacity in the Gulf of Mexico by an estimated 20%. bp expects to safely and systematically ramp up production from Argos through 2023.



bp chief executive Bernard Looney, said: "The start-up of Argos is a fantastic achievement that helps deliver our integrated energy strategy—investing in today's energy system and, at the same time, investing in the energy transition. As bp's most digital facility worldwide, applying our latest technologies, Argos will strengthen our key position in the Gulf of Mexico for years to come."

Argos is the centerpiece of bp's Mad Dog Phase 2 project, which extends the life of the super-giant oil field discovered in 1998. It is one of nine high-margin major projects that bp plans start up by the end of 2025 globally.

Operating in 4,500 feet of water about 190 miles south of New Orleans, Argos will support 250 permanent jobs. Standing 27 stories tall, the platform has a deck the length and width of an American football field and weighs more than 60,000 tons.

Argos also has a Dynamic Digital Twin, a bp patent-pending software that links complex data from Argos to 3D digital models of those systems, allowing remote operators wearing Virtual Reality headsets to access data in real time to improve decision-making, efficiency and safety.

» Argos helideck at night. (Image credit: bp)

SHELL COMPLETES RESTART OF OPERATIONS AT THE PIERCE FIELD



Shell UK has completed the restart of operations at the Pierce field in the UK Central North Sea, following a significant upgrade to allow gas to be produced after years of the field producing only oil. Pierce is a joint venture between Shell companies (operator, 92.52%) and Ithaca Energy (UK) Limited (7.48%).

Substantial modifications were made to the *Haewene Brim* floating production, storage and offloading vessel (FPSO), which is used to produce hydrocarbons at the Pierce field. A new subsea gas export line was also installed, connecting to the SEGAL pipeline system, which brings gas ashore at St Fergus, north of Aberdeen.

To enable the upgrade, the FPSO, which is owned and operated by Bluewater, stopped producing in October 2021. It then spent six months in dry dock where it was transformed into a vessel that could also produce gas, which had previously been re-injected into the reservoir.

Peak production is expected to reach 30,000 barrels of oil equivalent per day, which is more than twice the production prior to the redevelopment, with more gas being produced than oil. The gas will be sent through newly installed subsea pipelines and the oil will be transported by tanker, as before.

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SUBSEA BATTERIES FOR GREEN, LEANER OFFSHORE INFRASTRUCTURE INSPECTION



By Leon Adams
VP, Sales & Marketing



» Demand for subsea IMMR services continues to soar as offshore energy planners look to plan, build, and monitor offshore wind installations to support the green energy transition.

Subsea Inspection, Monitoring, Maintenance, and Repair (IMMR) services for offshore wind infrastructure management are in high demand right now as developers seek to prioritize the integration of renewable energy sources into power grids around the world. Central to planned IMMR operations is the periodic examination of the array and export cables—a network of submarine cables installed to transfer the generated power from turbine to offshore substation to onshore substation—to ensure operational optimization and reliability.

AUTOMATED IMMR TECHNOLOGIES

Current IMMR campaigns for offshore wind installations are increasingly leveraging automation technologies originally developed and fielded to enhance offshore oil well survey and intervention practices. Autonomous underwater vehicles (AUVs) have become a popular option given that they minimize topside vessel size and the duration of at-sea operations, resulting in significant savings in terms of operating costs and carbon emissions.

Central to the success of AUVs (and other remotely operated IMMR technologies) is the proximity of their power source—subsea batteries.

Recent advances in subsea battery technology have transformed the applicability of AUVs and other remotely piloted assets for efficient underwater inspection. Certain intervention tasks are better suited to remotely operated vehicles (ROVs), which typically draw

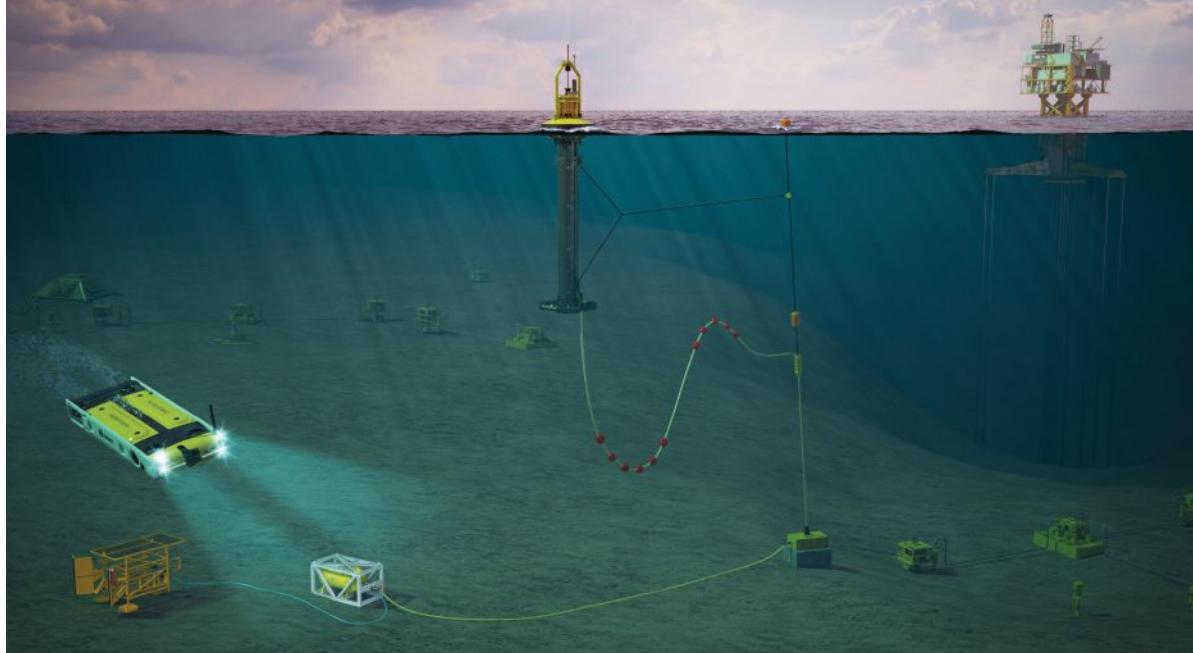
their power via an umbilical to topside support. However, improved efficiency, additional tools or equipment, and localized power are also evolving ROVs to use on board subsea batteries to support any required additional bursts of power or even to fuel fully electric ROVs, or eROVs, such as the *Nereid UI*, developed by Woods Hole Oceanographic Institution for under ice surveys in the Arctic.

The development of subsea "resident" AUV systems—equipped with seafloor battery-powered charging stations—extends the notion of subsea inspection to the next level. Subsea residency allows for ongoing scheduled survey operations and on-demand investigation from a remote command center without the need for any topside deployment.

Topping up the battery bank charging system for the AUV can be implemented with a slow rate charge from a topside (platform if viable) or even a wave-based energy generating buoy. Such slow rate charge line minimizes the wire gauge required to carry the power and therefore saves on electrical umbilical size and cost. Meanwhile, the subsea charged battery

» SeaSafe® II is pressure tolerant to 6,000-meter depth and includes SWE's patented battery management system. (Image credit: SWE)





» Subsea residency systems, supported by robust and reliable subsea battery technology, allow for the ongoing monitoring of subsea assets. (Image credit: Ocean Power Technologies/Modus Seabed Intervention/Saab Seaeye)

system is ready for immediate high-powered pulses to meet any vehicle need, hence mitigating the need for any long, bulky cables to transport power to the seabed.

SUBSEA BATTERIES FOR IMMR

Subsea batteries for such IMMR applications can be categorized into three types. The first type is 1 Atmosphere batteries, which are not pressure tolerant—hence the term 1 atmosphere—and so require a pressure vessel. The battery modules are inter-connected with classic electrical connectors and the pressure vessel features a bulkhead mount subsea connector. This style is typical in smaller AUVs for shallow deployment as small pressure vessels are manageable in cost and design.

The other two types of subsea batteries are both pressure tolerant, designed to resist the forces presented at depths of up to 6,000 m (tested to 10,000 psi). Some pressure tolerant types can be configured within a pressure balanced oil filled (PBOF) case. Such types are used for larger configuration battery systems used at greater depths, typically 1,000–6,000 m. The battery modules are inter-connected with classic electrical connectors within the PBOF case, connected in series for voltage increments, and in parallel for power and capacity increments. The case is then oil filled. A panel mount subsea connector presents the battery system power and communications to the subsea application connection.

The third type of subsea battery is also pressure tolerant, but it does not require the use of a PBOF case. It can be used directly in the water. It utilizes subsea ready cables and connectors for subsea interconnect. Such a battery type is very easy to use in subsea applications as it avoids both the pressure vessel requirement and the PBOF case and oil fill requirement. However, resulting subsea cables and connectors can become challenging when configuring a larger series and parallel modules battery system from the battery modules.

SMART SUBSEA BATTERY MODULES

Southwest Electronic Energy (SWE) has been developing and manufacturing batteries for the oil and gas industry for over 40 years, and capitalized on lessons learned from building ruggedized, reliable, downhole MWD batteries with the introduction of the SeaSafe battery product line. While the portfolio has evolved since its launch 12 years ago, today we offer 3 types of SeaSafe subsea

batteries as well as a series of accessories primed for underwater robotics and IMMR systems.

SWE's SeaSafe battery modules come in 24V, 30V or 37V versions, and accessories. Below highlights the 24V versions:

SeaSafe Direct: Use Direct in Water: Pressure Tolerant to 6,000 m
SeaSafe Direct 24V -40 Amp Battery Module
<ul style="list-style-type: none"> Goes Direct into the Sea Water 40 Amp capable
SeaSafe Direct 24V Battery Module
<ul style="list-style-type: none"> Goes Direct into the Sea Water 10 Amp capable
SeaSafe II: Use Within a Pressure Balanced Oil Filled (PBOF) Case: Pressure Tolerant to 6,000 m
SeaSafe II 24V Battery Module
<ul style="list-style-type: none"> Goes in a PBOF Case 40 Amp capable
SeaSafe Endurance: Use Within a 1 Atmosphere Pressure Vessel or Topside: NOT Pressure Tolerant
SeaSafe Endurance 24V Battery Module
<ul style="list-style-type: none"> Goes in a 1 ATM Pressure Vessel 40 Amp capable
SeaSafe Accessories:
SeaSafe Diode ORing Module: Pressure Tolerant to 6,000 m
SeaSafe 24V Charger: Topside Use Only
SeaSafe Observer Software: Topside Use Only

All 24V Battery modules above can be configured in series for increments in voltage of 24V each module and/or in parallel (with similar type) for increments in capacity per module (string) using Diode ORing Module. Also, above battery module options in 30V version and 37V version are available.

All SeaSafe batteries are UN 38.3 tested for cargo air, ground, and sea transport. SeaSafe II and SeaSafe Direct are American Bureau of Shipping (ABS) Design Certified.

For more information, visit: www.swe.com or contact Leon Adams at ladams@swe.com.

PROPOSAL TO STUDY AREAS FOR OFFSHORE WIND ON THE NORWEGIAN CONTINENTAL SHELF



» Kjersti Dahle, Director of Technology, Analyses and Coexistence. (Image credit: Linn Smerud/NPD)

A broadly composed group in the Norwegian Petroleum Directorate (NPD) has identified 20 areas on the Norwegian Continental Shelf that could be technically suitable for offshore wind, and where there are relatively few conflicts of interest.

The NPD has provided technical contributions in this process, which has been spearheaded by the Norwegian Water Resources and Energy Directorate (NVE).

"We have 50 years of experience with coexistence at sea, which has been useful in the effort to identify these areas. In addition to this, we know the shelf and understand seabed conditions—this is important expertise as we assess whether areas are suitable for offshore wind," said Kjersti Dahle, Director of Technology, Analyses and Coexistence.

Among other things, the NPD has contributed data and knowledge about petroleum resources,

CO₂ storage complexes and the subsurface.

"For us, it's crucial that no potential petroleum and CO₂ assets are lost as a result of developing offshore wind. Moving forward, it will be important to conduct a good, detailed mapping of the resource potential in the proposed areas, with the best possible data available," Dahle added. "Some of the areas are challenging as regards petroleum; others seem to be of little consequence."



TGS | 4C OFFSHORE INTRODUCES REGULATORY GUIDES FOR KEY OFFSHORE WIND MARKETS

TGS | 4C Offshore, a global energy data and intelligence provider, has announced the introduction of offshore wind regulatory 'cheat sheets' alongside their industry-leading quarterly international wind market intelligence reports. A high-level compendium of regulatory cheat sheets, one per offshore wind market, has been compiled, allowing for a comparative overview of the critical regulations impacting project development in different jurisdictions.

Created by experts in global wind markets and designed to help professionals in the offshore wind sector navigate complex regulations, these cheat sheets are a valuable resource for anyone involved in offshore wind project development, construction, or operations.

The cheat sheets cover a range of topics, including site identification and leasing, project permitting, localization requirements,

routes to revenue (securing offtake agreements), and offshore transmission responsibilities. They are designed to be easy to read and use, with clear explanations to simplify complex regulatory requirements.

"Regulations across the many different markets in the offshore wind industry are complex and constantly changing. As a result, details are often dispersed and assumed," said Richard Aukland, Director of Research at TGS | 4C Offshore. "Our cheat sheets provide an easy-to-use reference guide that can help professionals stay up to date with the latest offshore wind energy development frameworks, all in one place. This is increasingly critical when trying to understand the processes, timescales and hurdles involved in bringing projects to market. The recent introduction of accelerated permitting in some European markets adds another layer of consideration."

GE POWER CONVERSION PARTNERS WITH KEPPEL SHIPYARD ON PETROBRAS FPSO VESSELS

GE Power Conversion was recently awarded a contract from Keppel Shipyard Limited for the design, supply, and delivery of two electrical modules for the Petrobras P-80 and P-83 Floating, Production, Storage and Offloading (FPSO) vessels that will operate in Brazil.

The integrated electrical module to be provided by GE Power Conversion is considered the "heart" of the platform as it provides all the distributed energy to provide electric power for the entire FPSO operations, in addition to housing equipment that controls the vessel. GE Power Conversion scope of supply includes medium voltage and low voltage switchboards, MCCs (motor control centers), high power transformers and UPS (Uninterruptible Power Supply) for both P80 and P-83 vessels.

As part of the project execution strategy, delivery of both P-80 and P-83 will be led by GE Power Conversion's Asia team, based in Singapore. The team includes engineering, project management and commissioning capability and leadership, with GE Power Conversion having long-standing experience working in Singapore's maritime and offshore sectors.

Recognizing the importance of local content in Brazilian national projects, GE Power Conversion's LATAM team will provide local engineering, project management and supply chain support, based in Belo Horizonte. The team in Brazil brings expertise developed during previous delivery of electrical modules to six of Petrobras' FPSOs operating in the pre-salt area, including P-75 and P-77 in the Búzios field.



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EFFICIENCIES THROUGH INTEGRATING GEOPHYSICAL & GEOTECHNICAL SURVEYS

By **ACTEON**

There are ten times more suppliers involved in a typical wind development than one for oil or gas. In addition to the administrative burden for installers and developers, a fragmented supply chain means multiple supplier interfaces, which may lead to inefficiencies and costly project delays.

Geophysical and geotechnical site characterisation surveys, for example, are typically commissioned separately. However, this can lead to an additional administrative burden for the developer, overrunning projects and escalating costs, particularly if knowledge of the ground model is transferred inadequately and/or the necessary data integration happens late in the project.

There are significant advantages to a collaborative, integrated approach that combines geophysical and geotechnical surveys. Although geophysical results inform later geotechnical site investigations, considering the surveys together helps to better target geotechnical studies and ensure knowledge of the ground model and drill sites is transferred effectively.

More efficient surveys can help to deliver faster site assessments and, combined with the lower administrative burden from using a single interface, contact person, and contract can help to reduce costs. Effective knowledge transfer and improved ground models can better inform geotechnical site investigation locations for de-risked, cost-effective structure designs and, ultimately, better long-term project outcomes for a lower levelized cost of energy.

POOLING DEEP DOMAIN KNOWLEDGE

As a result of the pursuit of offshore renewable energy, reliable and competitively priced seabed site characterisation services are in high demand, with only a few large providers able to deliver combined geophysical and geotechnical services to meet offshore wind developers' needs. Together, the Geo-services brands in



» Benthic's Portable Remotely Operated Drill (PROD). (Image credit: Acteon)

Acteon's Data and Robotics division provide another option and combine deep domain knowledge with the scale and reach to handle large offshore wind site characterisation contracts across the globe. All through a single point of contact, which eliminates the need to manage separate interfaces and contracts.

The BlueFloat Energy and Renantis Partnership is already taking advantage of an integrated geophysical and geotechnical survey for its Bellrock and Broadshore wind farms northeast of Aberdeen, Scotland, UK. In the US, Acteon established a new base early in 2022 in Massachusetts, through its Geo-services brand TerraSond, to better support the Vineyard Wind 1 project and wider US offshore wind developments.

TECHNOLOGY IN THE FIELD

Technology also plays a critical role in delivering efficiency. For instance, TerraSond's autonomous surface vessels routinely double geophysical survey coverage and halve the company's carbon footprint. Also within Acteon's portfolio, Benthic's Portable Remotely Operated Drill (PROD) systems remove the need for costly drill ships and can achieve greater penetration depths than other sea-floor systems; and UTEC's iSite Subsea solution enables virtual survey data interrogation and comparison via a single secure cloud-based interface, remotely, 24/7 and without specialist software knowledge.

The integration of geophysical and geotechnical surveys, applied with deep domain knowledge and the latest innovative technologies, and combined with scale and global reach, has the potential to achieve efficiencies in the development of offshore wind in Europe, the US and beyond.

For more information, visit: www.acteon.com.

» Efficiencies in the field underpin Acteon's integrated approach to geoservices. (Image credit: Acteon)



CHINA'S FIRST SEMI-SUBMERSIBLE OFFSHORE SOLAR POWER PLATFORM DELIVERED

CIMC RAFFLES recently launched and delivered China's first semi-submersible offshore floating solar power platform, which is a self-developed and self-owned intellectual property. The platform has been officially handed over to CIMC Solar Marine Technology (Yantai) Co., Ltd., and it has been towed to the designated location for deployment.

The platform has four single float arrays and a total installed capacity of 400 kWp, as well as net deck area of approximately 1,900 square meters. The platform can operate safely in open seas with wave heights of up to 6.5 meters, wind speeds of up to 34 meters per second, and tidal differences of up to 4.6 meters.

Aligning with China's "dual carbon" goals, the development prospects of the photovoltaic (PV) power generation industry are highly promising. In 2022, CIMC RAFFLES partnered with the Yantai Municipal Government to jointly establish CIMC Solar, which offers integrated solutions for the comprehensive development of offshore PV, leveraging CIMC RAFFLES's rich experience in semi-submersible product engineering.

» *The successful launch of the first semi-submersible offshore floating solar power platform developed in China. (Image credit: CIMC RAFFLES)*

The platform will serve as an excellent model to future product development, large-scale application, and cost-effective verification, and will help pave the way towards the deep-sea development of semi-submersible PV power generation.



TRANSOCEAN AND ENETI ANNOUNCE JV FOR OFFSHORE WIND FOUNDATION INSTALLATION

Transocean Ltd. and Eneti Inc. has announced the execution of a non-binding memorandum of understanding through their respective subsidiary companies indicating their intention to form a joint venture company that will engage in offshore wind foundation installation activities.



» *JV to install wind turbine foundations and provide transport and installation services. (Image credit: Seajacks International Ltd.)*

The joint venture would benefit from the best-in-class experience of both partners across their respective core businesses providing offshore services. Transocean's vast experience operating a global fleet of dynamically positioned offshore drilling rigs to a diverse base of energy-producing customers on long-term contracts will be combined with Eneti's experience, through Seajacks International Ltd., installing more than 500 wind turbine foundation components and executing "Transport and Installation contracts" at wind farms including Akita & Noshiro (Japan), Meerwind (Germany), Veja Mate (Germany), and Moray East (Scotland).

The formation of the joint venture is subject to the successful negotiation and execution of definitive agreements. The parties expect the definitive agreements would provide that (i) the operations of the joint venture would be performed initially by personnel from both Eneti and Transocean and (ii) the joint venture, with technical assistance from the joint venture partners, would be responsible for converting up to two fit for purpose floating vessels into offshore wind foundation installation vessels.

Upgrades to the vessels would include a 5200 t crane and are expected to provide them with the capability to carry up to six 3,500 t monopile foundations with 12 m diameter and possess certain other environmentally responsible and efficiency-enhancing operating features.

COMMODITY MARKETS CONTINUE SEARCHING FOR DIRECTION



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

CRUDE OIL:

After the oil price collapse following the Silicon Valley Bank failure in early March, prices rebounded to a new high. Our accompanying chart of 2023 oil prices contains a red line showing the average daily price for the year of \$77 a barrel. The line shows how prices have oscillated around the average price, suggesting the market is range bound between the high \$60s and the low \$80s a barrel. Why is this the case?

The crude oil market is struggling to discern where the global economy is heading. Recession, soft landing, or blue skies? Investors, economists, business executives, central bankers, politicians, and families are all concerned. Each alternative economic trajectory means actions must be taken. If each party reaches a different conclusion and acts on its belief, economic outcomes may be worse than what they expected.

Each of the above scenarios produces a meaningfully different oil demand outlook—sharply down, flattish, or a healthy increase. If you are an oil minister or oil executive planning your future production and selling prices, what decision do you make? A wrong one could be financially painful for your country or company, but an equally wrong choice might be painful for millions of consumers.

Over the past century, oil supply and demand shifts have created industry booms and busts. Neither is good, although a select group benefits and wants its bounty

to continue. But that is not how markets work. Supply and demand fundamentals combine to correct booms and busts. The past two decades have seen the global oil industry respond to the China economic miracle of the 2000s, the American oil shale revolution of the 2010s, and the pandemic economic shutdowns and rebounds of the 2020s.

What has emerged from this history is a belief among producers, consumers, and investors that stable prices are better for the industry's financial health and the assurance of adequate oil supplies. We are essentially returning to a past era dominated by the Seven Sisters when a hand-

ful of leading global oil companies tacitly agreed to steps to stabilize oil markets and thus oil prices. Today, OPEC+ has replaced the Seven Sisters, although a few large oil producers dictate market adjustments.

As frustrating as a range-bound oil price is, especially for traders and investors, the range provides prices nearly everyone can live with and adjust to. A chart of oil prices this year looks like a series of moguls that skiers enjoy, although lacking the thrill of downhill or giant slalom runs. The thrills carry the risk of disaster, and many oil industry players are opting for boredom over terror.



» A lack of consensus surrounding the global economic outlook has the oil prices fluctuating within a range that nearly everyone can live with and adjust to.

NATURAL GAS:

The verdict is in—it was a warm winter and natural gas prices suffered. We are now in the early weeks of the gas injection season and the storage is growing. An analysis of winter demand explains why natural gas prices fell from \$5.71 per thousand cubic feet on November 1, the start of the withdrawal season, to \$2.22 on March 31, the end of winter. That is a 61 percent drop!

Gas investors were very optimistic about the winter of 2022–23 with exports to a gas-starved Europe soaring following the continent's loss of access to its cheap supply of Russian gas driving expectations for sustained high prices. US E&P companies ramped up drilling and production, so with elevated prices, it looked like a good final 2022 quarter for profits and a positive 2023 start.

On November 1, 2022, natural gas storage was three percent below the 5-year average winter starting volume. Due to the warm weather and surging gas production, storage ended the season 19 percent above the 5-year average ending volume.

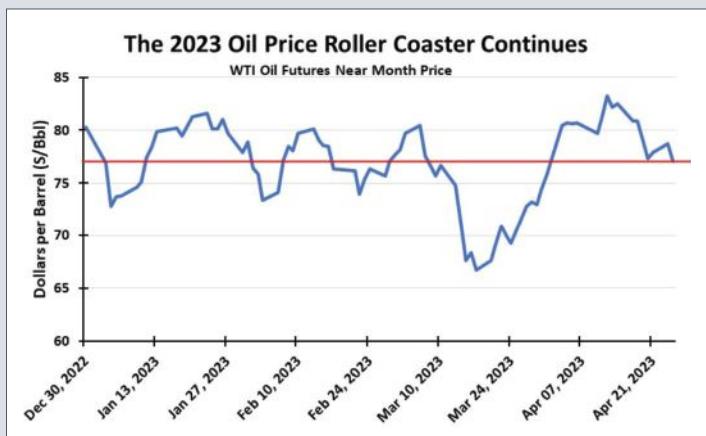
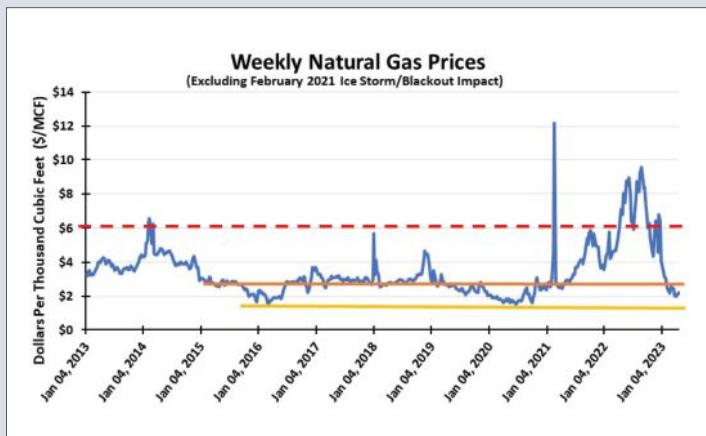
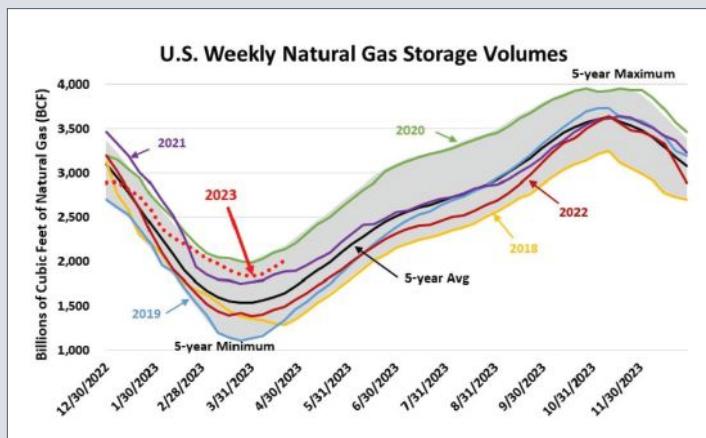
What crushed natural gas prices was production growing by 5.5 percent (+5.2 billion cubic feet per day). However, natural gas consumption grew by only 1.7 percent (+1.6 Bcf/d), despite gas consumed in generating electricity increasing by 9 percent. The latter's growth reflected cheaper gas undercutting coal prices—its primary competitor—in the power generation market. Not only did it help keep consumer electricity bills down, but cleaner natural gas helped reduce carbon emissions.

Regional temperature differences further illustrate the sensitivity of gas prices to demand. Areas west of the Rocky Mountains, including the Mountain and Pacific regions, experienced colder temperatures this winter. Heating degree days were 23 percent above normal in the Pacific region and 12 percent above in the Mountain region. More heating demand resulted in Pacific region gas storage volumes finishing the winter season 57 percent below the five-year average—a record low.

For gas investors, the only good news—and it will be a significant positive for the long-term—was the final government approval of two new liquefied natural gas export terminals. The projects had been approved in 2019 but were held up by the courts that demanded additional environmental and community assessments. One project, Rio Grande LNG in South Texas, still faces battles from environmentalists, but with FERC's final approval, construction can begin. The second terminal, Tellurian's Driftwood LNG, still must reach a "final investment decision," which requires firming up financing, partner roles, and contracts, all of which are expected to be completed this summer. Positive movement on these new projects will provide additional gas export opportunities that will tighten the gas supply/demand outlook and should support higher gas prices.



» Final approval of two new LNG export terminals is positive news for investors and should support higher long-term gas prices despite recent falls.



IN THE NICK OF TIME: US OFFSHORE WIND IS POISED FOR ENORMOUS GROWTH



By Josh Kaplowitz

Vice President of Offshore Wind



The East Coast has been described as the Saudi Arabia of wind energy. Powerful, consistent winds off the coastline make it an abundant clean energy solution, capable of supplying vast amounts of affordable, reliable power.

However, US offshore wind development has woefully lagged behind other countries. Right now, the US only has seven offshore wind turbines in operation generating 42 megawatts (MW) of power. Compare that to Europe and China, which had installed offshore wind projects generating over 60,000 MW by the end of 2022 with thousands more megawatts in the pipeline.

WINDS OF CHANGE

Thankfully, the tide is beginning to turn. To get a sense of demand for offshore wind energy, look no further than recent federal lease sales for offshore wind development off the New York and California coasts. These auctions generated over \$5 billion in revenue, which will lead to projects that are estimated to deliver a combined 15 GW of clean energy—enough to power over 6 million homes. These sales are a big step toward the US goal of deploying 30,000 MW of offshore wind energy by 2030. Four additional lease sales are expected through 2024.

There's a myriad of reasons why offshore wind is generating so much excitement. Roughly 80 percent of Americans live within 200 miles of the coast. Coastal population centers have the highest energy demand and the highest wholesale electricity prices as a result.

Offshore wind can generate significant amounts of electricity close to these consumers, blows more consistently and strongest at times of peak demand, and ultimately can make a significant difference in lowering energy costs. Offshore wind prices can be

locked in for 20 years or more, acting as a hedge against volatile fossil-fuel prices.

INVESTING IN INFRASTRUCTURE

A tremendous amount of construction and planning is already underway to build the infrastructure that's needed, including turbine components and the ports, ships, and platforms to build these projects. Offshore wind taps into the skills of US oil and gas workers, who have decades of experience with ocean energy infrastructure.

We're seeing this right now in Louisiana—a legacy oil and gas state—where the first American-flagged offshore wind service operations vessel is currently under construction.

The ship, called the *Eco Edison*, is being built for Ørsted, which is developing offshore wind along the East Coast. The *Eco Edison* will serve as floating housing and parts storage for US offshore wind technicians. The *Eco Edison* is just one of 30 offshore wind vessels the industry has invested in so far, creating significant employment and investment opportunity for American shipbuilders.

To reach 30,000 MW by 2030, the offshore wind industry is estimated to support nearly 45,000 jobs by 2025 and 83,000 jobs across all sectors. And by 2050, the US Department of Energy has found that the US could install a whopping 86,000 MW of offshore projects.

Offshore wind is America's next major energy source, representing a generational opportunity to create jobs and bolster the economy. We have a long way to go to get there, but this industry is well on its way.

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

GLOBAL OTEC GETS FIRST CERTIFICATE OF APPROVAL OF A COLD-WATER RISER

An important milestone on the way to building the first commercial Ocean Thermal Energy Conversion (OTEC) platform was achieved by Global OTEC Resources in April when the UK-based company received its first Certificate of Approval for the methodology of installation of a Cold-Water Riser, for the purposes of an offshore OTEC platform.

This forms a crucial step in the design process, using standards already tested and applied to the Oil and Gas industry for implementation in OTEC deployments.

The certificate was issued by the Marine Warranty Surveyor company ABL Group and has been in effect since the April 4, 2023. This approval is particularly important given the technical challenges faced by OTEC installations, and the long history of OTEC's unsuccessful implementations.

"History is an important teacher, and we are committed to learning from it. Failure of previous OTEC projects highlights where we should exercise caution, so third-party technical due diligence from the earliest stage is important for our success," said Global OTEC Founder and CEO, Dan Grech.

Global OTEC has designed what will be the first commercial-scale OTEC system, the 1.5 MW floating platform named *Dominique*. Set to be installed in São Tomé and Príncipe in 2025, this will be a shining example to the rest of the world of how diesel fuel imports can be replaced with clean energy from the ocean.

Generating power from the temperature difference naturally present across the tropical area of the ocean, OTEC uses warm surface seawater to evaporate a fluid, which produces a vapor that spins a turbine. Cold water from deep in the ocean is then used to cool the vapor and condense it back into a liquid so the cycle can continue all year round.



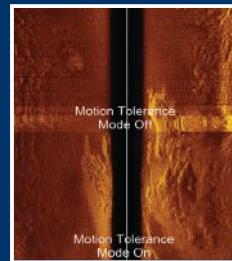
» *Dominique* is set to be installed in São Tomé and Príncipe in 2025. (Image credit: OTEC)

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ADVANCED NAVIGATION UNVEILS LARGEST SUBSEA ROBOTICS CENTER IN AUSTRALIA



Advanced Navigation has announced the largest subsea robotics facility in Australia, located in Balcatta, Western Australia (WA). The manufacturing and R&D facility will accelerate the production of the company's revolutionary underwater technologies, including its autonomous underwater robot, Hydrus.

The subsea center is located on a massive 5.5-acre site. The facility is split between development and manufacturing for high volume production and continued research and expansion of subsea navigation and robotics technologies. The new center also includes full testing facilities with several marine simulation environments to ensure reliable performance and the highest quality production.

The company's recent autonomous underwater robot Hydrus continues to revolutionize undersea research, survey, and exploration by making data capture far simpler and vastly more accessible. The Hydrus design synthesizes numerous cutting-edge navigational, sonar, propulsion, and data capture technologies with highly developed and sophisticated artificial neural network (ANN) intelligence.

The subsea center is just one of several investments made by Advanced Navigation as it continues to expand its global reach and capabilities. The company has established headquarters in Sydney with research centers throughout Australia, including Brisbane for aerial drone technology, Canberra for photonic and laser technology and Newcastle for quantum sensing.

» *Micro-AUV Hydrus. (Image credit: Advanced Navigation)*

EIA ASSESSMENTS UNDERWAY FOR MARRAMWIND OFFSHORE WIND FARM

The consenting process for the planned MarramWind offshore wind farm, off the Aberdeenshire coast, is underway.

MarramWind is a joint venture between ScottishPower and Shell. Located 75 km off the north-east coast of Scotland, it will be among the world's first large-scale commercial floating offshore wind farms, expected to generate up to 3 GW of renewable energy from around 200 floating turbines.

The project was announced following success in the recent ScotWind auction process run by Crown Estate Scotland, the first leasing round in Scottish waters for a decade.

On behalf of WSP, marine consultancy and survey company ABPmer is supporting the project with key elements of the Environmental Impact Assessment (EIA). Marine ecologists in ABPmer's Environment team are undertaking a benthic characterization study, based on analysis of geophysical data acquired by the project. This will greatly enhance baseline understanding of the site and provide a robust basis for the assessment of potential impacts to benthic habitats.

Marine physical processes specialists at ABPmer will also be completing the geology, oceanography, and physical process element

of the EIA, as part of the consenting process. The assessment will consider the likely significant effects on marine physical process receptors that may arise from the construction, operation and decommissioning of the project and will be supported by the use of ABPmer's SEASTATES validated hindcast metocean models.

MarramWind is expected to be operational by 2030.



» *MarramWind offshore wind farm will comprise approximately 200 floating turbines. (Image credit: ScottishPower/Shell)*

KONGSBERG DISCOVERY LAUNCHED TO TRANSFORM OCEAN SPACE MAPPING AND MONITORING



» The multipurpose USV from Kongsberg Discovery provides flexibility for diverse data acquisition applications. (Image credit: KONGSBERG)

KONGSBERG has launched a new business area to advance the application of robotics and sensor technology to map, monitor, and understand ocean space.

Until the turn of the year, Sensors and Robotics was a division under Kongsberg Maritime. It is now being separated and established as a separate business, Kongsberg Discovery. The new business area has more than thousand employees located in Horten, Trondheim, and Oslo in Norway, in addition to offices in Spain, the UK, the US, Canada, Singapore and Malaysia.

Kongsberg Discovery will be led by Martin Wien Fjell, who has held several management positions at Kongsberg over the past ten years, including Global Customer Support in Kongsberg Maritime.

"Kongsberg Discovery encompass extensive and world-leading technology within hydro acoustics, robotics, inertial navigation,

positioning, laser, radar, and communication, blended with deep application know-how and software and by establishing Kongsberg Discovery as a separate business area, our ambition is to facilitate further growth based on this core competency," said Fjell.

"Kongsberg Discovery builds on KONGSBERG's unique technology environment with knowledge and insight based on decades of cooperation with customers, subcontractors, authorities and research. There is great demand for technology and solutions we can deliver together with the rest of KONGSBERG within offshore operations, fisheries, research, monitoring, and marine operations."

Kongsberg Maritime is KONGSBERG's largest business, with more than 6,500 employees across 32 countries. With Kongsberg Discovery as a separate business area, KONGSBERG's ambition is to further strengthen the core areas in Kongsberg Maritime.

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SAAB



» Using an AID to unlock substantial cost savings for offshore energy operators. (Image credit: DeepOcean)

AUTONOMOUS INSPECTION DRONE READY FOR OFFSHORE OPERATIONS

Ocean services provider DeepOcean has successfully mobilized its first autonomous inspection drone (AID), which can unlock substantial cost savings for operators of offshore wind farms and oil and gas fields.

The AID has been mobilized on board the *Edda Fauna* subsea Inspection, Maintenance and Repair (IMR) and remotely operated vehicle (ROV) support vessel. In the coming months DeepOcean will conduct offshore trials for utilizing the AID under one of DeepOcean's annual inspection campaign for an operator on the Norwegian continental shelf.

Next Chapter for Subsea Inspection

Today, subsea infrastructure is typically inspected by ROVs that are launched from multipurpose vessels and controlled by ROV operators on board. Some companies, such as DeepOcean, have developed remote operations capabilities, which allow the company to control the ROV from an onshore-based Remote Operations Centre (ROC), thereby reducing operating costs, emissions, and HSE risk.

Automation of parts of the subsea inspection scope, using an AID, is an obvious next step for the offshore industry. Examples of inspection scopes, which are likely to be

automated in the near-term future, include external and internal production templates, jacket structures, and flexible risers.

In the offshore renewables sector, it is even more attractive to automate the regular inspection of subsea structures as hundreds of similar structures are installed on a single field development with very similar inspection requirements.

Digital Twin Enabler

A key enabler for the ability to perform programmed, autonomous inspection work is the creation of digital twins of subsea infrastructure.

DeepOcean has developed a digital twin platform where a model of an AID is controlled. This technology allows inspection engineers to virtually plan and simulate the route for the inspection scope. The inspection plan is then exported to the AID from the ROC. Subsequently, the AID can autonomously execute the planned route, while an operator simultaneously oversees the operation from the ROC.

The inspection data from the AID and the position of the vehicle is continuously being streamed back into the digital twin to ensure high data quality and increase

situational awareness for the operator.

Strategic Partnership

The AID project is a strategic partnership between DeepOcean, Argus Remote systems and Vaarst where a system of systems has been developed with industry guidance, support, and funding from AkerBP to bring a platform to market and could potentially disrupt the way subsea inspections are conducted.

The AID is based on a Rover MK2 ROV from Argus Remote Systems, with upgraded hardware and software packages. Argus is responsible for AID platform and navigation algorithm. DeepOcean is responsible for the digital twin platform, mission planner software and live view of the AID in operation, while Vaarst is responsible for machine vision camera "Subslam 2x" for autonomous navigation and data collection.

The AID measures 1.25 x 0.85 x 0.77 m and weighs 320 kg in air and can operate in water depths down to 3,000 meters.

The inertial navigation system selected from Sonardyne is the Sprint Navigator mini 4K. Live imaging sonar with obstacle tracking and avoidance is from the Norbit WBMS FLS.

FUGRO USV COMPLETES WORLD'S FIRST FULLY REMOTE OFFSHORE WIND ROV INSPECTION

The world's first fully remote inspection of offshore wind farm assets has been successfully carried out by Fugro, using one of its Blue Essence® uncrewed surface vessels (USVs) with Blue Volta®, an electrical remotely operated vehicle (eROV).

The inspection at the Aberdeen offshore wind farm in the North Sea (also known as the European Offshore Wind Deployment Centre) was jointly funded by Vattenfall and Offshore Renewable Energy (ORE) Catapult. This partnership gives innovators in the offshore wind supply chain the opportunity to test and prove technologies in real-world conditions to support innovation in operations and maintenance.



Blue Essence® is the first USV to receive approval from the Maritime and Coastguard Agency (MCA) to operate fully remotely with an eROV and undertake surveys in UK waters. The eROV, which was remotely launched and recovered from Fugro's remote operations center (ROC) in Aberdeen, delivered a number of inspections on the structure of the wind turbines to assess their stability and safety.

A detailed map of the seabed was also created using data gathered from a deep-water multibeam echosounder sensor mounted on the hull of the vessel. The acquired data was accessed in real-time, allowing Vattenfall to make quick decisions about their asset maintenance program.

Blue Essence forms part of Fugro's wider strategy towards more uncrewed operations for greater agility, safety, and sustainability; the vessel can spend up to two weeks executing inspection activities at sea without refueling resulting in a 95% reduction in carbon emissions compared to conventional ROV support vessels.

» *The USV's eROV was launched and recovered from Fugro's ROC in Aberdeen. (Image credit: Fugro)*

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MVI is a small business, multifaceted solutions provider working with a wide variety of industries and government agencies whose project needs are in the fields of ocean observing systems, engineering and development, subsea communications, ROV operations and training, environmental consulting, marine mammal observation, offshore field operations and sampling, and the provision of Subject Matter Experts (SMEs) to address marine environmental challenges.



MONITORING WORK STARTS AT BROADSHORE AND BELLROCK FLOATING WIND SITES

The BlueFloat Energy | Renantis Partnership has successfully deployed two floating LiDAR buoys at its proposed Scottish floating offshore wind projects.

The two EOLOS FLS200 LiDAR buoys were deployed during mid-April at the Partnership's Broadshore site 50 km north of Fraserburgh and the Bellrock site 130 km east of Aberdeen.

Equipped with fully autonomous and remote sensing devices, the buoys will remain onsite for at least 12 months to capture accurate wind, metocean, and atmospheric data, and obtain insights on other environmental characteristics likely to inform the design of the wind farms.

"This is another exciting step for our Broadshore and Bellrock projects and brings us closer towards delivering commercial scale floating offshore wind projects in Scotland," said Susie Lind, Managing Director of the BlueFloat Energy | Renantis Partnership. "These works will ensure that we can maximize the potential of our ScotWind projects with a detailed understanding of the environment and conditions at sea to feed the design process."

As well as its 3.1 GW portfolio of Scottish floating offshore wind projects—900 MW Broadshore, 1.2GW Bellrock and the 1GW

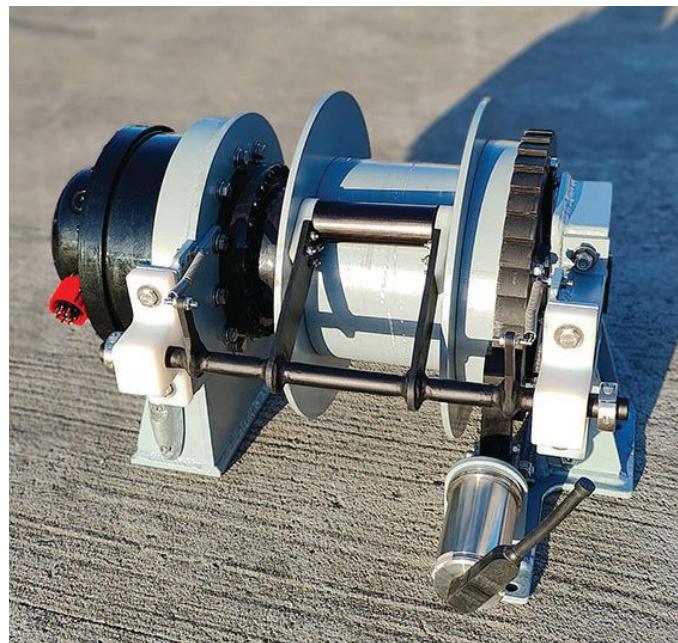
Stromar project it is developing in collaboration with Ørsted—the BlueFloat Energy | Renantis Partnership has recently been offered seabed exclusivity rights to develop two 99 MW projects under the innovation arm of Crown Estate Scotland's INTOG (Innovation and Targeted Oil & Gas) auction process.



» EOLOS FLS. (Image credit: BlueFloat Energy)

OKEANUS DELIVERS ALL-ELECTRIC SUBSEA WINCH FOR UUV MOORING APPLICATIONS

Okeanus Science & Technology has announced the successful delivery of a 1,500 m depth rated, 500 kg safe working load, underwater mooring winch custom designed for integration within a large displacement uncrewed underwater vehicle (UUV).



The all-electric DC winch, which was delivered to the client in Q1 2023, is the latest product extension to Okeanus' comprehensive portfolio of subsea winches, and was conceived specifically for UUV mooring applications.

The UUV applications called for the winch to have a compact footprint and be as light as possible and so was built with 5000 series aluminum, as well as other titanium materials. Weighing in at 125 lbs, which accounts for all the housed electronics, the all-electric subsea UUV winch includes other features such as subsea rated composite bearings, slack line prevision and pinch roller, and external parking brake for increased static line tension capacity.

With a storage capacity of 100 m of 0.25" synthetic line, the 24" (W) x 21" (L) x 14" (H) winch is equipped with an oil-filled motor and gearbox and an 1-ATM electronics pressure vessel. The winch's autonomy package with CANbus interface allows for real-time control and feedback to the host vessel's C2.

"As offshore operators, whether for defense-related missions or survey data acquisition, continue to integrate uncrewed assets into the field in pursuit of efficiency-led, long-endurance and covert operations, and safety-first ways of working, robust, compact, and failsafe handling systems—like our most recent subsea winch—will further prove instrumental to the scalable progress of subsea autonomy and effective remote operations," said Okeanus Chief Operating Officer Don Brockett.

SPANISH NAVY AMPS CAPACITY WITH MARITIME ROBOTICS AND KONGSBERG COLLABORATION

The Instituto Hidrográfico de la Marina (IHM), the hydrographic institute of the Spanish Navy, has increased its capacity for multipurpose operations with three uncrewed vehicles (USV) from Maritime Robotics.

Under the umbrella of the project VERIL (Vehículo Explorador Robotizado Integral Ligero), IHM selected KONGSBERG (Kongsberg Discovery), with which it has a long-standing relationship, to provide both small and compact, and long-range medium USVs fitted with a comprehensive ecosystem of sensors and equipment for a seamless, remote high-quality hydrographic data acquisition, processing, and online visualization and control.

IHM's capacity for subsea data acquisition and multipurpose operations will be enhanced with the incorporation of two distinct models from Maritime Robotics' portfolio of USVs, the Otter and the Mariner. The USVs are equipped with the Kongsberg-developed Multibeam Echosounder system EM2040 series, Seapath 130, MBR, and μ PAP, ideal for seabed mapping, inspections, scouting fish, and data acquisition in ultrahigh resolution. The Otter is designed for repetitive tasks such as bathymetric mapping, while the Mariner can be deployed from an existing fleet of vessels to enhance capabilities with reduced personnel required.

"We take great pride in supporting IHM with advanced uncrewed maritime survey capabilities. IHM is a forward-thinking customer, recognizing the numerous advantages of integrating uncrewed solutions into their operations. We have full confidence that our products will meet IHM's high expectations for this cutting-edge technology and look forward to continuing to support IHM in the future," said Kristoffer Fortun, Chief Sales Officer at Maritime Robotics.



» The compact Otter USV alongside the larger Mariner USV. (Image credit: Maritime Robotics)

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Remote Ocean Systems offers the most complete line of positioners in the industry, engineered for payloads from 10, 20, 100 and up to 350 pounds. All positioners are available in Aluminum housing (standard) but are offered in Stainless Steel and Titanium for maximum longevity in seawater. ROS positioners offer accuracy from +/- 1.5° to 0.1°. ROS AccuPositioner™ is ideal for Sonar applications where precise, computer-controlled accuracy is required. ROS positioners are available as single axis (pan rotation) and dual axis (pan & tilt rotation) configurations with numerous connector options.

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AQUATERRA ENERGY LAUNCHES SPECIALIST CCS RISER SYSTEM

Aquaterra Energy, a leader in global offshore energy engineering solutions, is bolstering its riser and connector portfolio with the addition of a completions and workover system that will specifically support carbon capture and storage (CCS) developments. The end-to-end solution will allow operators to safely perform workover and intervention operations in low temperature and high-pressure CCS subsea sites, without concerns of gas leakage.

The solution will support international net zero ambitions as the IEA estimates annual CCS capacity will need to reach 1,286 Mt CO₂ every year by 2030 to meet net zero by 2050.

The patent pending technology is designed to address the distinct issues and complexities that can occur when working with stored and pressurized CO₂, for example sweet corrosion and ultra-low tempera-

tures that standard low-alloy carbon steels can't safely deal with. The solution is based upon Aquaterra Energy's unique and proven ISO13628-7 completion and workover riser system which incorporates the company's proprietary AQC-CW connectors to reduce operational time and ensures complete system integrity. Aquaterra is extending this system design to provide the industry with a completion and workover riser that supports the CCS industry.

The technology will be manufactured in strict accordance with ISO13628-7 and will be deployable from a jack-up, semi-sub or light-weight intervention vessel.

This announcement follows the launch of Aquaterra Energy's CO₂ management platform which allows for long-term monitoring and sustained integrity of underwater CCS sites. The integrated solution provides monitoring of both sub-surface passive and

active seismic arrays, as well as dissolved CO₂ gas detection via self-powered (solar or wave) and remote data transmission nodes between the seabed and surface.



» AQC-CW connectors. (Image credit: Aquaterra)

C-INNOVATION EXPANDS INTO NEW PORT FOURCHON FACILITY

C-Innovation, an affiliate of Edison Chouest Offshore (ECO) and its family of companies, has expanded into a new facility in Port Fourchon, Louisiana, providing an additional dock facility for subsea inspection, maintenance, and repair (IMR) and riserless light well intervention (RLWI) services.

These dedicated docks, alongside C-Innovation's current docking location, will

provide the company's clients with faster mobilization, demobilization, and between wells maintenance times, which translates into cost savings.

The second facility offers vessel loading, project system integration testing (SIT), mobilization and demobilization services for the subsea market. With 1,500 square feet of linear dock space and 400,000

square feet of yard space, the location features a Manitowoc 888 crane and a Taylor 36,000 pound forklift.

The new Port Fourchon facility delivers comprehensive solutions for both subsea IMR and RLWI services on multiple vessels simultaneously. For IMR work, C-Innovation provides both short and long-term storage for project equipment and can move into SIT prior to mobilization.

For CI's RLWI services, equipment and fluid can be staged prior to each mobilization or between well maintenance (BWM). SIT and preventative maintenance can be completed at the new facility before the vessel is ready to start a well campaign. The new Port Fourchon location also features a dedicated waste fluid area, allowing the vessel to remove fluids and clean tanks efficiently so new fluids can be loaded in a timely manner.

» The new facility in Port Fourchon will provide additional dock facility for subsea IMR. (Image credit: C-Innovation)



C-KORE'S SUBSEA TESTING UNITS PERFORM IN NORTH SEA

C-Kore Systems recently completed a deployment with DeepOcean AS for Equinor. The C-Kore testing tools were used to quickly and simply confirm the status of subsea electrical jumpers on the Tordis field in the Norwegian waters of the North Sea. The C-Kore team provided easy to follow training prior to the mobilization to give the ROV operators a clear understanding how to use the units.

C-Kore's self-contained and automated subsea testing units are used on both asset integrity and installation operations to verify the health of subsea electrical systems. The Cable Monitor unit tests the insulation resistance and continuity of the electrical line while the Subsea TDR unit localizes

faults with an accuracy of around 20 cm.

The ROV engineer for DeepOcean said: "The C-Kore units worked very well. The ROV crew were happy with the training instructions they received from C-Kore prior to the mobilizations, and the units themselves were easy to use."

Cynthia Pikaar, Sales & Marketing Director for C-Kore Systems, commented: "We are pleased to be working with both Equinor and DeepOcean in Norway. Our C-Kore tools are really proving their value to North Sea operators with their ease of operation. Being automated, they also don't require extra offshore personnel, an added bonus in times where POB is kept to a minimum."

» C-Kore's testing tools were used to confirm the status of subsea electrical jumpers in the North Sea.
(Image credit: C-Kore)

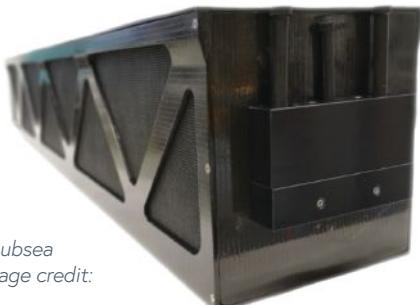


KRAKEN RECEIVES ORDER FOR SEAPOWER SUBSEA POWER SYSTEMS

Kraken Robotics has announced that it has received a \$3 million purchase order for its SeaPower® subsea batteries.

Kraken's SeaPower 6,000 m rated pressure tolerant batteries are based on Kraken's unique pressure tolerant gel encapsulation technology for lithium polymer batteries. This provides an attractively priced, environmentally friendly, and superior energy density alternative to the traditional oil compensated batteries commonly used for deep subsea battery applications.

Kraken's hot swappable batteries are modular and include an integrated battery management system within each battery module which provides a very high level of redundancy and safety. Deliveries will occur in 2023.



» SeaPower subsea batteries. (Image credit: Kraken)

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COLLABORATION TO BUILD EXTRA LARGE AUTONOMOUS UNDERSEA VEHICLES

Defense technology company Anduril Industries and the Australian Defense Force are entering into commercial negotiations for a US\$100 million co-funded design, development, and manufacturing program for extra large autonomous undersea vehicles (XL-AUVs) for the Royal Australian Navy.

The XL-AUV will be an affordable, autonomous, long endurance, multi-mission capable AUV. It is modular, customizable and can be optimized with a variety of payloads for a wide range of military and non-military missions such as advanced intelligence, infrastructure inspection, surveillance, reconnaissance, and targeting.

The three-year XL-AUV development program has an incredibly ambitious delivery schedule which will involve capability assessment and prototyping in record time using Anduril's agile capability development systems. There will be three prototypes delivered to the Royal Australian Navy over the three-year life of the program.

To support the design, development, and manufacturing of the program Anduril plans to hire dozens of employees in high skilled roles including maritime engineering, software development, advanced manufacturing, robotics, propulsion design, mission operations and more. In addition, Anduril will actively partner with other Australian SMEs and the research and technology communities to source nearly all elements of the supply chain for the program.

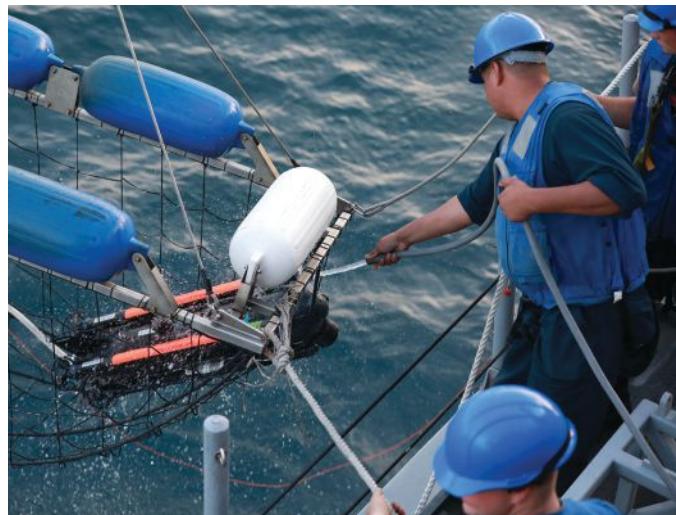
David Goodrich, OAM, Exec Chairman and CEO of Anduril Australia, said: "Through this partnership, Anduril Australia will become a major player in the thriving defense industrial base in Australia and contribute to Australia becoming a leading exporter of cutting-edge autonomous capability to the rest of the world."



» Anduril will design, develop, and manufacture the XL-AUVs in Australia. (Image credit: Anduril Industries)

US, FRANCE, AND UK COMPLETE MCM EXERCISE IN THE ARABIAN GULF

Forces from France, the United Kingdom and the United States completed a two-week exercise in the Arabian Gulf, in mid-April, with a focus on countering mines.



» MCM practices in the Arabian Gulf included the deployment of the latest detection technologies. (Image credit: US Navy)

The training exercise, called Artemis Trident, included mine countermeasures ship USS Devastator (MCM 6) as well as landing ship dock RFA Cardigan Bay (L3009). Dive teams and explosive ordnance disposal technicians from the US Navy, UK Royal Navy and French Navy also participated.

The exercise included a professional exchange among sailors from all navies aboard RFA Cardigan Bay during the initial week. Participants shared best practices and tactics for detecting, classifying, and clearing naval mines effectively.

"This exercise truly enhanced our interoperability and operational effectiveness in mine countermeasures and EOD operations," said Capt. Oscar Rojas, commander of Task Force 52, which oversees US 5th Fleet's mine warfare assets. "Working together at sea is vital to security in the region."

The previous iteration of Artemis Trident took place in April 2021 when the Australian, French, UK and US navies conducted mine hunting and clearance training in the Arabian Gulf.

The US 5th Fleet operating area includes 21 countries, the Arabian Gulf, Gulf of Oman, Red Sea, parts of the Indian Ocean and three critical choke points at the Strait of Hormuz, Bab al-Mandeb and Suez Canal.

AMSC AWARDED CONTRACT FOR US NAVY DEPLOYABLE MINE COUNTERMEASURE SYSTEM

AMSC has entered into a delivery contract for approximately \$8 million with Textron Systems for a pre-production High-Temperature Superconductor (HTS) Magnetic Influence Mine Countermeasure Payload System.

Textron Systems is acting as prime contractor for an initial award of over \$20 million, inclusive of the \$8 million award to AMSC, from the US Navy for the design, development, and integration of the next

generation mine sweep system for use on board the common unmanned surface vessel (CUSV) platform.

Designated as the Magnetic and Acoustic Generation Next Unmanned Superconducting Sweep (MAGNUSS), this program is supported by the Office of Naval Research (ONR) as part of its Future Naval Capabilities portfolio to transition the US Navy from traditional legacy towed mine-sweep systems.

"This nearly \$8 million multi-year contract builds on AMSC's prior work on the deployable MCM solution, allowing us to leverage our proprietary technology to develop the capabilities needed for possible future ship production systems," said Daniel P. McGahn, Chairman, President, and CEO, AMSC.

"AMSC has been contracted to design, develop, and deliver a pre-production system for the US Navy to deploy and test as part of its MCM USV program. Deployment into the fleet would potentially expand our Ship Protection System content per ship. We look forward to working with Textron and remain focused on our work to expand HTS technology into the fleet through a variety of applications for power and protection equipment.

» *The mine sweep system will be incorporated to a Common Unmanned Surface Vessel. (Image credit: Textron Systems)*



US NAVY CHOOSES VIDORAY DEFENDER AS STANDARD FOR PORTABLE UNDERWATER ROBOT

VideoRay has announced a \$16.1 million order for Mission Specialist Defender underwater remotely operated vehicles (ROVs) and related components for the US Navy's Maritime Expeditionary Standoff Response (MESR) program. This brings the US Navy's total procurement of Mission Specialist Defender vehicles and accessories to \$49 million since they entered into a Production-Other Transaction Agreement (P-OTA) with VideoRay.

With this order, the US Navy continues their efforts to procure and equip Explosive Ordnance Disposal (EOD) units with the Mission Specialist Defender as the base platform for the MK20 Defender ROV program. This program uses advanced technology provided by these remotely operated underwater vehicles to locate and neutralize underwater mines, such as those being laid near Ukraine, and in other maritime war zones.

"The Mission Specialist Defender, from which the US Navy's MK20 Defender ROV derives, offers modularity and an open systems architecture allowing easy integration of 3rd-party sensors and payloads," said Chris Gibson, VideoRay's CEO. "Our product provides our customers with industry-leading performance in size, weight, and power (SWAP) for its class with a proven record of reliability. And all of this is delivered in a man-portable package capable of performing a variety of demanding missions in the most challenging underwater environments."

With the MESR Program, the Navy plans to upgrade the baseline vehicle with incremental updates to sensors, autonomy, tools, and manipulators in order to provide enhanced capability to the EOD operator, further increasing standoff and decreasing risk.



» *The Mission Specialist Defender is the base platform for the MK20 Defender ROV program. (Image credit: US Navy photo by Petty Officer 1st Class Ryan Seelbach)*

BLUEYE ROBOTICS TO EQUIP NORWEGIAN COAST GUARD FLEET WITH ROVs



» The ROVs, among other tasks, will be used for critical vessel hull inspections. (Image credit: Blueye)

Blueye Robotics has been awarded a contract to supply the Norwegian Coast Guard with underwater remotely operated vehicle (ROV) systems. Blueye Robotics has equipped the entire fleet of Coast Guard vessels operated by the Norwegian Coast Guard with their Blueye X3 model, which was first launched in 2021.

The intention behind the large ROV order for the Norwegian Coast Guard was to supply their Diving Team with more eyes below the surface in addition to carrying sensors for improved navigation and data collection. The Blueye X3 ROV will be used by the mother ship and from MOBs (man overboard boats) for several use cases,

including search and recovery operations, hull inspections, and the detection of underwater threats.

The Norwegian Coast Guard chose the solution from Blueye Robotics because of its superior ease of use, sensor modularity capabilities, robustness in extreme environments, ability to operate from 2+ ft. of water to open ocean, portability (9 kg weight), and battery capacity (4 hours of operational time). The possibility to easily create dive reports directly in the Blueye App was also reported as a winning feature. In addition to delivering the hardware, Blueye Robotics has provided on-site training and access to an online help center library of articles and videos.

"Blueye Robotics has developed portable, robust, and user-friendly technology since

2015. We are incredibly proud to be the chosen partner for the Norwegian Coast Guard. This demonstrates a demand for smaller-sized, user-friendly ROVs and fuels the Blueye Robotics team to keep developing high-quality products and solutions for our growing base of customers," said Christian Gabrielsen, CEO of Blueye Robotics.



» Blueye X3 is a highly portable ROV. (Image credit: Blueye)

SIGNIFICANT MILESTONE TOWARDS AUTONOMOUS MCM SOLUTION

Nauticus Robotics, Inc. has announced it has successfully completed the competitive first phase of the Defense Innovation Unit (DIU) Amphibious Autonomous Response Vehicle program and is advancing toward the next milestone.

Within this multi-million dollar contract award, previously announced in October 2022, DIU, in partnership with Marine Corps Systems Command (MCSC) and the Office of the Deputy DoD CTO for Mission Capabilities, commissioned Nauticus to adapt the company's inventory of commercialized technologies and to quickly develop a new autonomous mine countermeasure (MCM) robot for use in surf zones and beach areas to support the US Marine Corps during amphibious operations.

Nauticus' novel implementation includes a robot capable of not only swimming, but also crawling out of the surf and onto the beach. The solution utilizes the Company's autonomous command and control software platform, ToolKITT, and combines several mature technologies such as machine vision, autonomous mission planning, and acoustic data networking onto an amphibious robotic vehicle hull that can collect intelligence and identify potential hazards. ToolKITT, which also serves as the foundation of Nau-

ticus' flagship robot Aquanaut, was specifically designed to enable autonomous actions, agonistic to the robotic platform.

"The Defense Innovation Unit has been a fantastic partner. They leverage our mature catalog of technologies we've developed from our outside investments and apply those to pressing problems facing the Services," said Nicolaus Radford, founder and CEO of Nauticus.



FORUM ENERGY TECHNOLOGIES TO SUPPLY TWO LIGHT WORK CLASS ROVs TO ASIAN NAVY

Forum Energy Technologies (FET) has secured a contract from Unique Group to supply two light work class remotely operated vehicles (ROVs) to support its contract with a major Asian Navy.

Both systems will be installed onboard the navy's new dive support vessels. The Comanche model is one of the most powerful observation-class ROVs of its size, and its lightweight construction allows for rapid set up and deployment.

The Navy selected the vehicle for its high thrust-to-drag ratio, enabling it to operate in strong currents, as well as its high payload which can achieve a minimum of 300 kg.

This type of ROV has a 2,000 m depth rating and with TMS Garage systems, is ideally suited to inspection, survey repair and

subsea maintenance tasks. Ancillary tools and sensors can also be added to the vehicle for survey and light intervention work. They come equipped to a high specification with a seven-function manipulator arm for complex underwater procedures.

Kevin Taylor, FET's Vice President - Subsea Vehicles, said: "We are very proud that Unique Group recognizes our capabilities and reliability to support an Asian Navy with two of our Sub-Atlantic Comanche light work class ROVs.

"The Comanche light work class ROV continues to be one of our most versatile and sought-after models in the market and our in-house team are expert across the key disciplines required to ensure each vehicle is adapted to suit a campaign's specific requirements.



» The Comanche ROVs are being manufactured at FET's UK facility and will be delivered in the second half of this year. (Image credit: FET)

DEMAND FOR NAVAL ELECTRIC SHIP SOLUTIONS CONTINUES TO GROW

Through integrated electrification, energy management, automation and control, power in the ship's electric grid can simultaneously supply high-energy defense systems, and propulsion. Energy-efficient electric architectures also serve as an effective way to integrate new, cleaner, energy sources as they emerge, and host digital technologies to implement more autonomous systems.

GE Power Conversion recently reported an increased intensity of customers wanting to understand how they can best use energy across their fleets to create a capability advantage, stating that there is a growing recognition that electrification is critical to new generations of networked mission systems and the right architecture to plug-in new energy sources.

Shaopeng Ji, Commercial Operations Leader – Asia Pacific at GE Power Conversion, commented: "In an emerging new naval era, fleets need to be more mission configurable, highly capable for military advantage, adaptable for technology insertion and affordable. Increasing power demands on vessels means that more customers are seeking help in future-proofing their ships for higher energy needs, partnered by a roadmap to emissions reduction."

With three decades of expertise of providing power and propulsion capability for the world's navies' largest combat vessels (GE's technology powers more than 90% of the UK Royal Navy large vessel fleet, including Queen Elizabeth Class, Type 45 and Type 26 vessels), GE Power Conversion is now seeing an increased customer

demand for smaller combat vessel solutions. By combining extensive commercial electric drive ship expertise with deep domain naval and coast guard experience, GE Power Conversion provides cost-effective electrification solutions for light combat corvettes and offshore patrol ships, undertaking reconnaissance and submarine deflection missions.



» Royal Canadian Navy's Harry DeWolf class arctic and offshore patrol ship at sea trials. (Image credit: Irving Shipbuilding)

MIKE BRENNAN APPOINTED DIRECTOR OF NOAA'S NATIONAL HURRICANE CENTER



» Mike Brennan, Ph.D. (Image credit: NOAA)

NOAA has selected Mike Brennan, Ph.D., to serve as the next director of NOAA's National Hurricane Center (NHC) in Miami, as preparations continue ahead of the 2023 hurricane season. Brennan assumed his new role on April 10, 2023.

"The NHC director is one of the most visible and important jobs in the nation, and Mike possesses the right combination of experience, leadership and personal traits to prepare and guide us through major storms," said Rick Spinrad, Ph.D., NOAA Administrator. "Alongside our trusted and dedicated team at NHC, Mike will continue to leverage vital partnerships to provide the best forecasts and build resilience to the impacts of hurricanes in US communities."

Brennan has spent nearly all his 15-year NOAA career at NHC, and for the past year has served as the acting NHC Deputy Director. Since 2018, Brennan has been the Branch Chief of the Hurricane Specialist Unit. During this period, he supervised one of NOAA's highest profile operational

forecast units through 18 US landfalling hurricanes—including eight major hurricanes—and more than 20 US tropical storm landfalls.

Brennan began his NHC career in 2008 as a Senior Hurricane Specialist for 10 years, following a year as the Science and Operations Officer for the Weather Prediction Center.

"I am honored and humbled to work with the talented staff at the National Hurricane Center at a time when we are making exciting advancements in hurricane forecasts and developing new decision support tools to improve community resilience to powerful hurricanes and tropical storms," said Brennan.

RRS DISCOVERY CELEBRATES 100-YEAR MILESTONE WITH REFIT AT BABCOCK'S ROSYTH SHIPYARD

The National Oceanography Centre (NOC) is celebrating the 100th anniversary of the world class scientific research ship RRS *Discovery*'s predecessor being designated as a Royal Research Ship (RRS) while the modern RRS *Discovery* becomes the first Research Vessel to be refitted at Babcock's Rosyth facility, a mere 35 miles away from the birthplace of the original vessel in Dundee.

To mark this 100th anniversary, the current RRS *Discovery* will also join its ancestral inspiration, the original RRS *Discovery* in Dundee from June 2–4, where the past and present will stand in each other's presence, serving as a reminder of the UK's world leading ocean research capabilities and long-term commitment to future scientific ocean research.

During her ten years on the sea, the current RRS *Discovery* has traveled 227,554.21 nautical miles, taking part in 56 expeditions.

To help continue to support the world-leading science undertaken by the RRS *Discovery*, Babcock's International Rosyth shipyard was recently awarded £45 million by the Natural Environment Research Council (NERC), part of UK Research and Innovation (UKRI) to maintain its fleet of scientific

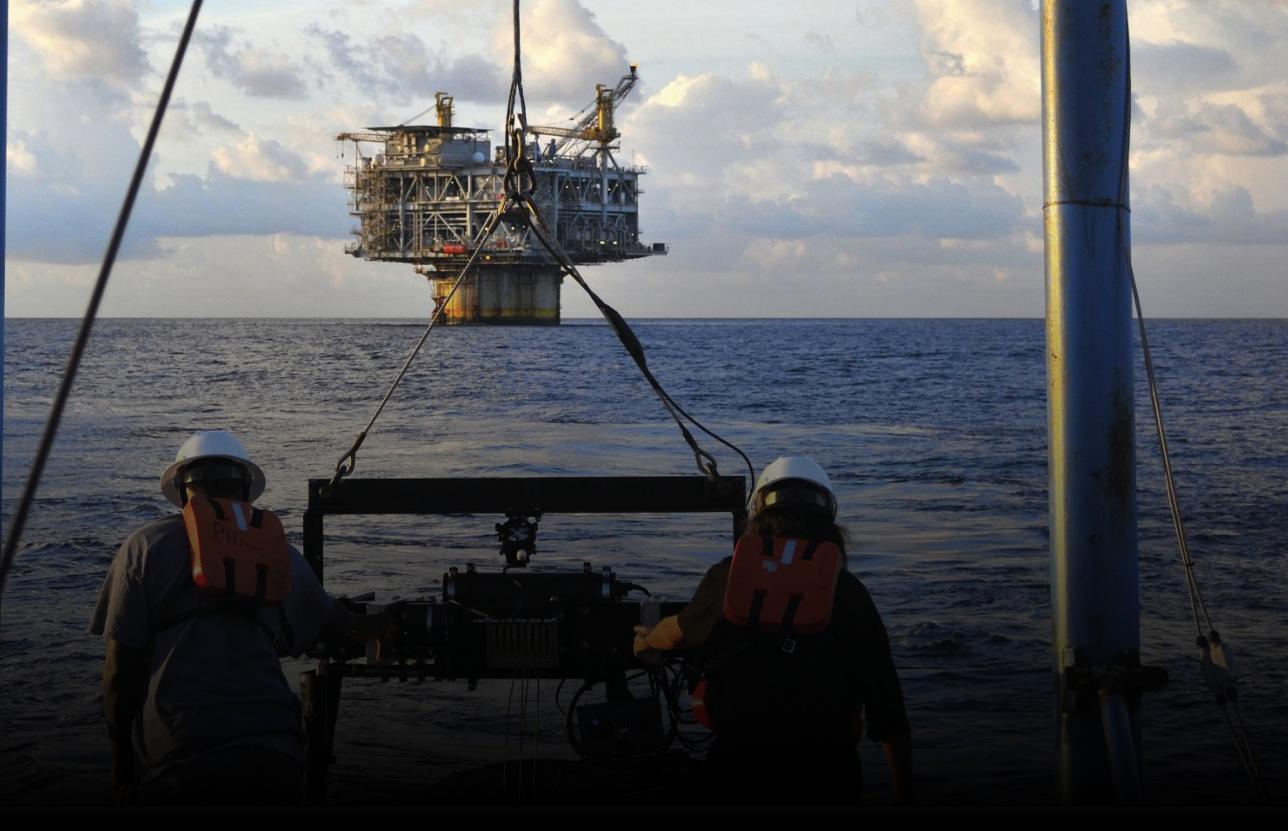
research vessels—including the RRS *Discovery*, RRS *James Cook*, and RRS *Sir David Attenborough*.

During this refit, RRS *Discovery* will be in drydock to allow the maintenance team access to clean the hull and propulsion equipment, which will help to lower fuel

usage and increase overall speed making her more efficient for future expeditions. Safety checks will also be conducted by a Lloyds of London surveyor to ensure the vessel is safe to operate for another year. RRS *Discovery* will then undertake her post refit trial expedition to the North Atlantic over the course of 19 days.



» RRS *Discovery* arriving in Rosyth for refit. (Image credit: Brian Donovan)



Whatever the mission...

Okeanus designs and manufactures mission-critical ocean equipment for commercial and government agencies throughout the world. We harness breakthrough Science and Technology to equip clients with the tools and trusted support they need for the rigors of ocean exploration.

Our comprehensive product portfolio—from customized deck equipment, including winches, LARS and A-Frames, to our extensive range of underwater survey and sampling equipment—is available for purchase or rent, and rapid deployment.

Whatever your mission, Okeanus has turn-key solutions to make it a success.

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ROVCO APPOINTS FRASER MOONIE AS NEW COO



» Fraser Moonie, Rovco's new COO

Fraser Moonie, a well-known name across the international subsea sector, has been appointed as Chief Operating Officer of Rovco.

He joins the global provider of technology-enabled project solutions to the offshore renewable energy sector, as the company forges ahead with the delivery of its plan to build a global infrastructure, realizing its ambitious growth strategy and supporting the energy transition.

Based in Aberdeen, Scotland, Fraser will use his 25 years plus industry experience in subsea sector service companies to implement the company's growth strategy.

A former chief executive of Decom North Sea, much of Fraser's relevant experience came from his time with Bibby Offshore Limited—part of the Bibby group of companies. He was one of a small leadership team who helped grow the business from start-up to a major international player in the subsea energy market over 15 years.

Over the past 18 months, as Regional Director for Mermaid Subsea Services UK, Fraser has worked to bring the Asia based subsea contractor Mermaid Group to the UK market, seeing it win major decommissioning contracts with North Sea operators shortly before he took up his new role with Rovco.

"I was attracted to Rovco because of its huge potential for growth, and for the opportunity to work with its sister company Vaarst, whose cutting-edge technology is already dominating the market in the energy transition space," Fraser said. "I think Rovco's progression also presents a massive opportunity for individuals within the company to develop and grow as the company continues to evolve. It truly is one of the most technologically advanced providers of subsea project solutions in the world."

HYDROSURV SECURES TRIPLE VESSEL SALE

HydroSurv, a leading provider of low-impact uncrewed surface vessels (USVs), has announced the sale of three REAV-16 inland multi-purpose USVs to new customer MSEis Limited. MSEis is a specialist provider of marine acoustic monitoring products and associated training and support services to the marine surveying industry. The sale represents a breakthrough into new applications that combine MSEis technology with HydroSurv's USV platforms.

Equipped with state-of-the-art NaviSuite Kuda Core autopilot technologies provided by EIVA, the three USVs sold to MSEis are the latest in a series of USV deliveries. The REAV-16 is the smallest product in HydroSurv's range and is designed to operate in a wide range of inland and sheltered water environments.

MSEis selected REAV-16s due to their ease of operation, communications capability and onboard computing power. The versatile craft provide a most suitable platform for mounting small hydrophone arrays or calibrated hydrophones that can be towed or accurately positioned on station respectively. Simple deployment, requiring no specialized equipment, was also seen as a real advantage.

"The purchase of multiple platforms will allow MSEis to multiply the productivity and efficiency gains offered by small USVs and we're confident they will deliver outstanding performance and results for this important new customer," said HydroSurv Founder & CEO David Hull.

The sale of these USVs marks another step forward in HydroSurv's commitment to scale its deployment of USV technology. By making its technology accessible and economically viable, HydroSurv aims to capture the impact that comes with enabling the sector to transition to USV technology.



» One of three HydroSurv REAV-16 USVs. (Image credit: HydroSurv)

BiSN SETS RECORD FOR LARGEST BISMUTH PLUG

BiSN, a leading supplier of downhole sealing solutions and technology to the global oil and gas industry, has eclipsed their own record for the largest bismuth plug with a recent deployment in the Gulf of Mexico. A permanent, gas-tight seal was required for a well with a 36" OD that was experiencing gas migration. In previous campaigns with Aker BP in Norway, BiSN had set the record for permanently sealing a 30" OD well in the North Sea.

To seal a well of this size, BiSN scaled its Wel-lok technology and operations to meet the needs of both the size of the tool and the production timeline requested by the operator. With potential environmental damage to be considered, it was essential to meet the timeline required by the operator. The Wel-lok tool required more than 10,000 kg of bismuth alloy and 2,200 kg of thermite, bringing the total weight to over 20,000 kg.

As the well had already been sealed using cement but was still experiencing gas migration, it was essential that BiSN deployed Wel-lok technology without using a rig and to avoid any potential environ-

mental damage. An innovative deployment method was applied using a liftboat and remote operated vehicles (ROV) to guide the tool into place to be fired.

Once the tool was activated by timer, the bismuth alloy flowed, filling and sealing the cross section of the conductor pipe in under an hour. Upon solidification, the alloy expanded creating a mechanical gas tight seal. The burn time took approximately 55 minutes resulting in significant environmental benefits and cost savings for the operator.

ROVs continued to observe the well for 20 hours with no evidence of further gas migration.

"The success of this tool really speaks more about the flexibility and varied applications of BiSN's Wel-lok technology, the size is just part of the story," said Paul Carragher, CEO of BiSN. "By utilizing BiSN's technology, we ensured a permanent seal giving the super-major operator peace of mind, saving them time as we were able to deploy from a lift-boat and costs as a rig wasn't necessary."



» BiSN beats own record for the largest bismuth plug with a recent deployment in the Gulf of Mexico.

ECO WAVE POWER TO EXPAND PRESENCE IN THE US



» Inna Braverman, Eco Wave Power's Founder and CEO

Eco Wave Power recently announced the opening of a US subsidiary, Eco Wave Power US, with plans to establish a corporate office in New York City, which will be Eco Wave Power's first office in the United States.

The decision reflects the company's commitment to expanding its footprint and impact in the US, an increasingly important market for renewable energy. Eco Wave Power's cutting-edge wave energy technol-

ogy has the potential to provide a reliable source of renewable energy to millions of people across the country's 95,000+ miles of coastline.

"The United States is a global leader in clean energy and climate initiatives, so it was extremely important for us to further develop our U.S. operations," said Inna Braverman, Eco Wave Power's Founder and CEO. "The United States is a key market for Eco Wave Power because, according to the US Energy Information Association, wave energy can supply up to 66% of all the United States energy needs. Could you imagine the impact the wave energy could have in the United States?"

In January 2022, the company signed an agreement with AltaSea at the Port of Los Angeles to bring its wave energy technology to the AltaSea campus. In just over a year, Eco Wave Power has successfully modified, upgraded, and transported the conversion unit to Los Angeles and will

soon begin installation on the pilot project. The speed at which the project went from concept to reality shows one of Eco Wave Power's technology's strongest assets—its mobility and scalability to fit the energy needs of any given coastline.

In March 2022, New Jersey Assemblyman Robert Karabinchak introduced legislation that would require the state of New Jersey—with its 130-mile coastline—to add wave energy to the state's master energy plan and provide funding for feasibility studies and pilot programs. Additionally, in California, State Senator Steven Padilla introduced SB 605—a bill that aims to promote and facilitate the development and growth of wave energy in the state, which will help California reach its ambitious clean energy goals.

Eco Wave Power believes that California's 840-mile coastline is an ideal location to explore this virtually untapped natural resource of renewable energy.

HALLIBURTON AND OIL STATES INTERNATIONAL WIN PRESTIGIOUS NOIA SAFETY IN SEAS AWARDS



HALLIBURTON



The National Ocean Industries Association (NOIA) recently announced Halliburton and Oil States International as the winners of the 2023 NOIA Safety in Seas Awards competition. Halliburton is the 2023 NOIA Safety in Seas Safety Practice Award winner and Oil States is recognized for the 2023 NOIA Safety in Seas Culture of Safety award.

The Safety Practice Award recognizes specific technologies, approaches, methods, or projects with direct and demonstrable impacts on improving safety. The Culture of Safety Award honors overall organizational immersion in and commitment to safety, which has resulted in remarkable, measurable, and sustained safety performance over a prolonged period of time.

NOIA President Erik Milito congratulated Halliburton and Oil States International, saying: "The success of American offshore energy demonstrates that safety is a col-

lective effort. The Safety in Seas entries showcase the full spectrum of offshore energy companies, including those in oil and gas, wind, and service and supply segments, all prioritizing safety in their operations. Notably, Halliburton and Oil States have taken an expansive approach towards safety, implementing programs and processes that translate to both company-wide and industry-wide safety performance improvements. We extend our gratitude to all the applicants for their strong submissions and unwavering commitment to safety and safety innovation."

Summer Condarco, Senior VP, Service Quality, Continuous Improvement, and Chief HSE Officer for Halliburton, said: "At Halliburton, HSE and service quality are at the heart of everything we do. We continuously assess for opportunities to advance our strong safety culture, and initiatives like 5 Checks to Go and our Risk Management program are essential to this effort. We are honored to receive this prestigious award from NOIA that recognizes our employee commitment to offshore safety."

"As a technology-focused manufacturing and energy services company, safety is a cornerstone of our culture, which is embedded in our processes and in the products and services we provide," explained Cindy B. Taylor, Oil States' President and CEO. "We are extremely proud to receive the Culture of Safety Award recognizing the commitment of our global organization,

at every level, to continuously improve our safety processes to positively impact the health and safety of our employees, and the communities that we work in."

Halliburton is recognized for the Safety Practice award for its Risk Management and 5 Checks to Go programs, which are part of Halliburton's "Journey to ZERO" vision of achieving zero safety incidents, zero environmental incidents, and zero non-productive time. Using a digital delivery platform and the 5 Checks to Go program to standardize safety processes, Halliburton reduced its HSE lost time injury rate from the previous year and improved service quality, achieving a historical best non-productive time performance.

Oil States is recognized for the Culture of Safety Award for the overlapping suite of processes designed to improve safety performance across the company's global operations. These processes include: executive commitment and monitoring; clear communication of vision; development and implementation of structured management systems (including training, surveillance, reporting and analytical safety tools); and the consistently applied commitment of each employee to protect themselves and others. Since 2013, Oil States has achieved dramatic reductions in the number of injuries and lost time events across its workforce.

FENDERCARE MARINE REBRANDS AS JAMES FISHER FENDERCARE

Fendercare Marine has undergone a rebranding exercise to simplify and streamline its identity for customers and the global markets it serves. The company will now be known as James Fisher Fendercare to further align with its parent company James Fisher and Sons plc.

As a world-leader in ship-to-ship operations and a major global supplier of premium quality marine products, the rebrand to James Fisher Fendercare showcases how this long-standing expertise is underpinned by the strength and

stability of James Fisher and Sons plc, an innovative organization with a 175-year heritage supporting the needs of customers operating in highly challenging environments.

James Fisher Fendercare's exemplary safety record and operational excellence sets it apart in the markets it operates in and is highly valued by its global customer base. This rebrand underscores its commitment to excellence, with a renewed customer-focused strategy and new leadership team, by simplifying and

James Fisher
Fendercare



focusing on core expertise to strengthen its capabilities and align itself with the specific needs of customers.

Ian Dawson, Product Line Director for James Fisher Fendercare, said: "We are delighted to unveil our rebrand, during what is an exciting period of transition. It shows the strength of our ambition and brings us closer to our parent company, further inspiring the trust and confidence in our ability to deliver consistently high standards to customers, whenever and wherever in the world."

NEW PARTNERSHIP WITH ACUA OCEAN STRENGTHENS SEABED 2030 MAPPING DRIVE

The Nippon Foundation-GEBCO Seabed 2030 Project has entered into a new partnership with ACUA Ocean, a developer of zero-carbon emission USVs.

The agreement will see the two parties work together to accelerate the worldwide effort towards mapping the seabed.

Headquartered in London, UK, ACUA Ocean is a maritime cleantech startup working to promote the sustainable economic and environmental management of the ocean. The company's hydrogen-powered uncrewed surface vessels (H-USV) reduce operational CO2 emissions by up to 99.3% compared to existing manned solutions, as well as diminishing fueling and maintenance requirements. This enhances operational efficiency by allowing for an increase in range, speed, and endurance.

In addition to the H-USVs which the company designs and deploys, ACUA Ocean also provides offshore asset and conservation protection.

"We are delighted to partner with ACUA Ocean, whose commitment to environmentally-friendly practices and marine conservation strongly aligns with Seabed 2030's goal of promoting the sustainable management of the ocean," commented Jamie McMichael-Phillips, Director of Seabed 2030.

"This partnership with Seabed 2030 is a natural fit for us," said Neil Tinmouth, CEO of ACUA Ocean. "Our mission is to advance underwater mapping in order to better understand the ocean and its ecosystems. By working with Seabed 2030, we can help to make a significant impact in our efforts to protect the planet."



» ACUA Ocean CEO Neil Tinmouth (left) and Seabed 2030 Project Director Jamie McMichael-Phillips

FRAMO WINS OTC SPOTLIGHT ON NEW TECHNOLOGY AWARD

The Offshore Technology Conference (OTC) has recognized Framo's Submerged Turbine technology with its Spotlight on New Technology award on May 1 in Houston. The Framo Submerged Turbine is designed to increase the efficiency of the cooling water system used on offshore installations by as much as 20–30 percent. It also lowers CO2 emissions created in the system by up to 3,000–5,000 tonnes per year.

On offshore installations, huge volumes of seawater are lifted from the sea to deck level for use as a cooling medium for onboard processing. The used seawater is then dumped back to the sea, meaning that substantial quantities of energy are left unexploited in the dumped seawater. The Framo Submerged Turbine generates electric power as the cooling water flows from the deck to the sea.

The unique feature of the turbine is the fact that it is submersible, enabling the full energy potential to be harnessed from the

dumped water. In this application the additional static height can contribute to as much as 50–70 percent additional energy recovery compared to a topside mounted turbine.

Generated power from the turbine technology will contribute to the total power supply on the offshore facility, thereby reducing gas fuel consumption for power generation. By liberating gas that would usually be utilized for energy production onboard, the solution also contributes to better earnings potential via increased gas exports. This benefit is in addition to reducing CO2 emissions and operational costs. This technology is the first to reuse the unexploited energy in cooling systems on offshore installations.

"Stricter global environmental regulations and cost considerations are significantly affecting offshore operations," commented Sigve Gjerstad, Director Offshore Pumping Systems at Framo. "This new technology



» Framo's Submerged Turbine solution is designed to increase the efficiency of the cooling water system used on offshore installations. (Image credit: Framo Submerged Marine)

not only increases the sustainability and operational efficiency of offshore installations, it also considerably helps to reduce their operating costs."



AMERICAS

H2O Conference

Halifax, Canada ➤ June 12–14
<https://www.h2oconference.ca/>

Suriname Energy, Oil, and Gas Summit

Paramaribo, Suriname ➤ June 19–22
<https://suriname-energy.com/welcome>

US Offshore Wind

Boston, MA ➤ July 11–12
<https://events.reutersevents.com/renewable-energy/offshore-wind-usa>

Dredging Summit & Expo

Las Vegas, NV ➤ July 17–20
<https://dredging-expo.com/>

SPE Subsea Well Intervention

Galveston, TX ➤ August 8–10
<https://www.spe.org/events/en/2023/symposium/23ssi/subsea-well-intervention.html>

Floating Wind Solutions South America

Rio de Janeiro, Brazil ➤ September 18–20
<https://fwssouthamerica.com/>

OCEANS Gulf Coast

Biloxi, MS ➤ September 25–28
<https://gulfcoast23.oceansconference.org/>

ACP Offshore WINDPOWER

Boston, MA ➤ October 3–4
<https://cleanpower.org/offshore-windpower/>

OTC Brasil

Rio de Janeiro, Brazil ➤ October 24–26
<https://otcbrasil.org/>

EUROPE

OCEANS Limerick

Limerick, Ireland ➤ June 5–8
www.limerick23.oceansconference.org

Renewable Energy Cyber Security Forum

Berlin, Germany ➤ June 6–7
<https://www.leadventgrp.com/events/renewable-energy-cyber-security-forum/details>

Seawork

Southampton, UK ➤ June 13–15
<https://seawork.com/>

Underwater Technology Conference (UTC)

Bergen, Norway ➤ June 13–15
<https://www.utc.no/>

Seanergy

Paris, France ➤ June 20–21
www.seanergy-forum.com/en/seanergy2023

Offshore Wind Foundations & Substations

Bremen, Germany ➤ August 28–31
<https://www.ipqc.com/events-offshore-foundations-substations>

SPE Offshore Europe

Aberdeen, UK ➤ September 5–8
<https://www.offshore-europe.co.uk/>

DSEI

London, UK ➤ September 12–15
<https://www.dsei.co.uk/welcome>

World Engineers Convention

Prague, Czech Republic ➤ October 11–3
<https://www.wec2023.com/>

International Wind Congress

Berlin, Germany ➤ October 23–24
<https://windcongress.com/>

OTHER REGIONS

Int'l Conference on Ocean, Offshore & Arctic Engineering

Melbourne, Australia ➤ June 11–16
<https://event.asme.org/OMAE>

Autonomous Robotics and Unmanned Systems for Offshore Infrastructure

Virtual ➤ June 28–29
<https://www.leadventgrp.com/events/autonomous-robotics-and-unmanned-systems-for-offshore-infrastructure/details>

Australia Wind Energy

Melbourne, Australia ➤ July 25–26
<https://www.windenergyaustralia.com/>

Gastech

Singapore ➤ September 5–8
www.gastechevent.com

Mozambique Gas & Energy Summit

Maputo, Mozambique ➤ September 27–28
www.mozambiqueenergysummit.com

ADIPEC

Abu Dhabi, UAE ➤ October 2–5
www.adippec.com

Eastern Mediterranean Conference

Cyprus ➤ November 28–30
www.emc-cyprus.com

2023

MONTH & DEADLINES	EDITORIAL FOCUS & CONFERENCES	CONTENT
JAN/FEB Editorial: Jan. 20 Ad: Feb. 10	» OFFSHORE EXPLORATION US Hydro / March 12–16 CUCE / March 26–28 Int'l Partnering Forum / March 28–30	Editorial Topics: Offshore Infrastructure Development, Exploration of Deep-Sea Resources, ESG, Geotechnical Services Product Focus: Submersibles, AUVs, Lights, Cameras, Deck Handling Equipment, Research Vessels, Samplers
MARCH Editorial: Feb. 20 Ad: Mar. 10	» UNCREWED VEHICLES Ocean Business / April 18–20 OCEANS Limerick / June 6–8	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 UDT / May 9–11	Editorial Topics: Coastal Surveillance, Mine Countermeasures (MCM), Anti-Submarine Warfare (ASW), Search & Rescue, Submarine Cable Infrastructure & Protection Product Focus: USVs, XLUUVs, AUVs, ROVs, Amphibious Vehicles, MCM, ASW
MAY Editorial: Apr. 14 Ad: May 5	» GREEN ENERGY TRANSITION H2O Conference / June 12–14 UTC / June 13–15 Seanergy / June 20–21 US Offshore Wind / July 11–12	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 OCEANS Gulf Coast / September 25–28	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
SEPTEMBER Editorial: Aug. 21 Ad: Sept. 8	» REMOTE MARINE OPERATIONS ACP Offshore WINDPOWER / Oct 3–4 Ocean Energy Europe / October 25–26 Offshore Energy / November 28–29	Editorial Topics: Subsea Inspection, Maintenance, Repair (IMR), Seabed Residency, Subsea Intervention, Oil Spill Response, Remote Operations Centers, Professional Development & Training Product Focus: Inspection AUVs, ROVs, USVs, Work-Class ROVs, Pipeline Pigs, Ultrasonic Imaging
OCT/NOV Editorial: Sept. 18 Ad: Oct. 6	» THE OFFSHORE DEVELOPER'S TOOLKIT	Editorial Topics: Offshore IoT, Asset Integrity Monitoring, Autonomous Control Systems, Digital Twin Technology, Decommissioning Services Product Focus: Predictive Maintenance Solutions, Electric Workboats, USVs, Untethered ROVs
DECEMBER Editorial: Oct. 30 Ad: Nov. 10	» THE FUTURE OF OCEAN TECHNOLOGY	Editorial Topics: Special Edition

☐ Digital Issue

RWE AND ACTA MARINE SIGN AGREEMENT FOR GREEN FUEL SERVICE OPERATION VESSELS



» Thomas Michel of RWE Renewables (left) with Rob Boer of Acta Marine

RWE, the world's second largest offshore wind player, and maritime support provider Acta Marine have entered a long-term vessel supply agreement that paves the way for the decarbonization of offshore wind farm operations.

The agreement is to build and operate two 'green' service operation vessels, which will be among the first in the world to be built with the capability of being powered by methanol and batteries, with the potential to save up to 10,000 tons of CO₂ emissions every year.

Acta Marine will begin constructing the vessels at Tersan Shipyards in Turkey during

the second quarter of 2023 and they are expected to begin operation from the Port of Grimsby in early 2025 and 2026. Both vessels will be methanol ready from day one and will support the day-to-day oper-

ations and maintenance of two of RWE's largest offshore wind projects, at the newly operational 857 MW Triton Knoll and the 1.4 GW Sofia Offshore Wind Farm, which is now under construction.

Director of Offshore Wind Operations at RWE Renewables, Thomas Michel, said: "This investment in low-emissions capable Service Operations Vessels demonstrates our commitment to not only playing a major role in decarbonizing the UK's energy mix, but also to supporting the green transition of our broader activities across the marine industry."

Rob Boer, Acta's Managing Director, added: "The ability to use e-methanol from day one of our operations with RWE drives the reduction of greenhouse gases significantly. The vessels have been designed for high performance in-field agility whilst reducing power consumption as much as possible."



IAN GRAINGER BECOMES NEW CEO OF IMCA

The International Marine Contractors Association (IMCA) has announced that Iain Grainger will succeed Allen Leatt as CEO when he retires at the end of May 2023.

Iain has over three decades of experience in offshore marine construction, with his early career at Brown & Root where he was engaged in the engineering and project management of major offshore projects. He then moved into commercial, strategy, and regional leadership roles with tier-one contractors, including Acergy, Subsea 7, and McDermott International. Iain was previously an IMCA Board Member and, more recently, he has represented the heavy fabrication division of COSCO in Europe and has been leading IMCA's Energy Transition initiatives.

IMCA's President, Jonathan Tame, said: "I would like to thank Allen for his leadership since 2015 through what has been one of the most challenging periods in our industry's history. He leaves IMCA in its strongest and most capable position since its formation in 1995.

"Iain's credentials, both as a former Board member and more recently in his energy transition work for the Association, will not only provide an important element of continuity, but are perfectly suited to leading the organization through its next stage of development."

Iain Grainger, incoming CEO at IMCA, added: "Since its formation IMCA has played a critical role in driving safety and

performance in the offshore industry, and it is a huge honor to be appointed as its new CEO. I am looking forward to working with members, the Secretariat, and the Board, to build on this success and support our entire industry to successfully navigate the challenges and opportunities which lie ahead."



» Iain Grainger

MARINE RENEWABLES CANADA AND UK MARINE ENERGY COUNCIL STRENGTHEN TIES

Marine Renewables Canada and the UK Marine Energy Council have entered into an agreement to share knowledge and support development of the resource. The two organizations are leaders for marine renewable energy in their respective nations and share many aims and objectives.

This marks an important step towards positive collaboration between the two regions, both of which have been working to address barriers to sector development and champion growth of marine renewable energy.

The UK, as an island nation, has tremendous tidal and wave energy resource. Its practical tidal resource (tidal power that could be economically captured) is the equivalent of 11% of its current electricity demand. Tidal stream energy has already provided over 45 GW of clean, predictable electricity. Research has found that the UK has over 20 GW of wave energy potential which could provide over 20% of its current electricity demand.

With some of the best tidal, wave, river current and offshore wind energy resources in the world, Canada has been building a



marine renewable energy industry for the last decade. As a result of supportive policies and ongoing R&D, tidal energy projects are progressing in the Bay of Fundy and reaching new milestones.

Elisa Obermann, Executive Director of Marine Renewables Canada, said: "By working more closely with the UK Marine Energy Council we hope to collaborate on key challenges, build partnerships amongst our memberships, and share information

and best practices that can help accelerate sector development."

Richard Arnold, Policy Director of the Marine Energy Council, said: "We believe that progress in harnessing the renewable potential of our seas anywhere, benefits decarbonization efforts everywhere. I look forward to working with Marine Renewables Canada to remove barriers and identify solutions to accelerating the deployment of marine energy technology."

STOCKHOLM LAUNCHES THE WORLD'S FIRST SELF-DRIVING ELECTRIC PASSENGER FERRY

Stockholm has launched the world's first self-driving commercial passenger ferry—powered entirely by electricity. The Norwegian shipping company Torghatten AS is behind the initiative and will operate the passenger ferry between the Stockholm islands of Kungsholmen and Södermalm.

The idea of autonomous urban ferries started at the Norwegian University of Science and Technology (NTNU) in Trondheim. Based on the researchers' results, the company Zeabuz was founded, in which Torghatten AS is a co-owner.

"Many large cities around the world have problems with congestion, lack of capacity and environmental and air pollution. Self-driving technology will be part of the solution and will be good for both the climate and people," said Reidun Svarva, Chief Business Development Officer at Torghatten. "Instead of being barriers, the water surfaces will sew the city together and become a shortcut for all Stockholmers."

Torghatten assures that the self-driving boat technology is tested and safe. Initially, an operator on board will ensure that everything

runs smoothly during the crossing.

"With 150 years of experience and tested technology, Stockholmers can rest assured that we are implementing this in a safe way," Svarva added.



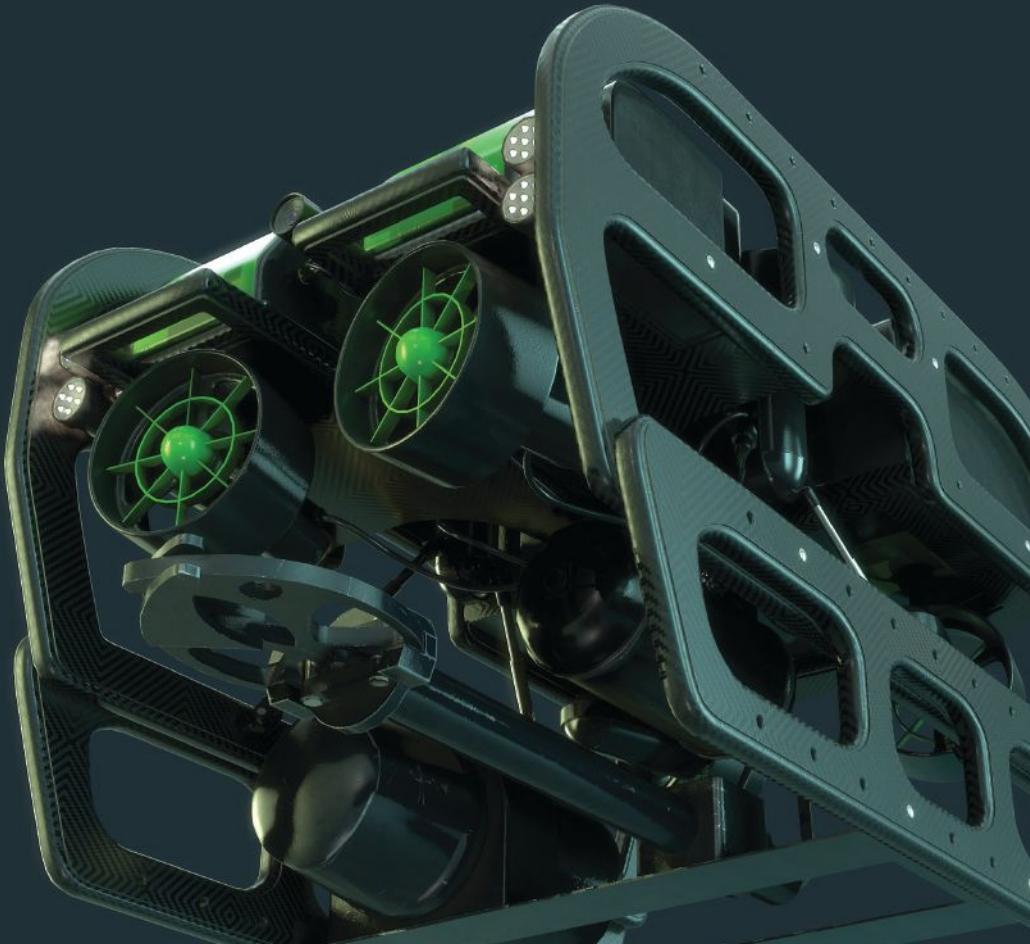
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✉ Bill Tell, Sales Manager

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Kongsberg Seatex is a leading international marine electronics manufacturer specializing in the development and production of precision positioning and motion sensing systems. Our commitment is to provide quality products and solutions for safe navigation and operations at sea in the commercial offshore, maritime, hydrographics and defence industries.

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International Submarine Engineering Ltd. (ISE) is a world leader in the design and integration of autonomous and remotely operated robotic vehicles and terrestrial robotics. Over our 40+ years in business, we have accumulated a great deal of expertise in the design, manufacture, and maintenance of Autonomous Underwater Vehicles (AUVs), Remotely Operated Vehicles (ROVs) for subsea operation, Human Occupied (HO) submersibles, Customized systems for the offshore oil industry, Customized systems for the Military-Naval sector, Hydraulic, pneumatic, and electric robotic manipulators, Teleoperated and autonomous robotic systems, Robotic systems for nuclear Industry applications, Communications and real-time control system.

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L3Harris Technologies is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defense and commercial technologies across air, land, sea, space and cyber domains. L3Harris develops autonomous, lightweight Unmanned Undersea Vehicles (UUV). L3Harris has established itself as the leader in man portable UUVs, providing highly capable vehicles to a wide array of military, commercial and research customers. With over 15 years experience in the underwater field, our engineers have developed a reliable and easy to use platform that is trusted to complete marine missions all around the world.

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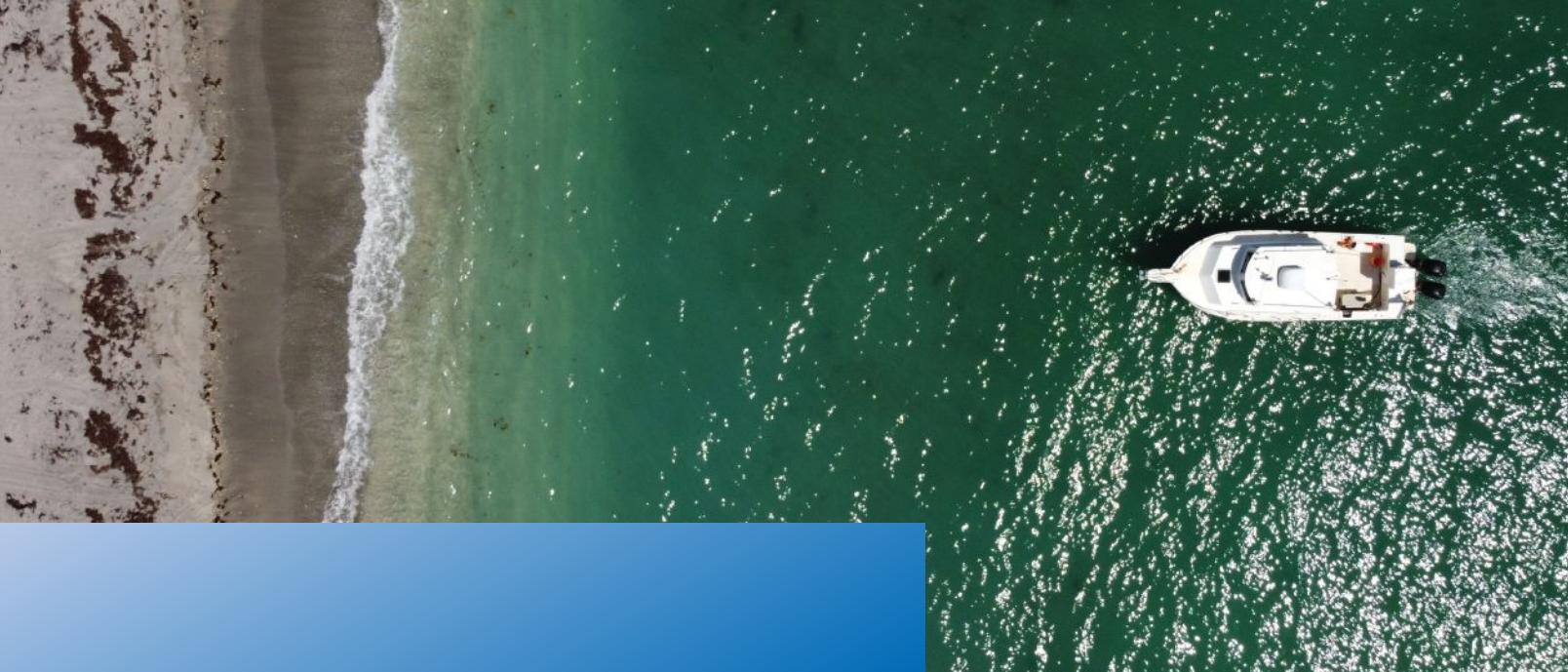
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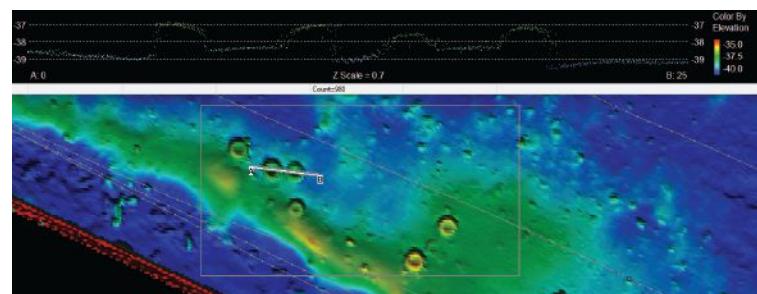


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