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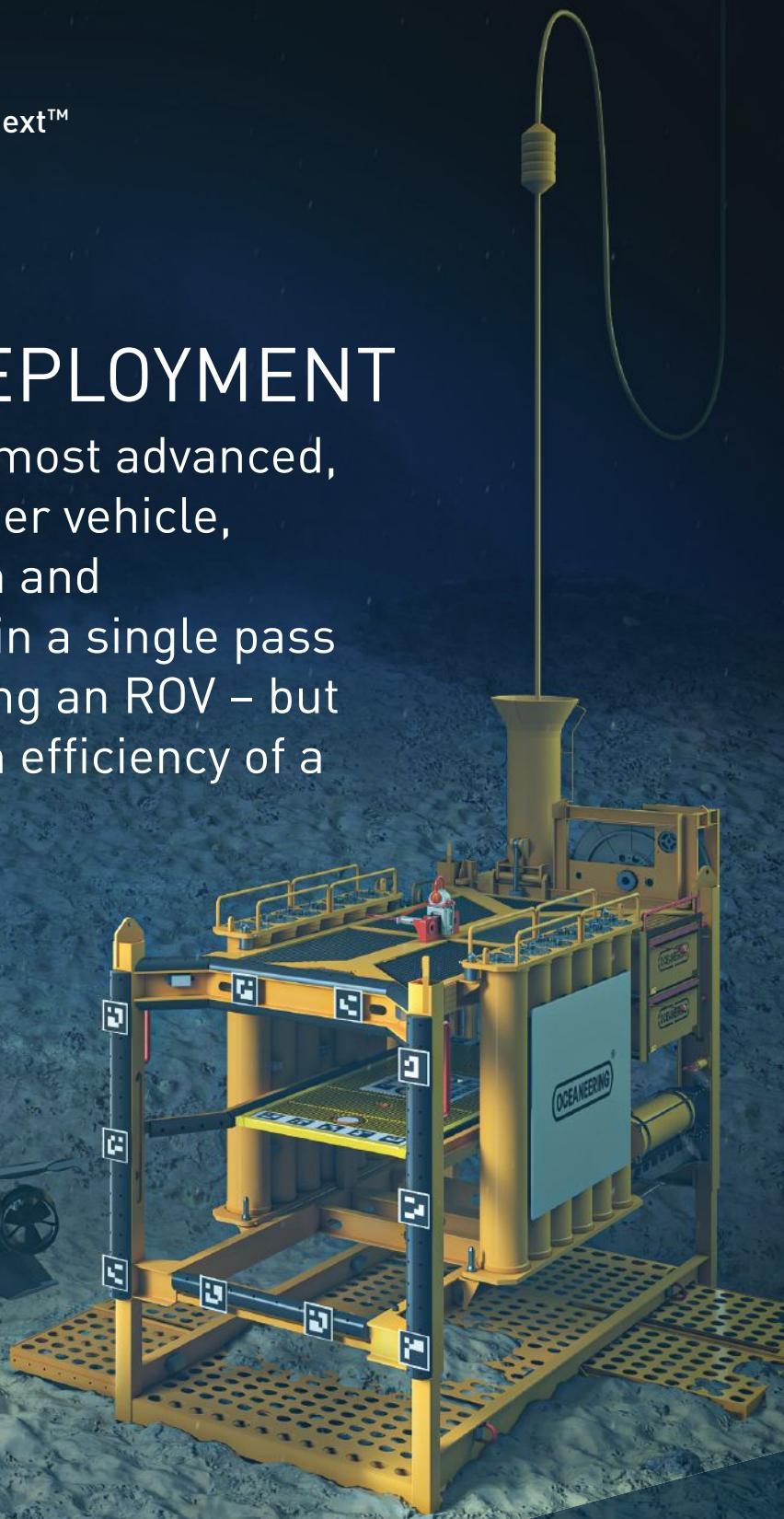
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YEARS
1964 - 2024

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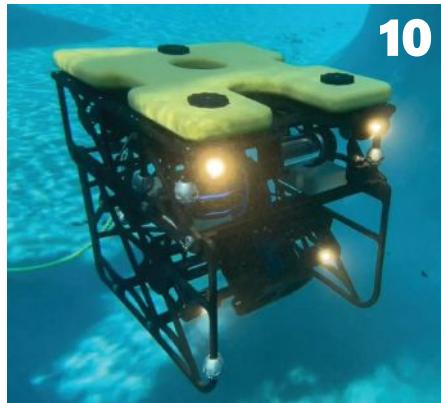
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Seaeye eM1-7

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IS ROV DEVELOPMENT SEEING WHOLESALE CHANGE?



Mark Collins
Director of Innovation



Can you believe it has been 70 years since French pioneer Dimitri Rebikoff invented the first ROV for underwater photography? It was cabled to the surface via a tether, with manual controls and a tv screen. At first glance it looks like ROV equipment still produced today. But what has changed?

In the past 30 years ROV technology has developed to become a trusted tool for deep-water exploration and building subsea energy infrastructure. Increased capability and flexibility, industrial modern work-class systems can be found working with efficiency and reliability at great depths for extended periods. In addition, smaller, lighter ROVs are still the mainstay of inspection and survey duties. Big or small, ROVs are unseen heroes working day and night to literally keep the lights on.

DRIVING CHANGE

But as with any industry, new legislation and new generations force progression and change. Much like the automotive industry the undersea robotics sector has had pressure on ease of use, operating costs and meeting the challenge of energy transition and plug in digital services. This has seen a drive for cleaner more efficient technologies such as electric propulsion and electric tooling solutions. At SMD we have made considerable investment in reducing the energy used by our products by up to 40% whilst simultaneously boosting the performance of our ROVs to cope with >3 kn water currents.

More efficient propulsion opens up the use of battery packs. And we are seeing the emergence of a new classification of tether-less highly capable autonomous robot that can venture further afield. Previously these machines were torpedo shaped and limited to "on the move" data gathering. Now we see hovering versions coming to market that can stop, investigate, and intervene without a physical connection to surface. This type of system requires new levels of onboard computing power, intelligence and decision making and is an area SMD is heavily invested in.

With the arrival of the above, the traditional ROV support vessel has come under pressure. It

is expensive, produces a lot of CO₂, and requires a large offshore crew and is constrained by the weather. For high-power heavy duty ROV systems, a constant surface fed power supply is still necessary. And we are seeing developments to reduce the size of support vessels through robotization for this application.

REALIZING RESIDENCY

However, resident ROV systems eliminate the support vessel requirement completely. Permanently positioned under the sea, not affected by launch weather windows, they offer appealing advantages. Some versions of these machines dock with existing energy infrastructure, where they can recharge and download data. Other more radical solutions are pairing fly out ROV systems with autonomous underwater motherships. The concept of swarming ROVs working in unison to undertake simultaneous underwater tasks is becoming a reality rather than a cinematic fantasy.

The emergence of secure and fast broadband is a key enabler for change, not only for reduced size robotic vessels and no vessel resident systems, but also traditional ROV operations. Open ocean broadband offers high speed data links to anywhere in the world permitting control and oversight from shore. This requires less people offshore and can align to the work/life balance expectations of younger generations and can enable those with offshore experience to remain in the industry, transfer their skills and know-how and be home in time for tea. Interconnected land-based stakeholders can see the same single source of truth, increasing efficiency and effectiveness of decision making to lower operational costs. This "over the horizon" digital technology is another key focus area for SMD.

So, going back to the original question—what has changed with ROV systems? Quite a lot. Progression has not just focused on the machines but the whole infrastructure surrounding offshore subsea robotic operations. It is the advances in infrastructure and interconnectivity which will unlock the biggest step change in the value ROVs bring to offshore operations.

SMART SUBSEA SOLUTIONS

- Delivering data in most adverse conditions: underwater acoustic modems with advanced communication technology and networking
- Accurate USBL, LBL and hybrid positioning of underwater assets, navigation for divers
- Modem emulator and multiple cost-saving developer tools
- Sonobot 5 - the autonomous surface vehicle for bathymetry, monitoring, search & rescue, and AUV support
- Quadroin - the novel bionic AUV for surveys and monitoring



NEW
**DIVER NAVIGATION
SYSTEM**

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PIONEERING ROV SYSTEMS

Subsea solutions for the next frontier: Earth



Beau Moreau

Vice President



More than 70% of our planet is covered in water, yet less than 10% has been comprehensively explored by humans. It is no exaggeration to say, we know more about outer space than we do of Earth's oceans. However, opportunities to better understand marine environments keep us searching for new and improved ways to dive deeper and further offshore—both efficiently and safely.

Outland Technology has been empowering underwater exploration activities for 40 years, both supporting the commercial diving industry with novel products and, for more than 20 years, the design, engineering, and manufacturing of remotely operated vehicles (ROVs).

Today, Outland's subsea solutions can be found in action around the globe, being used for a broad range of missions and applications, including search and recovery operations; naval archaeology; commercial diving; fisheries and aquaculture; defense exercise; offshore energy exploration; and other spe-

EVEN IF YOU HAVEN'T HEARD OF OUTLAND TECHNOLOGY, IF YOU ARE USING TOPSIDE POWERED ROV SYSTEMS, YOU'RE LIKELY BENEFITING FROM OUTLAND'S INNOVATION.

cialist projects led by the likes of NASA.

SEARCH & RECOVERY

Bruce's Legacy is a non-profit organization specializing in underwater recoveries. Led by Keith Cormican, this is the highly sought-after team that many law enforcement operatives enlist to carry out underwater search and recovery operations.

Quite remarkably, Bruce's Legacy holds the records for both the highest altitude underwater recovery at 16,400 ft (5,000 m) above sea level and the deepest known recovery at 1,565 ft (477 m) in California's Lake Tahoe. Both record feats were performed utilizing Outland ROVs.

FISHERIES & AQUACULTURE

Outland ROVs support numerous fishing ecology services and aquaculture companies. Dauphin Island Sea Labs utilizes an Outland ROV to survey fish and wildlife in the Gulf of Mexico. Blue Ocean Mariculture uses an Outland ROV to survey their beau-

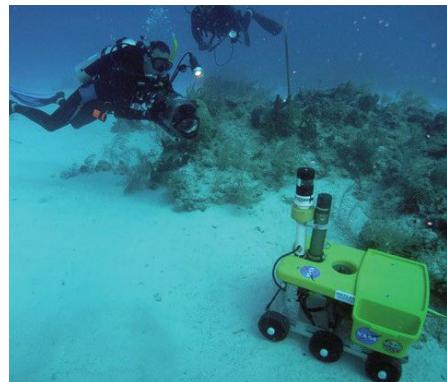
tiful Hawaiian Kanpachi, in submersible sea pens to ensure optimal, natural conditions for the fish and surrounding ecosystem.

OFFSHORE ENERGY

Companies such as Oceaneering, Seatrepid, C-Innovation, Jacob's Engineering, and Baker Marine Systems use Outland's ROVs to perform underwater tasks. From offshore wind farms to platform inspections and commercial diver support, these ROVs are invaluable to the operations performed in the Gulf of Mexico and other regions of offshore infrastructure development around the world.

DEFENSE & NASA

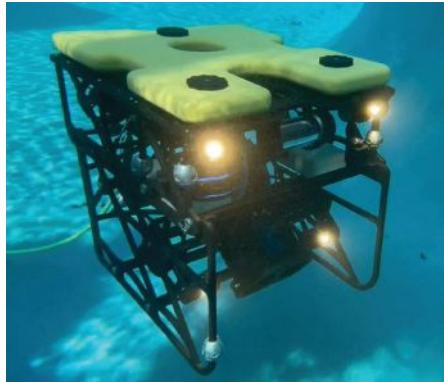
Outland ROVs are deployed extensively by both the US Army and the US Navy for conducting subsea inspections and other military operations. Some deployments are quite distinct, such as Outland's support of NASA's Extreme Environment Mission Operations 9 mission, or NEEMO 9, during which 6 aquanauts spent 18 days under-



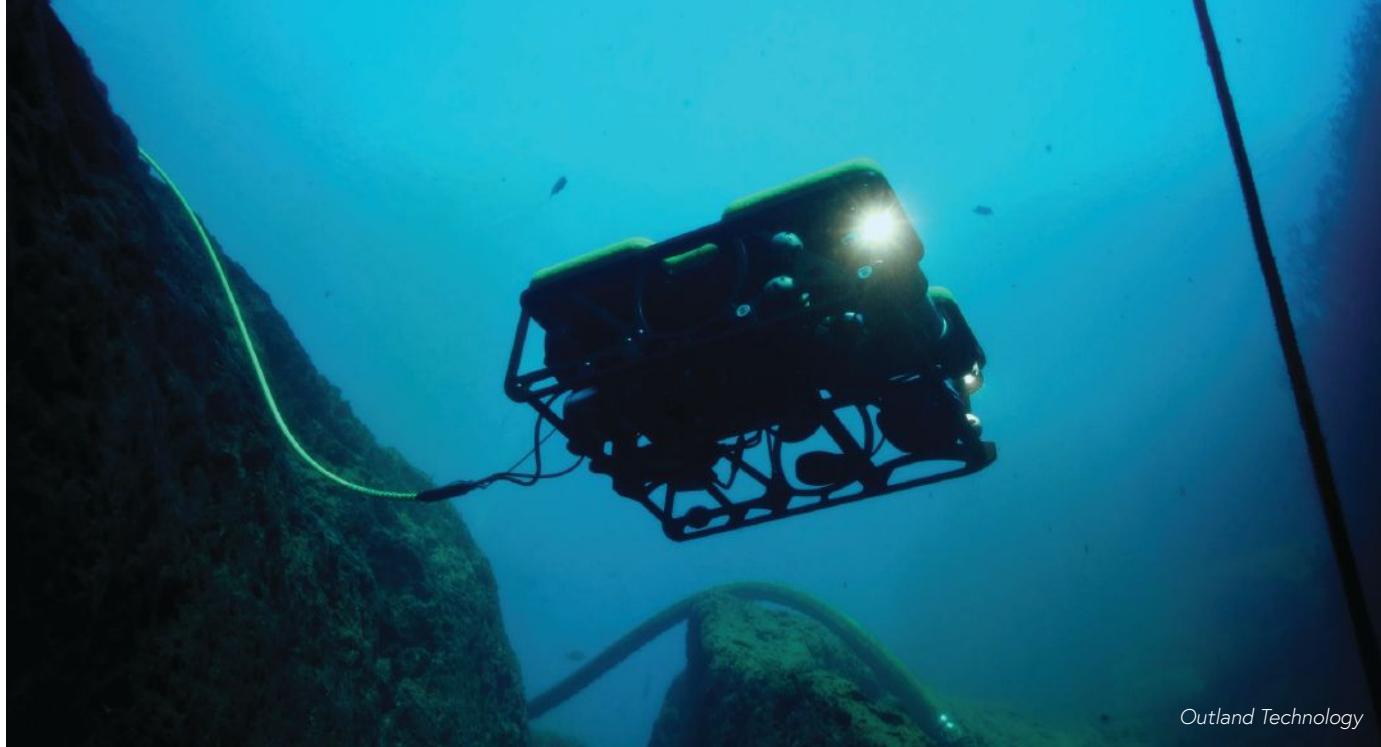
▲ Outland ROV-1000 serving as a rover in the NASA NEEMO 9 mission.



▲ Outland ROV-2500 in the Himalayan mountains at 1,565 ft elevation.



▲ Outland ROV-3000 with Vaast Skid, DVL-A50 and Tritech 1200iK Multibeam Sonar.



Outland Technology

water living aboard Aquarius, an undersea laboratory stationed 67 ft (20 m) beneath the ocean surface, just off Key Largo in the Florida Keys. An Outland ROV was used as an underwater rover during the mission to collect samples and return them to the undersea labs.

TOPSIDE POWER

Outland ROVs are exclusively topside powered ROVs, designed to stay underwater until the job is complete. Often, the hardest part of operating an ROV underwater is finding the target. The last thing an ROV pilot wants to do after locating an underwater target hundreds of feet down is return to the surface to charge or replace batteries.

While topside power seems like an obvious choice for an ROV, the implementation of topside power is challenging. The topside power supply is typically high voltage DC, which can present hazards in a marine environment. Outland has been manufacturing these high voltage underwater systems for over 20 years, with a spotless safety record, and offers numerous different battery conversion systems for ROV manufacturers. Each of these systems is unique to the power requirements and use case of the ROV.

ROV-3000

The last 20+ years of designing, manufacturing, and supporting ROV development has taught us that these sophisticated systems are seldom used just as flying cameras. So, when we embarked on a two-year

design effort to create the next breed of Outland ROV, we made sure to incorporate new features to push the limits of inspection-class ROVs.

The ROV-3000 topside system converts AC power to 3,500 W of high voltage DC power. This power pushes 6 thrusters producing 30+ lbs of thrust each. All this power is available for continuous use with no need to surface for charging or battery swaps.

Years of integrating tooling and sensors into Outland ROVs greatly influenced the development of the ROV-3000. The ROV frame includes 8020 aluminum extrusions for ease of tooling attachment, the available power for accessories/tooling is excessive, and the control bottle and tether allow for 100 Mbs of bandwidth. One recent example of such an integration is the Vaarst skid—a fully automated tilting skid package with an integrated SLAM camera system. Like the rest of the ROV, the skid was engineered to easily attach and detach requiring no tools and only seconds to convert between skid and skid-less operation.

The entire ROV was designed with ease-of-use in mind. The thrusters all include a quick release mechanism to allow tool-free removal. The ROV can be completely disassembled and reassembled with nothing more than a screwdriver. The user interface on the console allows the thrusters to be quickly switched to each orientation. Whatever the mission, the ROV can be configured to match its strength with the task.

The ROV-3000's versatility and tooling integration capabilities have been evident in the early production systems, with an extensive display of tooling and sensors integrations including:

- Operator controlled tilting Vaarst SLAM camera skid
- Multibeam sonar: Tritech Gemini 1200ik & Oculus M50d
- Scanning sonar: TriTech micron
- DVLs: WaterLinked A50 & A125
- CP Probe: Outland CP-100
- Impact Subsea ISA500 flooded member detector
- Outland underwater grinder, UWG-100
- Outland two function manipulator, MP-100

Since the launch of the ROV-3000 in February 2023, several sonar packages have been added, including the Sonoptics Echo and the Ping 360. A SLAM camera from Voyis has also been integrated into a skid package. With these upgrades, we are finalizing and testing a new version of the Outland two-function manipulator with 7 times the gripping strength of our current manipulator.

Outland has been a staple and an innovator in the marine industry for 40 years. Even if you haven't heard of Outland Technology, if you are using topside powered ROV systems, you're likely benefiting from Outland's innovation. As the ROV market progresses and innovation continues, Outland Technology will continue to push the limits of underwater robotics.

outlandtech.com

OXFORD UNIVERSITY RESEARCHERS PROFILE

A CORAL SUPERHIGHWAY IN THE INDIAN OCEAN

Despite being scattered across more than a million square kilometers, new research has revealed that remote coral reefs across the Seychelles are closely related. Using genetic analyses and oceanographic modeling, researchers at Oxford University demonstrated for the first time that a network of ocean currents scatter significant numbers of larvae between these distant islands, acting as a coral superhighway.

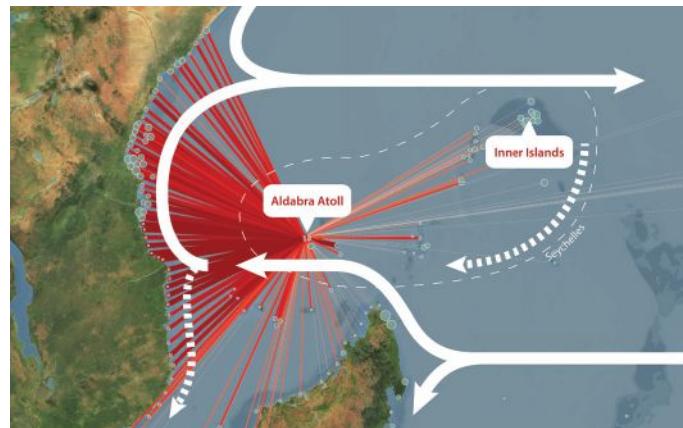
Dr. April Burt (Department of Biology, University of Oxford, and Seychelles Islands Foundation), lead author of the study, said: "This discovery is very important because a key factor in coral reef recovery is larval supply. Although corals have declined alarmingly across the world due to climate change and a number of other factors, actions can be taken at local and national scale to improve reef health and resilience. These actions can be more effective when we better understand the connectivity between coral reefs by, for instance, prioritizing conservation efforts around coral reefs that act as major larval sources to support regional reef resilience."

The researchers collaborated with a wide range of coral reef management organizations and the Seychelles government to collect coral samples from 19 different reef sites. A comprehensive genetic analysis revealed recent gene flow between all sample sites—possibly within just a few generations—suggesting that coral larvae may be frequently transferred between different populations. The results also hinted at the existence of a new cryptic species of the common bouldering coral, *Porites lutea*.

The genetic analyses were then coupled with oceanographic modelling, simulating the process of larval dispersal. These simulations allowed researchers to visualize the pathways coral larvae take to travel between reefs across the wider region and determine the relative importance of physical larval dispersal versus other biological processes in setting coral connectivity.



View of one of the channels that connect the lagoon and outer reef at Aldabra atoll, a route for coral larvae to reach the open ocean.
(Credit: Christophe Mason-Parker)



Map of the southwest Indian Ocean, with red lines connecting Aldabra Atoll, Seychelles, to simulated downstream coral larval destinations, primarily in East Africa. Solid white arrows show major current systems, dotted white arrows show minor or transient currents.
(Credit: Dr. Noam Vogt-Vincent)

This revealed that dispersal of coral larvae directly between reefs across the Seychelles is highly plausible. For example, coral larvae spawned at the remote Aldabra Atoll could disperse westwards towards the east coast of Africa via the East African Coastal Current. From here, they would then travel north along the coast, with some potentially even reaching the South Equatorial Counter Current, which could bring them eastwards again back towards the Inner Islands of Seychelles.

While these long-distance dispersal events are possible, it is likely that much of the connectivity between remote islands across the Seychelles may be established through 'stepping-stone' dispersal. This suggests that centrally located coral reefs in Seychelles, and possibly East Africa, may play an important role in linking the most remote islands.



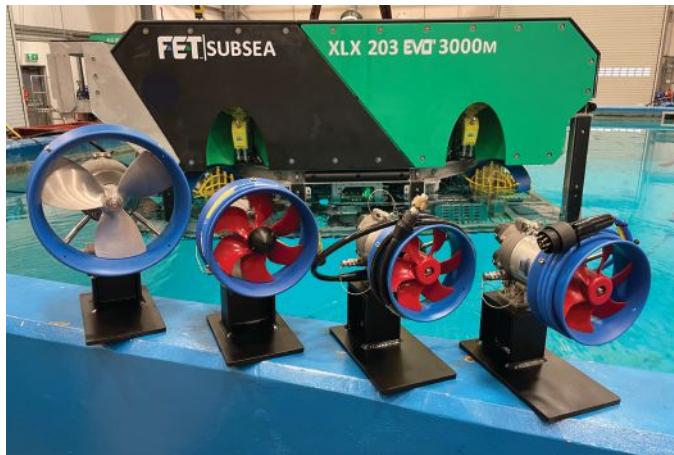
A coral reef in Seychelles, the preservation of these ecosystems is essential for the economic and social wellbeing of Seychelles.
(Credit: Christophe Mason-Parker)

FET TO COLLABORATE WITH SAFEEN FOR ROV ELECTRIC THRUSTERS

Forum Energy Technologies (FET) announced that its Subsea Technologies product line executed a memorandum of understanding with an underwater inspections provider, SAFEEN Survey & Subsea Services (SAFEEN), to collaborate on the development of cutting-edge electric thrusters for remotely operated vehicles (ROVs).

A signing ceremony took place at March's Oceanology International trade event in London, UK as FET launched its updated 300 Vdc and 600 Vdc range of direct current thrusters.

Under the Sub-Atlantic brand, FET has been a pioneer in the thruster market for over 20 years. The recently launched 600 Vdc ROV thruster option for all observation and light work class thrusters is equivalent to the well proven SA-300 hydraulic thruster.



▲ FET's updated 300Vdc and 600Vdc range of direct current thrusters.
(Credit: FET)

As part of the SAFEEN agreement, the thrusters will be subject to extensive cycle testing to fully validate functionality, durability, and integration capabilities with existing ROV systems. Testing will also ensure smooth deployment and operation.

The collaboration will enhance the performance, efficiency, and reliability of the United Arab Emirates headquartered company's underwater services capabilities. The thrusters will be tailored specifically to the requirements of SAFEEN's submersibles, delivering an optimal solution to the challenging marine operations in which it operates.

The development of the thrusters will be overseen by experts from both FET and SAFEEN, driving collaboration through effective communication and coordination of project activities.

Kevin Taylor, FET Vice President, KMS and Subsea Robotics, said: "We are pleased to collaborate with Safeen on this groundbreaking industry initiative. Our shared commitment to excellence is complementary to our ongoing innovation goals and will drive the advancement of electric thrusters, redefining industry standards to ensure safety and efficiency during offshore operations."

"At FET we are at the forefront of innovation and sustainable development for our subsea technology. With our latest thrusters being launched alongside the signing of this MOU, we look forward to furthering our offering to the offshore and energy industries."

Tareq Al Marzooqi, SAFEEN CEO, added: "This MOU represents a significant step forward in advancing underwater technology. By combining our expertise in marine exploration with FET's cutting-edge engineering capabilities, we aim to revolutionize ROV propulsion systems."

BIRNS CELEBRATES 70-YEAR MILESTONE WITH LAUNCH OF MERIDIAN LINE CONNECTORS

BIRNS has launched an all-new high amperage subsea connector series, the 225 Amp BIRNS Meridian™ line.

This robust, custom engineered dry-mate connector series is open face rated to 6 km and is perfect for battery packs and thrusters for crewed and uncrewed subsea vehicles that require high amperage power transfer. Select sizes are already being DNV type-approved for 6 km rated crewed submersibles.

BIRNS Meridians are compact, and feature several pin configurations, with more in design for release later this year. The M40 pin configuration has a single 85 square millimeter/3-000 contact. Both standard and reverse gender versions are featured in the series, and all withstand reverse pressure, too, and can be installed into both dry and oil-filled canisters.

The new connector line has a number of exclusive design features to create ease of use and mating, including a tactile alignment

index ridge and arrows indicating the primary key position. The receptacles also feature a blue color band on the shell, which allows users to have a strong visual indicator that a connector pair has been fully mated.



BIRNS

CELLULA ROBOTICS PARTNERS WITH METRON TO EXPAND UUV CAPABILITIES



Metron has announced the signing of a partnership agreement with Cellula Robotics to expand uncrewed underwater vehicle (UUV) capabilities for advanced operations in dynamic environments.

The new agreement will leverage the expertise of both companies and address specific technical gaps in the UUV defense and offshore energy markets especially for long duration, multi-payload mission operations where communications are often denied or restricted. As part of the new alliance, Metron's Resilient Mission Autonomy™ portfolio will be integrated into Cellula's Solus and Imotus families of vehicles to deliver AI-enabled situational awareness and execute real-time onboard mission adaption, rerouting,

and replanning, all with a multi-payload management system and the flexibility for ship or port-to-port mission deployments.

Cellula's Solus-LR and Solus-XR platforms (the latter with an operational range of at least 5,000 kilometers), will be equipped with Cellula's cutting-edge hydrogen fuel cell technology, supporting sustainable, long duration operations with zero carbon emissions. The result is a scalable UUV solution using a reconfigurable vehicle profile that will lower risk, reduce cost, and maximize mission flexibility and efficiencies to better serve the US Defense, Offshore energy, subsea telecommunications, and marine scientific exploration markets.

"This strategic collaboration signifies a major milestone in harnessing the expertise of Metron and Cellula to advance the frontier of long duration, multi-payload subsea capabilities," said Van Gurley, CEO of Metron. "We are thrilled to collaborate with Cellula to deliver disruptive innovations that will enable greater capability and impact for both the US Defense and commercial clients."

"This partnership represents a shared commitment to leverage expertise in the areas of hardware, software, and fuel cell technologies to expand UUV missions for dynamic and long-duration missions," added Neil Manning, CEO of Cellula Robotics, USA. "The combined brain trust of Cellula and Metron brings hundreds of years of real-world expertise to solve many of the challenges seen in subsea harsh environments, and reaffirms the critical role industry has to play delivering disruptive innovations into the evolving landscape of surface and subsea maritime missions."

HII UNVEILS NEW REMUS 130 UUV FOR A RANGE OF SUBSEA MISSIONS

HII announced the REMUS 130, a new unmanned underwater vehicle (UUV) model based on the highly successful HII REMUS series of UUVs.

The REMUS 130 is the third generation of REMUS 100 vehicles and is designed to enhance underwater operations with maximum flexibility, advanced capabilities, and innovative features, including a compact, two-person-portable design; effortless payload integration; operational depths down to 100 meters; and an extended battery life of up to 10 hours for sustained operations with easy field battery change.

"The REMUS 130 is built on the same proven technology platform as the REMUS 300 and offers customers a highly capable vehicle at reduced cost and risk," said

Duane Fotheringham, President of Mission Technologies' Unmanned Systems business group. "We are excited to introduce this latest generation of the REMUS 100 that will help drive commonality across the fleet and provide our customers with more flexibility to address their mission needs."

The REMUS 130 was developed with HII's internal funding specifically for customers seeking the long service life of REMUS UUVs, along with the proven modularity and open architecture of the REMUS 300 and 620 models at a reduced cost.

The REMUS 130 is built for a variety of missions and operations, including data collection and research; offshore oil and gas exploration; search and rescue; and mine countermeasures operations.



The REMUS 130 features modern core electronics, navigation and communications systems with modular, open architecture interfaces to accommodate wet or dry payloads, including custom payloads developed by the user.

Leveraging three decades of innovation and the global delivery of over 600 UUVs to 30 countries, including 14 NATO members, HII's REMUS 130 is poised to transform underwater operations with its advanced features and cost-efficient solutions.

ROBOSYS LAUNCHES USV AUTOPILOT FOR AUTONOMOUS REMOTE OPERATIONS

Robosys Automation has launched a first-in-class AI-supported USV Autopilot. Robosys' new VOYAGER AI Autopilot converts unmanned surface vessels (USVs) into fully autonomous craft, whether new build or retrofit.

The Robosys Autopilot module seamlessly integrates with Robosys' Voyager AI Survey, being part of the VOYAGER AI software suite, and which enables remote and autonomous heading and speed control as well as various other mission modes for navigation and vessel control specifically for hydrographic and oceanic surveying operations.

Robosys developed the VOYAGER AI Autopilot to meet the demands of the 3 m to 12 m electric drive survey USV market. In addition to the latest electric

drives, the system also works with both analogue and digital steering systems. Robosys' VOYAGER AI suite is easily scalable to full advanced autonomous navigation, which seamlessly integrates with third party steering, drive, and motor control systems to provide optimal vessel

functionality for USVs and other craft.

Nigel Lee, CSO of Robosys Automation, which is headquartered at the National Oceanography Centre in Southampton (UK), said: "We are delighted to launch Robosys' new VOYAGER AI Autopilot at Oceanology International, as the system is ideally suited to a large range of survey missions including for ocean and offshore survey platforms, and provides a cost effective and easy onboard system integration into a manufacturer's often complex integration protocols and messaging."

Robosys' VOYAGER AI software is regarded as the world-leading maritime AI software, which delivers autonomous navigation and remote control for USV control systems at various levels of autonomy.



Welcome to the World of ROS Positioners



The Most Complete Line of Reliable and Accurate Positioners in the Industry

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.

For More Information and Technical Specifications
Contact: sales@rosys.com or
Visit: www.rosys.com



Headquarters – San Diego, CA USA
Phone: (858) 565-8500
Email: sales@rosys.com
www.rosys.com

With ROV design, development, and deployment the editorial focus of this month's ON&T, we sat down for an exclusive chat with Chris Lade, Head of Marketing & Sales (Naval) at Saab UK, to get the latest insights into one of the leading manufacturers of electric underwater robotics.



with Chris Lade
Head of Marketing & Sales
(Naval)



1 ON&T: What are the foremost in-field requirements driving ROV R&D priorities at Saab?

CL: Saab is at the forefront of developing new technologies and concepts of operation that will substantially reduce emissions, health and safety exposure and cost, whilst improving service.

Our latest solutions, such as the Seaeye eWROV, the all-electric work class robot, can be controlled from the comfort and safety of an onshore office—or any location with a computer and an internet connection. The ROV has been designed to be deployed from unmanned surface vessels and can even be resident on the seabed requiring no ship or platform at all. The new Seaeye systems are more cost effective, safer, and create substantially less emissions compared to traditional solutions.



Seaeye Falcon participating in the NATO REPMUS exercise in September 2023. (Credit: Saab UK)

2 ON&T: What is the capacity of Saab residency vehicles for sustained missions?

CL: The key capability that ROV residency delivers is persistence, allowing the ROV to remain submerged for extended periods. From a commercial perspective this brings with it the additional benefit of operating cost reductions, as less support vessel time is required. These systems are not so much speculation as they are very real and in operation today, for example, Saab's Sabertooths are currently being used on commercial contracts in a resident configuration.

Specific requirements for ROVs to succeed in alternative modes of operation, such as seabed residency, are being designed into various Saab underwater systems from the outset. This includes the eWROV, with

higher levels of pre-requisite reliability and increased automation and autonomy. This is backed up by a number of demonstrations and qualification programs that have been carried out to prove key aspects of the resident systems.

Ensuring extended ROV operations requires adequate support infrastructure, primarily in two key areas. First is power. ROVs need sufficient power to function, which can come from batteries, tethers, or various power generators like wave, tidal or fuel cells. Saab has even conducted trials with wave generators and fuel cell technology to explore alternative power sources. Second is communication. Since ROVs do not possess full autonomy, near-real-time communication is critical. Establishing communication with the vehicle during operations requires reliable systems. This can be done through cables, though their use may be limited in certain operations.

Communication between the ROV/autonomous underwater vehicles (AUVs) is vital. ROVs, with tethers, have easier communication setups compared to AUVs. For AUVs, establishing an underwater network of multiple acoustic nodes and free space optics are all possible through Saab's underwater systems ecosystem.

3 ON&T: Tell us about the latest addition to Saab's underwater portfolio...

CL: The latest addition to Saab's underwater portfolio, is the eWROV. It is a full-sized Class III B ROV system. But it's electric rather than hydraulic per the majority of systems currently in use. Electrification is the key to improved performance, and the eWROV takes electric underwater vehicle capabilities to the next level.

The goal of carbon neutrality is a growing focus among the global community, and the eWROV has been designed with eco-responsibility in mind. When comparing electric thrusters with hydraulic thrusters, electric is 48% more efficient. The eWROV offers comparable or higher levels of thrust and superior efficiency compared to hydraulic systems, crucial for demanding underwater tasks. This coupled with increased reliability and options to operate from shore result in not only being more capable, but also more environmentally friendly and safer to operate.

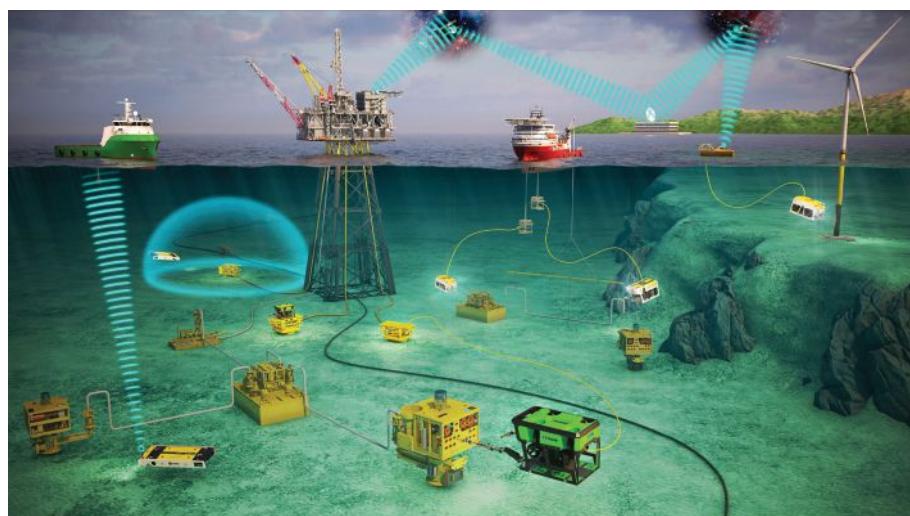
To fully realize the environmental and efficiency benefits of electric ROVs, Saab UK has developed the Seaeye eM1-7 electric manipulator, the world's most advanced electric manipulator yet. The eM1-7 manipulator features an advanced control system allowing both manual and automated operation. Highly accurate, modular electric joints enable enhanced arm control, path planning solutions and actuator re-use. It also has an impressive lift capacity and range of motion, exceeding its hydraulic equivalents, while its aluminum construction ensures high reliability.

ON&T: How is Saab working with the defense sector to integrate ROVs into tactical operations?

CL: Critical Undersea Infrastructure Warfare (CUIW) is an essential aspect of our involvement in underwater operations. With our world becoming more connected and tensions rising, safeguarding these assets has become critical. It's essential for everyone—government agencies and industry to team up and find new ways to keep our undersea infrastructure safe. This can be done through partnerships with the commercial industry.

A prime example of this is the NATO REP-MUS and DYNAMIC MESSENGER exercises that happened in September 2023, hosted by the Portuguese Navy, that Saab participated in. The exercises involved over 2,000 personnel from 16 NATO nations and Ireland. They focused on the integration of new maritime technologies into NATO operations and the ability of uncrewed underwater vehicles to operate together in a range of scenarios including CUIW.

During the exercises, Saab deployed and operated the AUV62-AT anti-submarine warfare training target and the Seaeye



▲ Saab's underwater ecosystem. (Credit: Saab UK)

Falcon. Sponsored by the Royal Navy the Falcon was used primarily to showcase its versatility by aiding in tasks such as identifying and neutralizing simulated Underwater Explosive Devices. The AUV62-AT, in collaboration with Sweden's defense procurement agency, supported Anti-Submarine Warfare (ASW) systems by mimicking the acoustic profile of submarines. This then fed-back valuable data about how the ASW battle had been conducted. Saab's participation in these events was to help enhance underwater capabilities, as well as strengthen international security efforts.

ON&T: What does the future of ROVs look like for Saab?

CL: The future will see significant growth in onshore controlled remote operations. This will be with vehicles deployed from subsea docking stations, or lightly manned, or unmanned vessels, where reliability and reduced maintenance will require all-electric robots for long-term deployment underwater.

Another key area of advancement is further convergence of AUV/ROVs with greater levels of autonomy. By enabling subsea robots to make decisions independently during missions, challenges associated with high latency, low bandwidth over the horizon communication links, will be minimized.

Looking ahead, Saab's Underwater Systems is gearing up for even deeper dives beyond the industry standard 3,000 m. Operations like CUIW demand ROVs that can plunge down to 6,000 m and have the ability to carry various payloads that will evolve with

the growing need for offensive and defensive operations. This shift isn't just about defense needs; it's also about the growing use of the ocean floor for commercial purposes, and the need to go to deeper depths.

[i saabseaeye.com](http://saabseaeye.com)



▲ Seaeye eM1-7 electric manipulator (Credit: Saab UK)

**FOR MORE TAKE 5 INTERVIEWS, VISIT:
oceannews.com/featured-stories/take-5**

SIMPLY BLUE GROUP JOINS CONSORTIUM TO DEVELOP COMMERCIAL-SCALE SEAWEED FARM



Simply Blue Group, a blue economy project developer headquartered in Ireland, has joined the North Sea Farm 1 Project (NSF1) consortium to develop the world's first commercial-scale seaweed farm located within an offshore windfarm.

Positioned off the coast of the Netherlands in the North Sea, the farm is planned to become operational in autumn this year when it will be deployed and seeded, with the first harvest expected to be in spring 2025.

Sponsored by Amazon's Right Now Climate Fund, the consortium aims to help address climate action targets in Europe by tapping into the vast, unmet potential of seaweed cultivation. Like trees, seaweed absorbs nitrogen, phosphorus and carbon dioxide and produces oxygen, thereby being part of the solution to climate change and ocean acidification. In doing this, it produces a valuable biomass with a wide range of uses from pharmaceuticals to animal feed to fertilizers.

Simply Blue Group is focused on replacing fossil fuels with clean ocean energy, removing CO₂ from the atmosphere, and developing sustainable sources of protein, while attracting investment into coastal communities. It has a keen interest in multiple uses of wind farms and believes that efficient use of sea space is key to working with the oceans on climate change and bringing more local communities and supply chains into the transition of a low carbon economy.

Hugh Kelly Co-Founder & CEO at Simply Blue Group, said: "At Simply Blue Group, we want our marine projects to make a tangible difference, which is why we're delighted to join this consortium. We recognize that seaweed cultivation is a valuable tool in tackling climate change and supporting our oceans. We believe that in time offshore wind farms will have multiple uses, with seaweed production being one of them. By joining NSF1 we are making the first step on that journey."

Eef Brouwers, Project Manager of the North Sea Farm 1 initiative, said: "We are delighted that Simply Blue Group has joined the consortium to help deliver this project. Their expertise in aquaculture and offshore wind will be valuable in the successful execution of seaweed production in an offshore wind farm for the first time. The North Sea Farm 1 project aims to help the seaweed industry in scaling up within offshore wind farms and Simply Blue Group's capabilities in both areas make them an ideal partner."

KRAKEN PARTNERS WITH AUTERION TO BOOST USV CAPABILITIES

Kraken Technology Group, a maritime technology leader specializing in the disruptive design and manufacturing of high-performance platforms, and Auterion, the company building the software-defined future for mobile robotics and powering the world's leading drone manufacturers, have announced a strategic partnership to exponentially develop autonomous capabilities in the high-performance littoral security boat sector.

The partnership is focused around the development and implementation of modular, low-cost autonomy software and UxV systems for the maritime domain. The agreement will initially focus on integrated autonomy architecture for Kraken's K3 SCOUT and K4 MANTA uncrewed platforms.

Auterion's Skynode X, AuterionOS and numerous capability 'Apps' have already been developed and integrated into Kraken's K3 SCOUT USV, which is currently undergoing open water sea trials. AuterionOS' open software architecture unlocks the ability to create new apps as needed, continuously expanding Kraken's ability to serve the wide variety of use cases necessary in maritime domains.

"We are thrilled to be able to extend our expertise into the maritime domain alongside like-minded pioneers and littoral platform experts Kraken," said Lorenz Meier, CEO at Auterion. "The work done, and the progress achieved to date on the development of K3's uncrewed capability has been impressive and visionary."

Mal Crease, Founder and CEO of Kraken Technology Group, added: "Collaborating with Auterion on the rapid development of the K3 SCOUT USV has opened our eyes to the size and scale of the technical transformation already underway and has already delivered unique capabilities in record time. We very much look forward to an exciting future transforming littoral maneuver with Auterion."



BEDROCK SELECTS EXAIL COMPACT INS FOR NEXT-GENERATION AUV

Exail has concluded its first sale of the Phins 9 Compact brand-new compact high-performance Inertial Navigation System (INS) to Bedrock, a leader in underwater data acquisition platforms. The Phins 9 Compact INS will be integrated into Bedrock's new autonomous underwater vehicle (AUV), marking a significant advancement in navigational accuracy and operational efficiency.

Bedrock's AUV is a purpose-built, modular platform designed for swift deployment in geophysical surveys and monitoring. Equipped with Multibeam Echosounder (MBES), Side Scan Sonar (SSS), and Magnetometer (MAG), the AUV boasts a 300 m depth rating and 12-hour endurance surveying at 3 knots with all systems operational. The integration of Phins 9 Compact INS will empower Bedrock to achieve high navigational accuracy, address operational efficiencies, and mitigate Total Horizontal Uncertainty (THU) and Total Vertical Uncertainty (TVU).

"The INS was central to addressing uncertainties and performance challenges for our AUV. We sought an INS solution that could overcome challenges in form factor, power, support, compactness, accuracy, and performance, and Exail's Phins 9 Compact INS seamlessly aligns with all these requirements," said Charles Chiau, CTO and Co-Founder at Bedrock. "We are eager to witness the field



Bedrock

performance of this INS during sea trials and explore its potential in enhancing our AUV's navigational capabilities."

Boasting compact dimensions of 88.9 x 130 mm, the Phins 9 Compact stands as the most compact high-performance INS available in the market. With a power consumption of less than 7 W and a DVL-aided position accuracy of 0.1% TD, it provides exceptional reliability and navigation precision for compact subsea vehicles operating in demanding applications with low power requirements.

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Oculus Multibeam Imaging Sonars

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WIND ASSISTED PROPULSION TECHNOLOGY PROVES SUCCESSFUL AFTER SIX-MONTH TEST

Cargill recently revealed exciting results of the six-month test period of the *Pyxis Ocean*, underscoring the potential for the wind assisted propulsion technology in moving the shipping industry toward renewable energy use. The MC Shipping Kamsarmax vessel retrofitted with two WindWings®—large solid wind sails developed by BAR Technologies—has achieved performance consistent with what was predicted which is equivalent to an average of 3 tons of fuel per day.

The *Pyxis Ocean* hit open waters in August 2023 and during the first six months of testing it has sailed the Indian Ocean, Pacific Ocean, North and South Atlantic, and passed Cape Horn and the Cape of Good Hope.

The ship was retrofitted with two WindWings, which measure 37.5 meters in



Cargill

height and resemble large airplane wings. The wings are installed vertically to catch the wind and propel the ship forward, allowing the ship's engine to be turned down so that the ship can travel at the same speed as a conventional ship using less fuel. The wings are controlled by a touch panel on the bridge. A simple traffic light system tells the crew when to raise or lower the sails. Once raised, the operation is fully automated: sensors onboard

constantly measure the wind, and the sails self-adjust to the optimal configuration.

Wind assisted propulsion has potential to be a cost-efficient way of supporting the International Maritime Organization's (IMO) new greenhouse gas strategy. One of the IMO's 2030 targets is to have 5 percent, striving for 10 percent, of energy coming from very low carbon sources by 2030: wind assisted propulsion could be an important way of achieving this.

The early voyages have provided insight on more than just the application of the sails on a vessel, it has also highlighted broader logistical challenges in the global maritime system. Given that every port, terminal, and berth is different, their involvement is critical towards integrating wind assisted propulsion technology into the global maritime system on a wider scale.

GREENSEA IQ AND OPT EXTEND PARTNERSHIP TO ENHANCE MARITIME DOMAIN AWARENESS

Greensea IQ has strengthened its partnership with Ocean Power Technologies (OPT), which began in 2021, and signifies a deepening of their collaboration and shared

vision in advancing maritime technologies and solutions.

Leveraging its versatile open architecture platform OPENSEA, Greensea IQ will continue to work with OPT to develop the next generation of OPT's Maritime Domain Awareness Solution (MDAS).

OPT is renowned for its over-the-horizon (OTH) MDAS-equipped PowerBuoy products. The OPT PowerBuoy serves as an innovative renewable energy solution, harnessing its power from a combination of solar, wind, and wave activity. MDAS is integrated with OPT PowerBuoys to monitor and collect data in marine protected areas, mitigate illegal fishing, provide automated vessel traffic data for ports, or support extended offshore monitoring and data collection capabilities for defense and security applications.

The new multi-year contract extension, which will run through to May 2025, will

see Greensea IQ's advanced technologies, including OPENSEA and Safe C2, play a pivotal role in the evolution of OPT's MDAS, with Greensea IQ and OPT collaborating on all aspects of system and software design and development, including command and control, communications, and data transfer, including integration of OPT's unmanned surface vehicles (USVs) into the overall architecture.

Initially developed for specific defense purposes, the dual-purpose technologies, OPENSEA and Safe C2, are being reworked to adapt to and support OPT's objectives in maritime security and awareness and will enhance the efficiency and effectiveness of its ocean energy and defense solutions. This partnership will encompass integration of sensory data, user interface optimization, secure data transfer to the cloud, and integrating edge computing and storage solutions. Together, these advancements will enable seamless communication, and robust command and control capabilities.



OPT

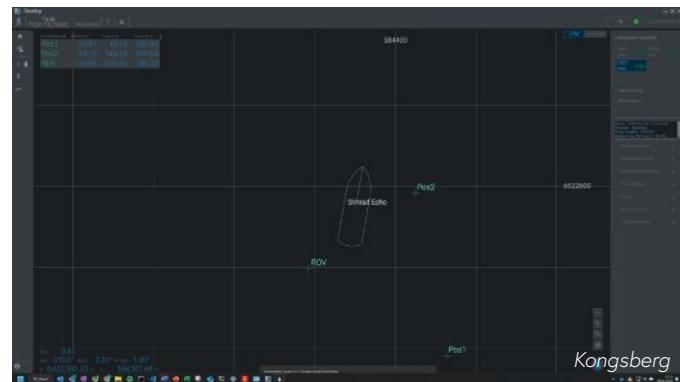
KONGSBERG DISCOVERY UNVEILS SOFTWARE TO ENHANCE REMOTE OPERATIONS

Kongsberg Discovery has responded to market demand with an innovative new software solution to enable remote operations of HiPAP and µPAP SSBL acoustic positioning systems, for both crewed and uncrewed survey vessels.

HiPOS—HiPAP Positioning Software for Remote Operations bridges the gap between onshore teams and vessels, allowing shore-based surveyors in remote operations control centers to operate the SSBL system with the same functionality as being offshore. Remote operations reduce HSE risk, with fewer personnel offshore, while also enabling lower operational carbon footprints with smaller uncrewed vessels.

The software essentially splits the workload of Kongsberg Discovery's HiPAP systems, with the positioning and processing managed onboard the vessel processor, while a client user interface is run remotely over a lower bandwidth VPN connection. The remote connection can be via satellite, 4G, 5G or Maritime broadband radio.

The user interface can also be operated directly on the vessel, as in a traditional setup, while at the same time having the option for shore-based operators to log in and take over for a shift or provide expert support.



HiPOS can be used across the latest generation of Kongsberg Discovery HiPAP systems, including the 602, 502, 352 and µPAP solutions.

In addition to the software innovation, the Norwegian-headquartered business has also added two models of portable SSBL acoustic systems to its market-leading portfolio, the µPAP 201-C and HiPAP 352P-C. With computers built into the transceiver/transducer housing this offering allows for easy installation on smaller uncrewed vessels by negating the need for a separate onboard computer.

OUTLAND TECHNOLOGY

NEW
Dual Function
Manipulator

MP-200

**Complete Redesign
7x increase in Gripping Strength**

Simple Customer Integration

www.OutlandTech.com

This advertisement features a large image of an underwater robotic arm with a dual-gripper manipulator. The manipulator is shown in various states of grip, including holding a yellow ring and a yellow cylindrical object. The background is a blurred underwater scene with a small ROV. The Outland Technology logo is at the top right. The text "NEW Dual Function Manipulator" is prominently displayed in the center. To the right, a vertical image of the MP-200 manipulator is shown with the text "Complete Redesign 7x increase in Gripping Strength". At the bottom, the text "Simple Customer Integration" and the website "www.OutlandTech.com" are displayed.

STUDY DEVELOPS NEW CONTROL METHOD FOR OPTIMIZING AUTONOMOUS SHIP NAVIGATION

Existing ship control systems using Model Predictive Control for Maritime Autonomous Surface Ships (MASS) do not consider the various forces acting on ships in real sea conditions.

Addressing this gap, in a new study, researchers developed a novel time-optimal control method, that accounts for the real wave loads acting on a ship, enabling effective planning and control of MASS at sea.

The study of ship maneuvering at sea has long been the central focus of the shipping industry. With the rapid advancements in remote control, communication technologies and artificial intelligence, the concept of MASS has emerged as a promising solution for autonomous marine navigation. This shift highlights the growing need for optimal control models for autonomous ship maneuvering.

While many studies have investigated this problem and proposed various control methods, including Model Predictive Control (MPC), most have focused on control in calm waters, which do not represent real operating conditions. At sea, ships are continuously affected by different external loads, with loads from sea waves being the most significant factor affecting maneuvering performance.

To address this gap, a team of researchers, led by Assistant Professor Daejeong Kim from the Division of Navigation Convergence Studies at the Korea Maritime & Ocean University in South Korea, designed a novel time-optimal control method for MASS. "Our control model accounts for various forces that act on the ship,

enabling MASS to better navigate and track targets in dynamic sea conditions," said Dr. Kim.

At the heart of this innovative control system is a comprehensive mathematical ship model that accounts for various forces in the sea, including wave loads, acting on key parts of a ship such as the hull, propellers, and rudders. However, this model cannot be directly used to optimize the maneuvering time. For this, the researchers developed a novel time optimization model that transforms the mathematical model from a temporal formulation to a spatial one. This successfully optimizes the maneuvering time.

These two models were integrated into a nonlinear MPC controller to achieve time-optimal control. They tested this controller by simulating a real ship model navigating in the sea with different wave loads. Additionally, for effective course planning and tracking researchers proposed three control strategies: Strategy A excluded wave loads during both the planning and tracking stages, serving as a reference; Strategy B included wave loads only in the planning stage; and Strategy C included wave loads in both stages, measuring their influence on both propulsion and steering.

Experiments revealed that wave loads increased the expected maneuvering time on both strategies B and C. Comparing the two strategies, the researchers found strategy B to be simpler with lower performance than strategy C, with the latter being more reliable. However, strategy C places an additional burden on the controller by including wave load prediction in the planning stage.

NEW WHITEPAPER PUBLISHED BY INTERNATIONAL PROFILES VESSEL PERFORMANCE TOOL

International® Marine Coatings (International) has published a new whitepaper which reveals the high degree of accuracy of its predictive Intertrac® Vision tool to real-life vessel operations by correlating to the speed loss of a globally trading VLCC vessel over a five-year docking period, in line with the principles of the ISO 19030 standard.

Using the forecasting tool to project a 1.4 percent speed loss over a 60-month in-service period proved to be in line with actual vessel performance.

In the real-life validation exercise, the hull performance team at International collaborated with the vessel operator to monitor and report any significant performance deviations, ensuring optimal vessel performance was maintained. The application of Intercept 8500 LPP also resulted in a reduction of vessel carbon emissions of roughly 8,500 tons over the five years.

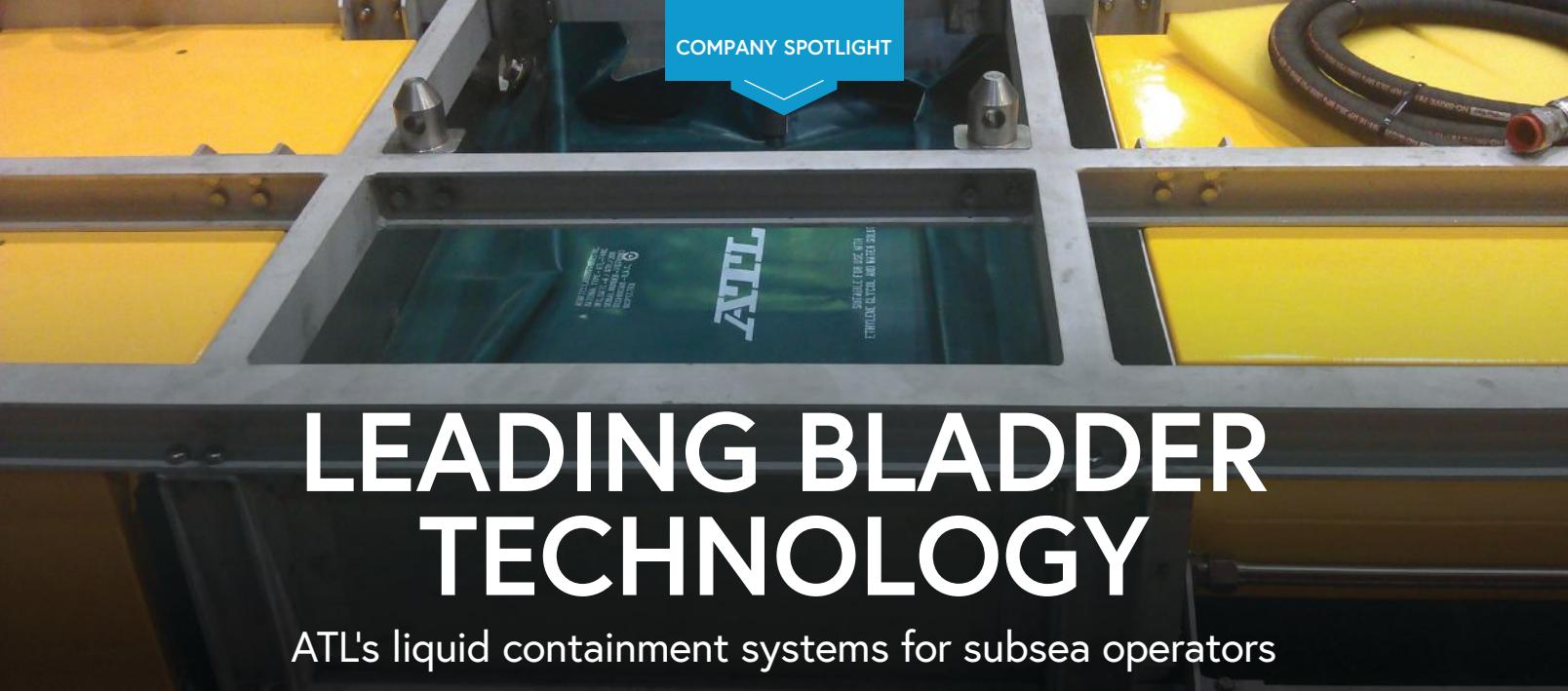
International states that the findings in this whitepaper reinforce the pivotal role tailored fouling control coating recommendations and real-time monitoring have in optimizing vessel perfor-

mance and advancing decarbonization efforts within the maritime industry.

Last year the International Marine Organization (IMO) announced new carbon targets for the fleet, which include a 20% reduction in emissions by 2030, a 70% reduction by 2040, compared to 2008 levels, and the goal of net-zero emissions by 2050.



International Marine Coatings



LEADING BLADDER TECHNOLOGY

ATL's liquid containment systems for subsea operators

▲ BOP Skid with ATL Bladder for Working Class ROV. (Credit: ATL)

Aero Tec Laboratories (ATL) understands the unique challenges that face the subsea industry and provide innovative solutions that withstand and deliver in such harsh environments.

ATL specializes in the design and manufacture of bladder-type containment systems (air, gas, or liquid) that support subsea oil and gas exploration, pipeline maintenance and repair, remote intervention, and defense projects. ATL's flexible bladder technology is utilized in a variety of subsea applications including liquid reactant storage, ballast and buoyancy, and propulsion systems, just to name a few.

BLADDER TANKS

ATL's custom engineered bladder tanks are manufactured from a variety of materials ranging from thin, flexible films to high strength fabric-reinforced polymers. These bladders, inflatables and bellows boast



▲ Fully custom—ANY size or shape—handheld to 1,200+ gallons. (Credit: ATL)

unparalleled chemical tolerance, abrasion resistance, and remarkable durability for long term storage.

Liquids such as mono ethylene glycol (MEG), biocides, methanol, hydraulic fluid, and reactants like caustic and acidic solutions and Otto Fuel are no match for ATL's specially developed bladder materials. Aero Tec's nearly 55 years of research and development have yielded materials and technologies that perform flawlessly in the extreme pressure depths of the sea.

From the initial concept to the finished product, ATL assists clients during the entire process, whether it be a single prototype or a full production run. Utilizing the latest CAD software, ATL engineers can transform any design and digitally construct a bladder tank to the exact specifications required.

After approval of drawing package by the client, the project then moves to the production floor where the manufacturing process begins. ATL's production engineers have decades of experience and numerous cutting-edge fabrication techniques at their disposal, including RF (Radio Frequency) sealing, as well as thermal, friction, ultrasonic, vulcanization, and adhesive welding. These methods yield a remarkably strong and leak-tight bladder.

CUSTOM SERVICES

ATL's capabilities do not stop there. ATL also offers a wide variety of standard hardware, including fittings, valves, flanged, and caps that allow for easy fill/discharge/refill. If



▲ ATL Bladder with custom stainless steel hardware. (Credit: ATL)

a project requires custom hardware, ATL's in-house machine shop is equipped with the latest CNC technology that can provide a true turn-key solution.

Every day, ATL products are put to the test in the most demanding underwater oil and gas projects, some of which include, solutions for uncrewed vehicles like ROVs/AUVs, blow out prevention skid (BOP) bladders, dispersant reservoirs, flotation chambers, submersible ballast bladders, pressure compensators, buoyancy bladders, dampers, accumulators, diaphragms, and storage for chemical and cleaning solutions.

ATL's expertise and on-time delivery has led to longstanding relationships with many industry leaders such as Oceaneering, Baker Hughes, Teledyne, and Scripps Institution of Oceanography.

i atlinc.com (US)
i atltd.com (UK)



A PROVEN PATH

ROVs steal the limelight at Oi24

At Oceanology International 2024 (Oi24) in March, companies indexed as having remotely operated vehicle (ROV) product offerings, services, or rentals were out in full force to showcase their technology and connect with existing or new industry users.

However, as amply demonstrated under the lights of ExCeL London, the ROV realm extends way beyond vehicle manufacturers.

Whether deploying work-, observation-, or inspection-class ROVs, most operator requests remain aligned; ROV users are increasingly looking for customizable, reliable, and cost-effective systems capable of completing a series of programmable tasks for subsea infrastructure inspections, deep-sea exploration, near and offshore aquaculture inspections, and more.

In other words, they demand sustained in-field versatility, and this is slowly but surely impacting how developers consider the future utility of ROVs across the ocean sector.

The pronounced uptick in interest and availability of smaller, portable observa-

tion-class ROVs is in no small part attributable to the needs voiced by research, survey, and nearshore infrastructure managers. These compact, modular units offer plug-and-play capabilities, and with ongoing investments being made to introduce additional functionality and tooling, there is a renewed excitement surrounding ROV development and application.

FORM & FUNCTION

At a time when "doing more with less" is more a project directive than an operational goal, manufacturers are dedicating considerable resources to stretching the suitability of smaller ROVs to complement—even challenge—the tasks traditionally associated with larger sized ROV models. Across the board, from micro-ROVs to imposing, deep-water work-class units, all are unified in the mission to optimize the use of onboard space and potential payload. Frame materials, buoyancy aids, lights, cameras, power sources, propulsion systems, thrusters, tethers, and other tooling components are all subject to scrutiny when striking the right balance between form and function.

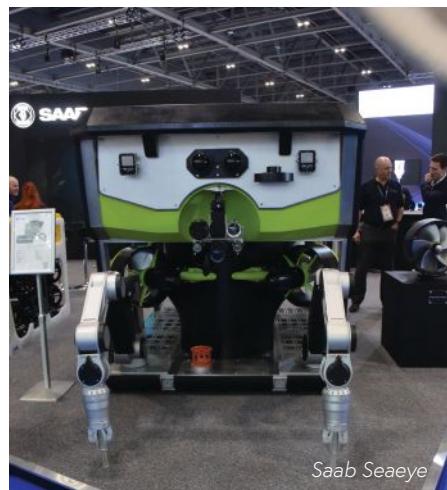
Fast emerging as a front runner in the

design and production of commercial grade, portable ROVs, Deep Trekker was on the Oi24 exhibition floor, presenting their portfolio of compact, mission-ready machines, all offering flexible power options and integrated accessory add-ons. While small, these ROV packages boast powerful capabilities, providing users with stability and control in a portable package that can be deployed in a multitude of environments.

With several models on display in London, the Deep Trekker's DGT3 ROV was an immediate draw as it flaunted its extreme moveability in a small test tank. Depth-rated to 200 m with tether options to 700 m, this lightweight, highly portable ROV with a growing menu of interchangeable add-ons is certainly a bellwether for the future of smaller systems.

ELECTRIFYING TECH

Decarbonizing remote technologies is a theme destined to endure. Like most modern-day tech, the industry is limited and controlled by one major component: the battery. While smaller, less power hungry ROV conversions to electric power sources have come with more ease, larger work-class vehicles—systems traditionally reli-



Saab Seaeye



uWare Robotics



Marine Nav



FET



Strategic Robotic Systems



Deep Trekker

ant on hydraulic systems for power—have had to overcome in-field challenges related to pressure at depth, heat, and reliability.

Today, the rapid evolution of electric ROVs (eROVs) is enabling offshore developers and partners to electrify their subsea toolkits. One such operator is Luxembourg-based marine operator Jan De Nul Group, who announced the acquisition of a Quantum EV ROV from SMD.

Commenting on its latest partnership with SMD, Jan Van de Velde, Director New-building at Jan De Nul Group, said: "Our attention to environment and climate is mirrored in SMD's Quantum EV, which not only offers superior efficiency and reliability but also consumes less energy and drastically reduces the risk of oil contamination."

Also on display at Oi24, was Saab Seaeye's eWROV. With precise, quieter, and reliable performance matching that of a 250-horsepower hydraulic vehicle, the eWROV has been designed with "eco-responsibility" in mind. Saab also featured the eManip, an all-electric-seven-function work-class manipulator characterized as being more

accurate, reliable, and dexterous than its hydraulic counterparts.

Technical innovations like these continue to inspire the notion of carbon neutrality among offshore operators and offer a practical pathway to establishing sustainable, in-field practices that prioritize climate concerns without compromising the reliability and operational efficiency of more conventional hydraulic work-class ROVs.

ONBOARD CUSTOMIZATION

And it was not just complete systems on show at Oi24. Increasingly, it is what's being added to them that demands attention. Sensors and instrument providers are ramping up their efforts to incorporate plug-and-play options for efficient and compatible monitoring and observing tasks like carbon and methane gas detection, corrosion lifetime and protections, and ocean noise measurements.

Payload add-ons and sensor options for ROVs, down to the size of microchips, the types of connectors and plugs, and ease of calibration, are front-and-center consider-

ations for ROV developers and users alike.

Sensor providers like NBOSI Ocean Sensors, another exhibitor at Oi24, are leading the charge in delivering small and rugged instrumentation for ROVs. Chip size, bulk-head connectors, and feasibility of calibration are all considerations being made by instrument and sensor companies seeking to stretch and enhance the utility of modern-day ROV platforms.

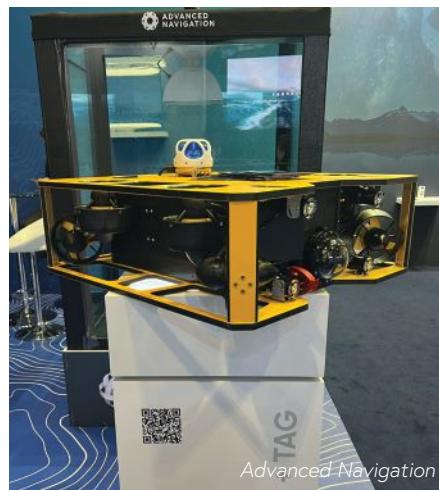
In recent years, the ROV—a stalwart of ocean explorations—has arguably been eclipsed by some of the other breaking technologies seeking to champion remote marine operations. These contenders, noticeably USVs and AUVs, were also well represented at this year's conference and exhibition. There is a renewed excitement surrounding ROVs as the categorization within their classes continues to diversify.

For ON&T, that is a tantalizing prospect as we tiptoe towards the tenth edition of our *Uncrewed Vehicles Buyers' Guide (UVBG)*, to be published in July 2024.

i oceannews.com/uncrewed-vehicles



FRAMEWORK ROBOTICS



Advanced Navigation



Atlanta MARINE

SAIPEM SELECTED BY NEP JOINT VENTURE FOR CO2 TRANSPORT AND STORAGE PROJECTS

Saipem has signed a Letter of Intent, received by the Northern Endurance Partnership (NEP), a joint venture between the operator bp, Equinor, and TotalEnergies, and Net Zero Teesside Power (NZT Power), a joint venture between bp and Equinor, stating that the company has been selected for the award of the NEP and Net Zero Teesside Power (NZT) projects.

The two projects are related to the development of CO2 offshore transportation and storage facilities to the East Coast Cluster in the United Kingdom.

The final award to Saipem is subject to the receipt of relevant regulatory clearances and positive Final Investment Decisions (FID) by the projects and UK government, planned for September 2024 or earlier.

Saipem's scope of work covers the Engineering, Procurement, Construction and Installation of a 28" and approximately 145 km offshore pipeline with associated landfalls and onshore outlet facilities for the NEP project, and the Engineering, Procurement, Construction and Installation of the water outfall for the Net Zero Teesside Power (NZTP) project.



The pipeline offshore operations will be performed by Saipem's flagship vessel Castorone, and the nearshore operations will be performed by the Saipem's shallow water pipelay Castoro 10.

When completed, the Projects will serve the East Coast Cluster in Teesside with the transportation and storage of around 4 million tonnes of CO2 per year from 2027.

MAERSK'S NEW PARTNERSHIP WITH ECO FOR OFFSHORE WIND INSTALLATIONS IN US



Maersk Supply Service to partner with Edison Chouest Offshore (ECO) for the construction and operation of a windfarm feeder concept specifically designed for Maersk Supply Service's next-generation Wind Installation Vessel.

Based on innovative technology, Maersk Supply Service looks to enable steady transfer of turbine components at sea to accelerate the rollout of offshore wind.

Maersk Supply Service is already invested in the US Offshore wind market, and partnering with ECO to construct a purpose-built windfarm feeder spread is a natural next step.

"Maersk Supply Service's new installation concept can make offshore wind farm installations significantly faster with estimated efficiency gains of 30%. The partnership with ECO makes this new technology

available for the US offshore wind market enabling faster offshore wind installations in the US," said Christian M. Ingerslev, CEO at Maersk Supply Service.

The purpose-built feeder spread includes two tugs and two barges to be delivered in 2026. They will be owned and operated by ECO and constructed by Bollinger Shipyards—the largest privately-owned shipyard group in the United States.

As a key component to the installation process, this newbuild feeder spread will transport wind turbine components or foundations to the installation site, while the wind installation vessel (WIV) remains on location to complete successive installations, allow faster installation, and thereby enable the wind park to be on-grid faster.

"This partnership facilitates expansion of our existing footprint in the US offshore wind industry, and our decades of offshore experience, efficiency and focus on technology can play an important role in the further development of the US offshore wind segment," added Mr. Dino Chouest, Executive Vice President of ECO.

RAMBOLL SELECTED FOR PRE-FEED WORK ON TWP'S BOWDUN OFFSHORE WIND FARM

Thistle Wind Partners (TWP), a consortium involving DEME, Qair, and Aspiravi, has awarded Ramboll the contract for pre-FEED (Front-End Engineering Design) of the foundations for its Bowdun project.

Ramboll, a global engineering and consultancy company, will take the foundation concepts for TWP's 1 GW Bowdun Offshore Wind Project to the next stage as the project progresses its pre-FEEDs throughout this year.

The scope of work includes the substructure design for the Wind Turbine Generators (WTG), consisting of a base case jacket design concept for water depths up to 70 m. In addition, the work will also consider various parallel geotechnical sensitivity assessments to advise on the future development of the wind farm. Ramboll will also provide offshore substation foundation concepts for the Bowdun project and TWP's Ayre Offshore Wind Farm.

The design will contribute to establishing a full design envelope for the projects and help determine the fabrication, transport, and installation requirements at a later stage. Once this work is completed, FEED and detailed design procurement is expected to commence in the spring of next year.

The news comes fast on the heels of the recent announcement by COWI that they have been awarded the contract to produce comprehensive pre-FEED studies for the onshore and offshore electrical and civil designs for both projects.



DEMЕ's Orion vessel is installing XXL foundations at the Moray West Offshore Wind Farm. (Credit: Thistle Wind Partners)

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EQUINOR EXTENDS DRILLING CONTRACTS ON NORWEGIAN CONTINENTAL SHELF

Equinor, on behalf of the partners, is exercising two options to extend contracts with Archer AS, KCA Deutag Drilling Norway AS, and Odfjell Operations AS for a total of four years.

The options for drilling services on fixed installations on the Norwegian continental shelf provide jobs for 2,000 people per year and have an estimated value of \$1.75 billion.

The contracts were signed in 2018 with three option periods of two years. The first two-year option was exercised in 2022. The new contract period runs for four years from October 1, 2024.

"We appreciate the good collaboration we have had with these suppliers for many years and have therefore added a fourth option of two years in addition to those agreed in the original contracts. This will help ensure predictability and form the basis for continuous improvements over



Arne Reidar Mortensen/Equinor

time. This is a clear signal that we have long-term plans for cooperation with all three suppliers," said Mette H. Ottøy, Equinor's Chief Procurement Officer.

In this option round, Equinor has conducted a limited competition evaluating drilling

suppliers on certain fixed installations based on a combination of technical and commercial criteria.

This has resulted in some redistribution between these suppliers on four of the 19 installations in the contract portfolios.

CARBON STORAGE GUIDANCE PUBLISHED BY NORTH SEA TRANSITION AUTHORITY

The energy transition recently took another step forward with the publication of new guidance for the carbon storage industry.

On March 28, the North Sea Transition Authority (NSTA) published two sets of guidance which will help the developing carbon storage industry prepare for first injection.

The Guidance for Measurement of Carbon Dioxide for Carbon Storage Permit Applications provides licensees with information on NSTA expectations regarding the proper measurement of CO₂ being injected in a storage site and suggestions on how that can be achieved.

It is important that injection flow rates are accurately determined, as this information is used in modeling the behavior of the CO₂ in the reservoir. In addition to the

overall volume being injected, the exact composition of the gas is also measured. This ensures that the correct payment is made under the Carbon Trading Scheme.

The second set of guidance, *Requirements for the definition of a carbon storage site, storage complex and hydraulic unit* provides clarity on determining the extent of subsurface storage site and focus for licensees on the area they must manage to prevent/detect leakage.

This piece of guidance advises licensees of the requirement to provide precise definitions of the spaces in which carbon dioxide will be stored and the surrounding areas that it must be contained within.

This precise definition is required so that any deviations from the expected CO₂ movement and containment are clearly

identifiable so that preventative or remedial action can be taken. The NSTA does not instruct independent businesses on how they should operate, but planned monitoring for such events is a requirement for each carbon storage application.

The guidance will immediately help the licensees of the Track 1 clusters at HyNet and Northern Endurance, and Track 2 at Acorn and Viking, which are the most far advanced projects, as well as new licensees.



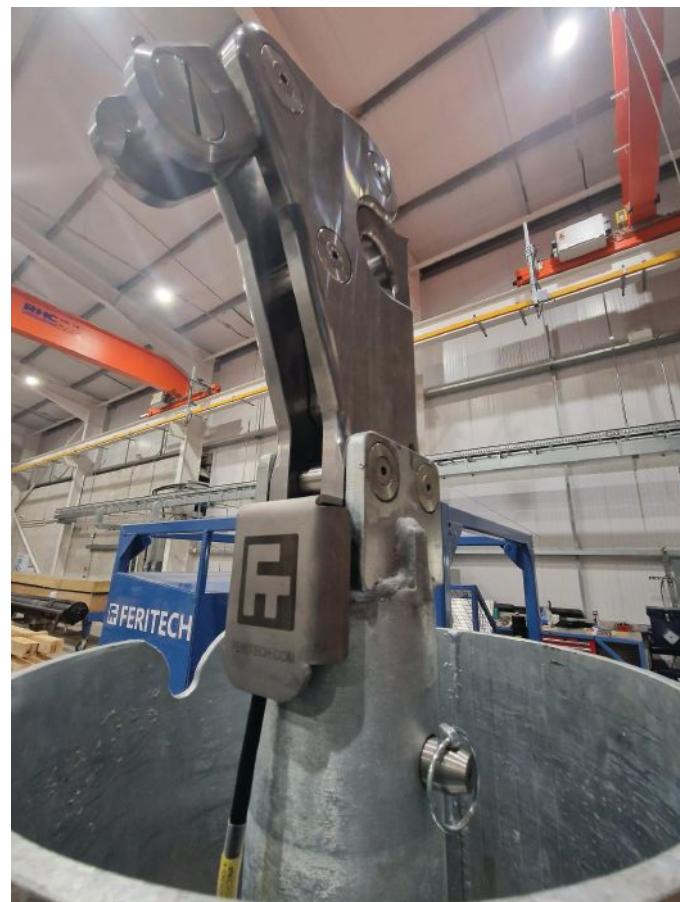
FERITECH GLOBAL COMPLETES PISTON CORER DESIGN AND BUILD FOR OCEANEERING

Feritech Global has completed a major design and build project for Oceaneering, the world's largest provider of subsea robotics to the offshore energy industry. The company has designed a next generation auto-drop piston corer which is expected to dramatically reduce the amount of time needed for subsea geotechnical surveying, increasing safety and efficiency, whilst reducing costs.

A piston corer is a long, heavy tube plunged into the seafloor to extract samples of soft sediment. Analysis of these samples provides vital information for developers who want to build installations out at sea, such as wind turbines, oil and gas pipelines, or undersea cables.

Rob Ferris, Managing Director of Falmouth-based Feritech Global, said: "The new auto-drop piston corer technology represents a step change in precision and efficiency. We estimate that this new product will enable seabed samples to be collected up to ten times faster than with traditional piston corers."

The new bespoke system has been developed for Oceaneering with their project team involved in its development, providing feedback at each stage.



▲ Close up of the auto-drop piston corer technology. (Credit: Feritech)

The new system includes a range of innovative features. Using sophisticated software, the auto-drop piston corer can be programmed, lowered to pre-set sea depth and then automatically released.

This provides much greater precision and faster speeds than traditional piston corers, which are launched manually by a trigger mechanism. As well as improving efficiency, this system also enhances operator safety.

In addition, the Launch and Recovery System (LARS) and the winch can be operated remotely, through a control panel which is integrated into a lightweight wearable pack. This allows the operator to carry the control panel on the front of his body, making it portable and flexible.

As a result, piston corer operations can be carried out safely by only one person, whereas previously at least two staff would have been needed to operate all the equipment required.

The upgraded LARS system also includes a new, strengthened barrier rail, which can withstand pressures of up to 2 tons.

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SULMARA SELECTED FOR SITE CHARACTERIZATION CAMPAIGN AT FLOATING OFFSHORE WINDFARM

Sulmara has been awarded a contract to work on one of the world's largest proposed floating offshore developments. The contract, which will see Sulmara conduct site characterization at the Stromar floating offshore windfarm in Scotland, will utilize the *Vos Gorgeous*, a 60 m multi-purpose subsea vessel, to carry out geophysical investigation across the proposed windfarm site in water depths up to 100 m.

The news comes on the back of several announcements already this year, all of which provide proof of the company's commitment to drive improvements which are better for the environment and customers.

One of the world's largest proposed floating offshore developments which will one day generate renewable electricity to homes in Scotland, Stromar is a joint venture between Orsted, BlueFloat Energy and Renantis, and part of the ScotWind offshore wind leasing round.

Due to commence in April, the project will see data acquisition carried out to support Stromar's engineering design work, as well as its ongoing environmental assessment of the site, which is approximately 50 km (31 miles) off Caithness in northern Scotland.

Michael King, Head of Sales at Sulmara, said: "As a business founded in Scotland, and with our headquarters in the heart of

Glasgow, we're really excited to be working on a project that is such a big part of Scotland's energy future.

"We're very much looking forward to working with the team at Stromar to help them gather critical information about their site ground conditions."

Stromar's Project Director, Nicholas Ritchie added: "This marks a critical milestone for Stromar, where Sulmara's expertise, alongside its sustainable vessels and innovative

technology, will be crucial for this significant work."

"Partnering with the Sulmara team aligns with our commitment to decarbonization and, importantly, working with Scottish partners to bolster the local supply chain. Stromar represents a major project that could enhance Scotland's leadership in the global floating wind sector, while also contributing to the ambitious net zero targets set by both the Scottish and UK governments."



Sulmara

SHEARWATER AWARDED SEISMIC SURVEY FOR UK CARBON CAPTURE AND STORAGE PROJECT

Shearwater GeoServices Holding AS (Shearwater) has been awarded a contract for advancing Carbon Capture and Storage (CCS) capabilities in the United Kingdom by Spirit Energy. The project in the Morecambe Bay area confirms Shearwater's position as a leading provider of CCS enabling geophysical data.

The six-week operation is scheduled for the summer of 2024 and will be Shearwater's fifth CCS survey in the last two years. It relates to Spirit Energy's recent carbon

storage license award by the UK's North Sea Transition Authority (NSTA).

The license is a key step forward in transforming the North and South Morecambe gas fields into permanent, safe, and secure carbon storage, supporting the United Kingdom's Net Zero ambition to capture and store over 50 million tonnes of CO₂ per year by 2035.

"We are proud to support Spirit Energy on the Morecambe CCS hub. By applying

our innovative data collection and imaging technology to help operators gain a better understanding of their storage sites we support deployment of CCS at scale. CCS has been identified as a key mitigation measure for climate change but deployment at scale remains the challenge. We are leveraging our expertise and our marine seismic technology to meet this challenge in order to build a more sustainable future," said Tanya Herwanger, SVP of Strategy and New Markets of Shearwater.

ICT INNOVATION TAKES CENTER STAGE AT OCEANOLOGY INTERNATIONAL

With a total attendance approaching 14,000 delegates, over 7,500 new to Oceanology International (Oi), the flurry of activity at ExCeL London from March 12–14 is testament to both the pace and breadth of technological innovation driving the future of the ocean industry.

Over 110 product and service launches were announced at Oi24 alongside over 175 dockside demonstrations of uncrewed surface vehicles (USVs), uncrewed underwater vehicles (UUVs), remotely operated vehicles (ROVs), marine instruments, marine survey vessels, and advanced scientific diver technologies.

ICT IN FOCUS

Integral to the event, the OceanICT co-located zone, powered by ON&T, was a space focused on innovations and solutions in data management, artificial intelligence, communications, satellites, and more. In the OceanICT Theater, Sequent, CSignum, Seagate, Autonomous Crafts, ET Works, Ground control, MicroStep-MIS, and the European Space Agency (ESA) all unraveled solutions to complex ocean industry problems using some of the latest collaborative information and communication systems.

When asked about what the future of OceanICT looks like, Ruti Arazi, Go To Market and Partnerships, Lyve Services | Edge to Cloud Services, Seagate Technology, stated: "The future of ocean-based ICT hinges on the ability to improve data transfer and time to data, and we're looking forward to being an integral part and a game changer in the exciting future of ocean research."

To keep up with some of the latest leaders in the OceanICT space, visit:
oceannews.com/featured-stories/take-5



The inaugural "Meet the Media" event at Oi24 created an open access space for journalists and business leaders to conduct opportune interviews.

MEET THE MEDIA

Also new to the Oi 2024 was the inaugural "Meet the Media" gathering created by ON&T, which seeks to provide an open-access space for journalists and industry leaders to discuss new products and upcoming trends in the ocean technology industry.

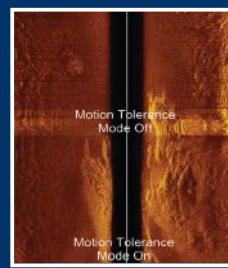
Among others, attendees included: Huntington Ingalls (HII), hot off the launch of their new REMUS 130 unmanned underwater vehicle (UUV) with advanced capabilities like effortless payload integration, portable design, and operational depths down to 100 meters; Saildrone, sharing details of their newest USV model—an aluminum-hulled Surveyor that will provide long-distance endurance and increased stability for deep ocean mapping and maritime domain awareness; and Navtech Radar who's radar technologies are traversing into the maritime space to provide solutions for autonomy and object avoidance in ports and harbors.

For the editorial team at ON&T, the clear takeaways from Oi24 are clear: autonomy and remote systems are here to stay; the workforce requirements for the ocean industry are evolving, with newcomers bringing novel approaches to long-standing challenges and issues; and while more technologies and innovations are coming online to tackle information, communications, and technology challenges in the marine space, there is still a long way to go, but minds and leaders—like those who took center stage at Oi's OceanICT—are paving the way for success.



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OIL PRICES CLIMB

While natural gas sits in the basement



G. Allen Brooks
ON&T's Offshore Energy Expert
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CRUDE OIL

The stock market has suddenly rediscovered crude oil and commodities as investment options. Investment talk is about a sea change for investors as the long-term commodity cycle remains in place. The dismal 2023 stock market results for the energy and materials sectors were largely a second-half-of-the year story. The two sectors and their underlying commodity prices had held up during much of 2023's first half.

The poor second-half performance for oil coincided with China's continued struggles to reinvigorate its economy. World oil demand grew last year and is projected to grow further this year, and preliminarily, grow additionally in 2025. What hurt oil prices late last year was oversupply as Chinese demand failed to materialize as expected.

OPEC+ members continued controlling oil prices by restricting their production. The group had extended their initial cuts numerous times to keep oil prices from falling too low. The latest extension holds OPEC+ output down through mid-year.

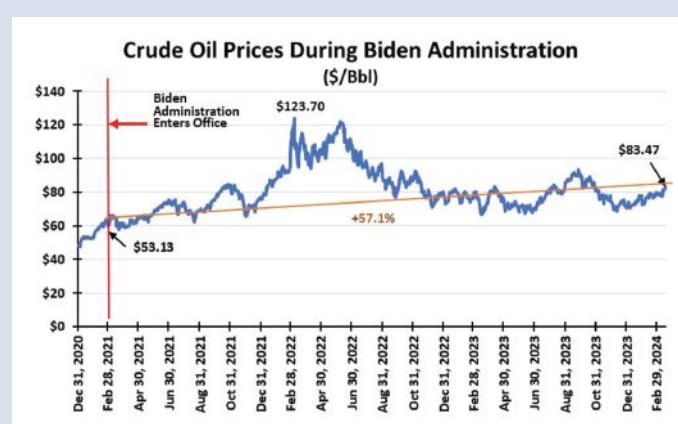
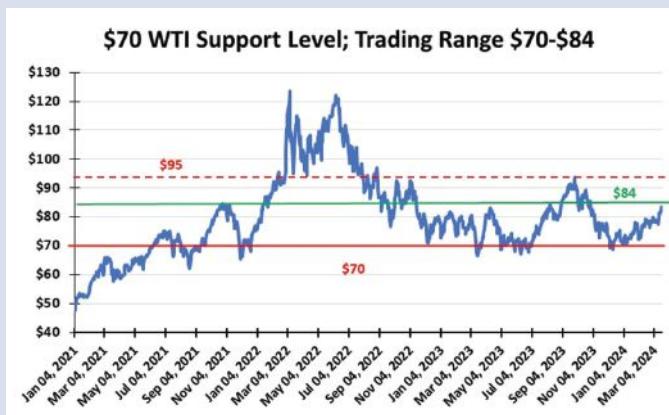
What is becoming more evident, however, is how oil prices have not been considering supply risks due to geopolitical events that are real. The Russia/Ukraine war continues to drag on, but with signs that Russia is gaining momentum, while it threatens to upscale the conflict should Europe and the US escalate support for Ukraine.

The latest geopolitical issue is the growing use of drones by Ukraine to strike at Russia's oil infrastructure. Ukraine has been frustrated, as have many in the West, over Russia's ability to evade oil industry sanctions whose revenues are funding the war. Ukraine's drones have demonstrated they can strike potentially 60 percent of Russia's refinery and export capacity. Ukrainian drones have also hit Russian oil shipping ports. So far, Ukraine has hit seven major Russian refineries causing damage and fires, which have reduced output volumes. We do not know if the reductions are temporary or permanent. Losing some or all of Russia's oil exports would immediately panic the global oil market sending prices soaring.

The ongoing attacks on shipping in the Red Sea by Yemen's Houthi have forced almost all vessels to sail around Africa adding to global bunker fuel demand and extending cargo deliveries by weeks. The bunker fuel demand increase forced the International Energy Agency to boost its oil demand forecast for 2024 to be closer to OPEC's projections. The IEA's revised forecast has the global oil market falling into a shortage in the second quarter rather than during the second half of 2024. As the market digests these developments, the oil risk premium is re-entering the pricing equation.

The oil industry continues adhering to strict capital discipline, so exploration and development expenditures are being throttled back while dividends and share buybacks continue. This reinforces

OIL PRICES REFLECTING GREATER GEOPOLITICAL RISK PREMIUM AND COMMODITY CYCLE REVIVAL





▲ Ongoing safety vessels in the Red Sea have forced most vessels to sail around Africa adding to global bunker fuel demand.

the prospect of tighter oil markets in the future, even when OPEC+ eliminates its production cuts. The oil and commodity cycles are regaining their mojo.

NATURAL GAS

In mid-March, the natural gas market experienced its first weekly injection into storage for 2024. Warmer temperatures in the first half of March contributed to the early start of the gas injection season. The second half of March has experienced several large snowstorms and cooler weather nationwide than expected, and certainly unexpected after the warm weather in the first half of the month. This weather has contributed to sending gas prices into the basement. The outlook does not suggest much of a recovery in the near term.

Our two natural gas charts demonstrate the weak gas market. For most of 2024, natural gas storage has been above or only slightly below the 5-year maximum storage. The market entered 2024 with a surplus over the 5-year maximum of 80 billion cubic feet (Bcf) which has grown to 300 Bcf at mid-March. Unless something changes, the gas storage surplus will grow.

Estimating how much the storage surplus may grow depends on the weather—heating or cooling needs for natural gas. For the week ending March 15, heating degree days nationally were 121. However, that was 36 HDD below normal and 49 HDD below last year. That explains the gas storage injection—a lack of heating

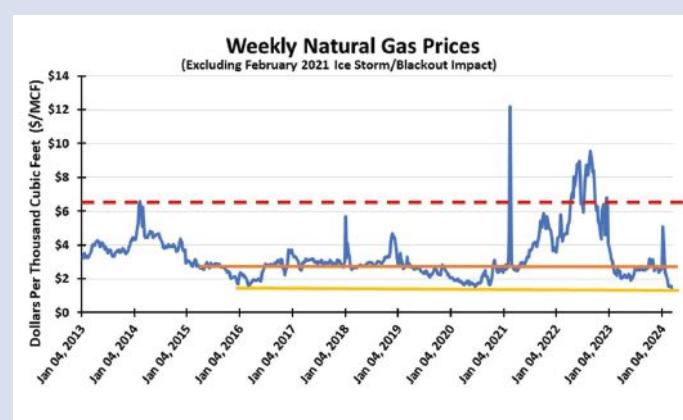
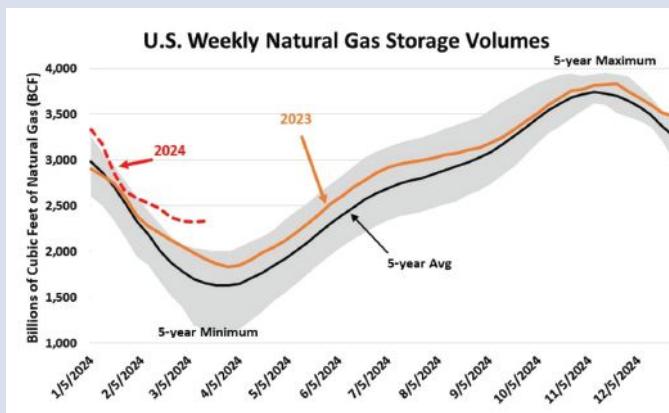
demand. As we move into the Easter Season, snow and cold temperatures are sweeping across the upper tier of the US. That should provide some support for gas consumption and prices.

However, any gas price support coming from the colder-than-normal temperatures will dissipate as the nation heads into the spring "shoulder" months for gas demand when the absence of heating and cooling needs boost gas consumption. Thus, gas prices will swing on liquefied natural gas export volumes and gas production growth.

The latest weekly gas data shows production remaining high—101 Bcf/day. Fortunately, it is not rising. It has been flat for the last year. That offers a glimmer of hope for better gas prices. However, LNG exports are not rising. National export volumes are being held down by the continued operating restrictions at the Freeport LNG terminal, south of Houston, Texas. It has been operating at reduced levels since mid-January following a winter storm incident and anticipates operating with only one liquefaction train until May. The good news is that gas prices in The Netherlands and Asia are up from a year ago signaling there remains healthy international gas demand. Prices in those international markets are about \$13.50 per thousand cubic feet, while here, Henry Hub prices are about \$1.50.

The natural gas market is in the basement, but it has been there before, yet recovered. This market will recover, too. We just don't know when.

TOO MUCH GAS IN STORAGE HAS DRIVEN GAS PRICES TO BASEMENT LEVELS



US DEPARTMENT OF ENERGY TO AWARD ØRSTED FUNDING FOR E-METHANOL FACILITY



Ørsted, a leading US clean energy developer, announced it has been selected by the Department of Energy (DOE) Office of Clean Energy Demonstrations to begin award negotiations for up to \$100 million in federal funding to construct a ground-breaking Power-to-X facility, called Star e-Methanol, along the Texas Gulf Coast.

Ørsted's project was selected as one of

33 projects across more than 20 states to demonstrate commercial-scale decarbonization solutions needed to move energy-intensive industries toward net-zero.

The US industrial and transportation sectors accounts for 65 percent of US greenhouse gas emissions. Ørsted is leveraging its renewable power portfolio to produce green hydrogen and e-methanol to reduce

emissions from these sectors. Star e-Methanol is estimated to produce up to 300,000 metric tons of e-methanol annually which can be used directly as a marine shipping fuel, or as an input in sustainable aviation fuel or in chemical production, which all currently rely on energy-intensive fossil-derived fuels.

The Star e-Methanol project consists of multiple components to reach a net-neutral carbon solution. This includes building new onshore wind and solar projects in Texas to power the electrolysis of green hydrogen, capturing biogenic carbon from an industrial facility, and synthesizing the captured biogenic carbon with green hydrogen to create e-methanol. The resulting e-methanol will reduce CO₂ emissions by more than 90 percent compared to conventional marine fuel.

The project is estimated to create 300 construction jobs and 50 permanent jobs for operations and maintenance. Many employees supporting the project will be based in Houston, where Ørsted opened a new office in early 2024.

DNV AND MOSS MARITIME COLLABORATE TO ACCELERATE FLOATING SOLAR TECHNOLOGY

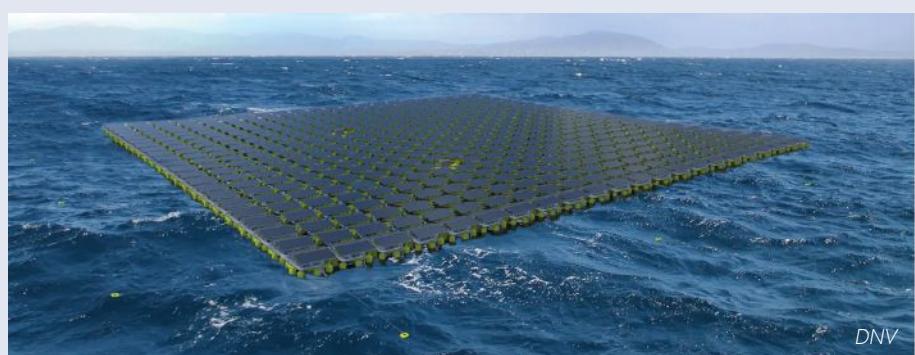
DNV has handed over a Statement of Conformity to Moss Maritime for their design brief outlining the design methodology for their concept called XolarSurf. This marks a significant milestone in the development of their technology. The recognition helps pave the way for further developments for floating solar in exposed waters and the opportunity of providing clean energy close to shore without the use of area on land.

The Statement of Conformity verifies that the design methodology complies with DNV general principles and requirements following the standard DNV-ST-0119. DNV has conducted independent investigations to identify and reduce errors, deficiencies, and weaknesses in methods and analytical tools. Wind, waves, and currents affect structures in the sea, and DNV's input ensures that this is taken care of in the further development of the concept.

The independent confirmation of their design brief helps Moss Maritime reduce risks as well as attract the investments needed for further advancing their floating solar technology.

"We aim to have a prototype in the water by June. DNV's Statement of Conformity is a recognition and a stamp of quality that gives us a good basis for further work,"

said Alexander Minge Thøgersen, Vice President of Engineering at Moss Maritime. "Compared to floating wind turbines, floating solar power technology is simpler, engineering costs are lower, and structures are easier to build. Floating solar power is also well suited for mass production, which will have a positive impact on price and deployment."



DNV

SBM OFFSHORE AND TECHNIP ENERGIES ANNOUNCE FLOATING OFFSHORE WIND JV

SBM Offshore and Technip Energies have signed an MoU for the creation of a joint venture entity, EkWiL. The new company will be a Floating Offshore Wind (FOW) pure player, capable of proposing a wide range of solutions to clients.

EkWiL will combine the people expertise, engineering and delivery capabilities, and complementary technologies of Technip Energies and SBM Offshore, creating integrated floating solutions and leading delivery offerings for the floating offshore wind market. This unique positioning will enhance execution certainty and cost com-



petitiveness to these innovative projects.

The 50/50 JV will operate as a fully integrated team, bringing together knowledge, innovation, and capacities to develop the two leading-edge technologies (Semi-submersible INO15 by T.EN™ and Tension Leg Platform Float4Wind®) covering a large spectrum of the floating offshore wind market, and bring them to commercial deployment.

Bruno Chabas, CEO of SBM Offshore, commented: "Our aim is to become a recognized leading contractor in developing floating offshore wind infrastructures. Collaboration is fundamental to position our ambitions sustainably while managing the pace of infrastructure development and the challenging economics of these pioneering systems. We are pleased to share our experience with the right partner, broadening the range of solutions and reinforcing our energy transition commitment."

Arnaud Pieten, CEO of Technip Energies, added: "Joining forces and collaborating are necessary to capture the potential of the nascent floating offshore wind market. By leveraging the synergies of complementary technologies and supply chain experience, EkWiL will increase predictability to meet market demand and deliver on our ambition to provide new energy solutions."



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FUGRO TO SUPPORT MIDDLE EAST OCEAN DATA EXPANSION

Following the successful launch of the Middle East's first fully remote survey vessel in 2022, Fugro has announced the arrival of its Blue Shadow® class uncrewed surface vessel (USV), in the Middle East. Crafted for precise hydrographic mapping and bathymetry surveys, the Blue Shadow will play a crucial role in addressing the rising demand for accurate hydrographic data in the Middle East, where infrastructure development, port expansion, and coastal management initiatives are at an all-time high.

Utilizing state-of-the-art navigation and surveying technology, the Blue Shadow efficiently collects vital data such as water depth and seafloor morphology, supporting the development of the blue economy in the Middle East while also aiding in understanding and protecting the delicate marine ecosystem.

This advanced technology enables non-disruptive hydrographic surveys near existing offshore structures, resulting in efficient hydrographic surveys, reducing project timelines, and providing crucial speed and accuracy in the dynamic maritime environment of the region.

With an ambitious goal to achieve net-zero emissions by 2035, Fugro is taking significant strides in minimizing its environmental impact by including more remote operations in its surveys. Data acquisitions through USVs from remote operation centers contribute up to 90% less carbon emissions than traditional vessel oper-

ations whilst significantly reducing human exposure to hazardous environments.

Louis Burnard, Regional Director Marine Site Characterization, Middle East and India, said: "This addition to the region's fleet marks Fugro's commitment to leveraging technology for a safe and livable world. With the Blue Shadow navigating our waters, we're not just mapping the seabed, we're forging a path for safer, more efficient maritime navigation in our region."



▲ Blue Shadow USV. (Credit: Fugro)

HUGHES SUBSEA SECURES UXO PROJECT FOR EAST ANGLIA THREE WIND FARM

Hughes Subsea, an OEG Renewables (OEGR) business, has been awarded the contract to undertake the unexploded ordnance (UXO) identification and clearance campaign on the East Anglia THREE (EA3) wind farm being developed by ScottishPower Renewables in the Southern North Sea.

This is expected to be a 6-month project, commencing in mid-March, and continuing until early October 2024 utilizing the *Glomar Wave*, a DP2 66.4 m long vessel. The offshore operations will involve the identification, investigation, and disposal of confirmed

UXO (cUXO) targets across an area of approximately 305 km².

Hughes Subsea will deploy its work class remotely operated vehicle (WROV) and specialist divers, and be supported by another OEGR business, GEOSIGHT, who will be providing surveying and calibration services. In addition, maritime archaeologists will be enlisted to handle historic findings, and marine mammal observers (MMOs) will support the monitoring of local wildlife, underlining our commitment to environmental stewardship.

The EA3 wind farm, located 69 km off the coast of East Anglia, will comprise an offshore substation, up to 100 wind turbine generators on monopile foundations (towering 262 m high), and 147 km of array and export cabling. This large offshore wind development project is set to generate up to 1,400 MW of clean energy—enough green energy to power over one million homes.

Mike Bailey, Managing Director of Hughes Subsea, said: "We are very much looking forward to working with ScottishPower Renewables on the EA3 wind farm development. OEGR and Hughes Subsea are leaders in this highly specialist field of surveying, identifying and responsibly clearing confirmed UXOs. With a steadfast commitment to safety and environmental stewardship, and to supporting the successful deployment of offshore renewables to meet the UK's energy transition goals."



Hughes Subsea

CIP SIGNS PREFERRED SUPPLY AGREEMENT WITH LS CABLE FOR TAIWAN PROJECT

Copenhagen Infrastructure Partners (CIP) has signed a preferred supply agreement with LS Cable for the supply of offshore and onshore cables to CIP's third offshore wind project in Taiwan, the 500 MW Feng Miao 1 project.

The contract specifies that LS Cable, a Korea-based industrial corporation and one of the biggest cable manufacturers worldwide, will supply offshore export cables, inter-array cables and onshore export cables from their Korean manufacturing facility to the 500 MW Feng Miao 1 offshore wind project in Taiwan. CIP was awarded Feng Miao 1 in the first round of Taiwan's Round 3 Zonal Development Offshore Wind Auction in December 2022.

The joint statement was signed during

the Korea-Denmark Wind Business Conference in Seoul, which was attended by Lars Aagaard, Danish Climate Minister, and Namho Choe, Korean Vice Minister for the Ministry of Trade, Industry and Energy.

Feng Miao 1 project is owned by CIP's Flagship Fund V (CI V), and is currently in the late development stage, finalizing design and procurement in preparation for financial close. This is the fourth cable supply collaboration between LS Cable and CIP's offshore wind projects in Asia, following Changfang Xidao and Zhong Neng in Taiwan and Jeonnam Offshore Wind 1 in Korea.

"We thank LS Cable for their continuous commitment to delivering the best quality cable systems to our offshore wind projects both in Taiwan and South Korea. The



Thomas Wibe Poulsen, Partner and Head of Asia-Pacific at CIP

fact that we have now signed our fourth agreement is a testimony to the strong relationship between our two companies," said Thomas Wibe Poulsen, Partner and Head of Asia-Pacific at CIP.

SUBSEA 7 CONTRACT FOR TRION DEVELOPMENT

Subsea 7 has announced the award of a contract by Woodside Energy to provide subsea installation services for the Trion development. The field is located approximately 30 kilometers south of the US/Mexico border and 180 kilometers away from the Mexican coastline, at a water depth of 2,600 meters.

The project, which Woodside and Pemex are developing in partnership, involves a wet tree subsea system connected to an infield Floating Production Unit (FPU). Subsea 7 will be responsible for the engineering, construction, and installation of the subsea umbilicals, risers, and flowlines, as well as the associated subsea architecture.

Project management and engineering will begin immediately from our offices in the US and Mexico. Offshore activities are expected to take place between 2026 and 2027.

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AR GEO SIGNS DEAL WITH CSI NORDICS FOR KONGSBERG HUGIN SUPERIOR AUV

Ocean surveying and inspection specialist Argeo Subsea, CSI Nordics, and Kongsberg Discovery have signed a three-party Certificate of Delivery and Acceptance for a new HUGIN Superior AUV.

The agreement, which was confirmed at Oceanology International in London in March, supports Argeo's ambitious fleet expansion plans, as the firm looks to build the world's most advanced AUV fleet, with seven high specification units. Argeo already has one HUGIN Superior in service.

CSI Nordics, a subsidiary of CSI Leasing, one of the largest independent equipment leasing in the world, will purchase the unit from Kongsberg Discovery, entering into a long-term leasing agreement with Argeo.

Argeo CEO Trond Crantz said the deal will amplify the company's operational capacity, putting it in "a unique position within

both the marine minerals, oil and gas and the renewables segment, increasing efficiency and productivity substantially."

Speaking on behalf of CSI, Kenneth Mitsem, General Manager at CSI Nordics, adds: "We specialize in crafting leasing solutions that are both flexible and sustainable, designed to meet the rapidly changing needs of the modern market. Our strategic approach focuses on making advanced technology readily accessible, enabling businesses to quickly respond to new challenges and maintain a competitive edge."

"We're proud to collaborate with Kongsberg and Argeo to develop smart leasing options, facilitating easier access to innovations like the HUGIN Superior from Kongsberg Discovery. This partnership underscores our shared commitment to enhancing the acquisition of technology critical for thriving."



From the left: Camilla Kiss, Executive Vice President Finance Kongsberg Discovery, Stene Førsund, Executive Vice President Sales & Marketing, Kongsberg Discovery, Trond Crantz, CEO Argeo, Atle Gran, Senior Sales Manager, Kongsberg Discovery, and Kenneth Mitsem General Manager at CSI Nordics. (Credit: Argeo Subsea)

MACGREGOR RECEIVES ORDER FROM VARD FOR CRANE INSTALLATION PROJECT



VARD cable layer for Prysmian. (Credit: MacGregor)

MacGregor, part of Cargotec, has received a large order for three cranes that will be installed onboard a state-of-the-art cable layer due delivery from global shipbuilder VARD.

The contract has been booked into Cargotec's first quarter 2024 order intake, with crane supply scheduled for the third quarter of 2025. MacGregor will deliver a 100-ton active heave-compensated (AHC)

crane, a 20 T offshore crane and a 3 T deck crane to Prysmian, to equip the Italian owner's third NB970 cable laying vessel from VARD.

In addition, MacGregor has been contracted to supply its OnWatch solution, including 24/7 technical service support worldwide. Developed for advanced subsea operations, the 191-meter-long Prysmian cable layer will be capable of complex

installation works, including simultaneous lay and burial with heavy-duty ploughs. It is equipped with cutting-edge DP3 positioning and seakeeping systems. At 19,000 tons, the vessel will take its place among the highest cable loading capacity ships in the market.

"MacGregor has been a reliable supplier for VARD on multiple projects over many years," said Pasi Lehtonen, Senior Vice President, Offshore Solutions. "This is a significant order for MacGregor's offshore handling business, and we are pleased to supply VARD with yet another package of our high-performance cranes."

"The market continues to respond well to our unique and modern designs, which combine resilience in service and lightweight round-shaped jibs," he added.

The initial phase of construction on the new vessel will take place at Vard Shipyards Romania—Tulcea, with completion in Norway and handover to the owner due by the beginning of 2027.

EFFICIENT SUBSEA TESTING

Simplifying infrastructure monitoring with C-Kore's testing tools



C-Kore

C-Kore Systems' innovative testing tools are changing the way operators and ROV contractors perform subsea testing. By automating the testing process and designing their testing tools to be simple, C-Kore's technology simplifies the subsea testing process, providing money savings to the operators and time savings to the ROV contractors.

Adding the patented Subsea Optical TDR tool to their testing capabilities now allows C-Kore's customers to also perform testing on the optical fibers as well as the electrical and hydraulic lines of subsea umbilicals.

SIMPLIFYING SUBSEA TESTING

A two-time Queen's Award for Enterprise winner for Innovation in 2019 and International Trade in 2021, C-Kore's game-changing technology is used by operators and installation contractors the world over on new installation projects and fault-finding operations. C-Kore's small testing tools are designed to be versatile yet simple to use.

By automating the testing process, no engineer is needed to accompany the equipment, and all support is given remotely in the time-zone of the customer as required.

Cynthia Pikaar, C-Kore Sales & Marketing Director, explains: "The comment we receive most from our customers is how

easy the units were to use, even with once complicated procedures such as electrical and optical TDR testing. The fact that a C-Kore engineer does not need to accompany the units is a big logistical and money savings for our customer."

MANUFACTURING EFFICIENCY

New umbilical installation projects benefit greatly from the C-Kore units. By already installing the C-Kore units onto a new umbilical before it leaves the umbilical manufacturer's facility, allows the health of the umbilical to be recorded throughout the entire installation process.

Any changes in the measurements are identified as they happen, where rectifications can be made. The alternative to wait until the whole system is installed and powered up to find out there is a problem could delay the time to first oil.

Greg Smith, Operations Director at C-Kore, believes that his company's focus on providing intuitive, customer-focused solutions for complex subsea challenges is a key differential: "The key to C-Kore's worldwide success has been the design philosophy to keep it simple while providing excellent service. Keeping the units small allows for quick mobilization, even by helicopter when needed. The fact that no extra personnel is required simplifies the logistics for our customers. Our whole team enjoys



▲ C-Kore subsea with ROV. (Credit: C-Kore)



▲ C-Kore monitoring umbilical installation. (Credit: C-Kore)

hearing the great feedback from customers. My personal favorite: 'They are worth their weight in gold'!"

i www.c-kore.com

C-Kore
Simplify Subsea Testing

SUBSEA EUROPE SERVICES RECEIVES INVESTMENT TO ADVANCE AUTONOMOUS MARINE SURVEY



▲ The A.IKANBILIS HAU in the foreground, with the Autonomous Surveyor USV in the background. (Credit: Subsea Europe Services)

Subsea Europe Services has completed a strategic multi-million Euro funding round. This significant investment marks a pivotal moment in the company's journey towards 'True Autonomy,' an innovative approach to optimizing marine data workflows through the seamless integration of new-generation sensors and platforms.

Comprised of 50% private equity and business angels, the investment is complemented by a mirrored contribution from the 'Mittelständische Beteiligungsgesellschaft Mecklenburg-Vorpommern mbH' through the innovative 'innoGROWTH' Program, which is renowned for supporting start-ups and medium-sized companies, particularly those focusing on ecological, digital, or social innovations.

The funding will propel Subsea Europe Services into a new era of growth and development, with a focus on attracting more skilled talent and expanding software and hardware development. Key workstreams

will be accelerated with the company's ongoing development of a state-of-the-art 'Autonomy Engine' and expansion of its existing autonomous surface and underwater vessel fleet leading the way. The addition of cutting-edge vehicles will be a significant leap forward in providing more capacity for autonomous survey and inspection services to the offshore wind industry and other marine sectors.

In alignment with this growth trajectory, Subsea Europe Services has strategically decided to relocate its headquarters to Rostock, in the Mecklenburg-Western Pomerania region, where the company already has an extensive R&D center. This relocation is poised to leverage the exceptional resources of the Ocean Technology Campus in Rostock, including the Digital Ocean Lab (DOL), the state-of-the-art testing facilities along the Warnow river waterfront, and proximity to key research institutions like the IOW, Rostock University, and the Fraunhofer Institute.

FILM-OCEAN INVESTS IN THIRD SMD ROV TO MEET DEMAND FOR SUBSEA SERVICES

Subsea services provider, Film-Ocean, has announced the expansion of its work-class ROV fleet with the purchase of a third hydraulic ROV from global technology manufacturer, SMD. The company has also entered into a support agreement for services and spares.

Film-Ocean will take delivery of the ultra-compact Atom hydraulic vehicle (HV) this summer, where it will commence operations on a wide range of projects.

With a high power-to-size ratio, the Atom HV is suitable for multiple applications across Film-Ocean's service range, adding greater flexibility to its expanding offshore fleet.

Film-Ocean's CEO, Scott Jenney, said: "Having collaborated with SMD for over five years, we are pleased to incorporate a third SMD ROV into our fleet."

"We are seeing a huge increase in demand for ROV services, and this latest investment

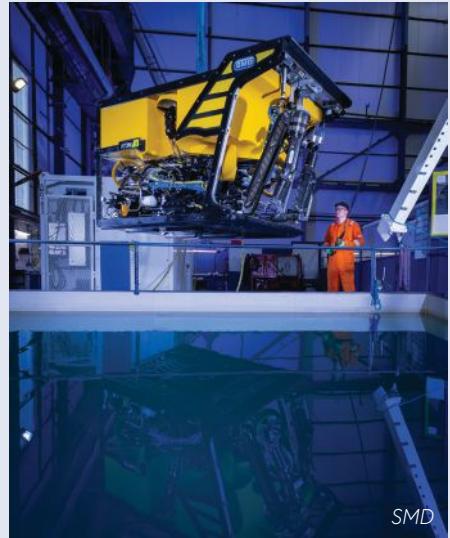
enables us to continue delivering high-class assets to our clients. We expect demand to continue to grow in the coming years and we are working closely with SMD to incorporate the additional capabilities of its EV range into our fleet of vehicles."

Speaking on the recent sale, SMD's Senior Account Manager, Lee Carden, added: "We are delighted to continue our ongoing partnership with Film-Ocean; a forward-thinking and dynamic organization with a truly exceptional team and world-class facility."

"The company's investment in our pioneering equipment is indicative of its long-term vision to build a sustainable business for the future."

SMD's Atom HV has been engineered with flexibility in mind. Constructed from the latest Curvetech® components, its modular design enables vehicle configuration to be optimized for the job at hand, with a lightweight aluminum chassis ensuring tight control is maintained in high cur-

rents. Able to divert up to 100 percent of its power from propulsion to tooling, the Atom HV can operate powerful tools typically reserved for much larger vehicles.



SMD

ENSHORE SUBSEA ANNOUNCES RETURN OF T3200 FOLLOWING COMPLETE REFURBISHMENT

Enshore Subsea has announced the return of—the world's most powerful subsea trencher. The 170 tons, 2,200 kW, T3200 is proudly under the Enshore Subsea banner again and has entered the firms Blyth workshop for a complete refurbishment and readiness campaign, in preparation for a planned series of projects.

With 3200 HP of effective trenching power T3200 offers unrivalled capability for the burial of cables and pipelines in challenging ground conditions. T3200 has a market-leading track record of high-performance burials in both Offshore Wind and Interconnectors.

The T3200, built in 2009 for Enshore Subsea's original parent company DeepOcean, was managed and operated by the Enshore Subsea team for major global projects for 12 years after her build. Following a management buyout of Enshore Subsea in April 2021 the intention was always to bring the trencher back to her home.

Pierre Boyde, Enshore Subsea Managing Director, said: "We're delighted to have the T3200 in the Enshore Subsea asset bank again! Our trusted team of onshore and offshore personnel are experts in operating T3200 in some of the most challenging seabed conditions and, whilst we have been able to use her over

the last three years, it was always our plan that she became a fully owned Enshore Subsea asset where we can maximize her full potential."

Operating in water depths from 9 m through to 500 m with products up to 1,300 mm in jetting mode, and 800 mm in cutting mode, the T3200 buries products in soil conditions up to 100 kPa in jetting mode and up to 40,000 kPa (40 MPA UCS) in cutting mode.



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POWERING PROGRESS

Lithium batteries enable long-term, remote, and wireless deployments



Sol Jacobs
VP and General Manager



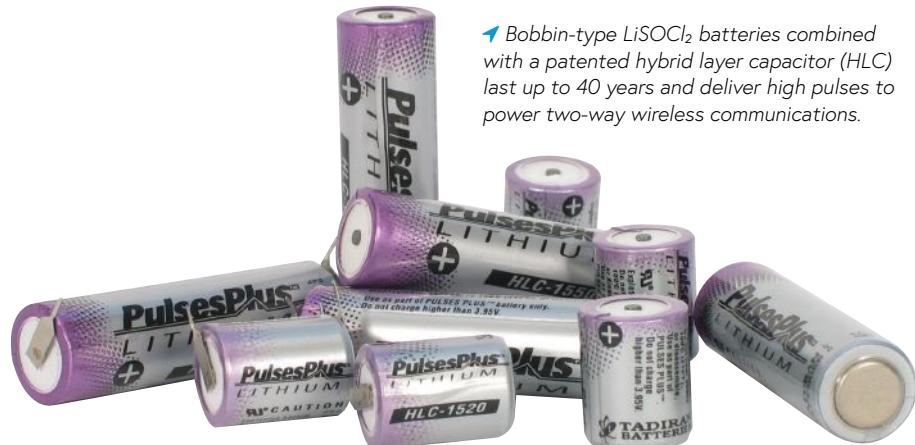
PRIMARY LITHIUM BATTERIES FEATURE THE HIGHEST SPECIFIC ENERGY (ENERGY PER UNIT WEIGHT) AND HIGHEST ENERGY DENSITY (ENERGY PER UNIT VOLUME), WHICH AIDS IN PRODUCT MINIATURIZATION.

Lithium batteries power remote wireless devices worldwide that are utilized throughout oceanographic and geophysical sciences, including buoys (drifting, moored, ARGO), mayday, GPS and ARGOS tracking devices, current meters, transponders, harbor lights, acoustic releases, and seismometers, to name a few.

Most remote wireless devices utilize primary (non-rechargeable) lithium batteries. However, certain niche applications draw enough average energy to prematurely exhaust a primary battery, thus requiring the use of rechargeable Lithium-ion (Li-ion) cells in combination with energy harvesting devices. For these specialized applications, industrial grade TLI Series Li-ion batteries were developed that can operate for up to 20 years and 5,000 full recharge cycles while delivering high pulses and surviving extreme temperatures.

Primary lithium batteries feature the highest specific energy (energy per unit weight) and highest energy density (energy per unit volume), which aids in product miniaturization. As the lightest non-gaseous metal, lithium offers the highest electrical potential, which enables higher voltage (2.7-3.9 VDC) to potentially enable the use of fewer or smaller cells. Because lithium chemistries are non-aqueous, they are less prone to freezing than alkaline.

Numerous primary (non-rechargeable) lithium chemistries are available, with bobbin-type lithium thionyl chloride (LiSOCl_2) cells being widely preferred for low-power devices that draw average current measurable in micro-Amps with pulses in the multi-Amp range. Bobbin-type LiSOCl_2 cells feature the widest temperature range (-80°C to +125°C) with an annual self-discharge rate as low as 0.7% per year, enabling certain devices to operate for up to 40 years without battery replacement.



▲ Bobbin-type LiSOCl_2 batteries combined with a patented hybrid layer capacitor (HLC) last up to 40 years and deliver high pulses to power two-way wireless communications.

Due to their low-rate design, bobbin-type LiSOCl_2 must be combined with patented Hybrid Layer Capacitors (HLCs) to generate high pulses. This hybrid approach uses the bobbin-type cells to deliver low-level base current during 'standby' mode while the HLCs deliver high pulses to power wireless communications. As an added benefit, HLCs feature an end-of-life voltage plateau that can be interpreted to deliver 'low battery' status alerts for scheduled battery replacement. These two technologies are easily configurable into battery packs.

CONDENSED POWER

Oceantronics' GPS/ice buoys were deployed by NOAA/PMEL to monitor the status and position of icebergs in the North Atlantic. Originally powered by bulky (54 kg) battery packs consisting of 380 alkaline D-size cells that provided one year of shelf life, the buoys were redesigned using 32 D-size bobbin-type LiSOCl_2 cells and 4 HLCs, which reduced size and weight by over 90% while increasing operating life manyfold and enabling the devices to operate reliably at -55°C, modifiable to below -80°C.

Similarly, remotely piloted aircraft dropping asset-tracking tags onto icebergs floating off the coast of Antarctica required a lightweight solution (under 500 g) capable of surviving a 100 m drop. A lightweight pack was created by combining one AA-size LiSOCl_2 bobbin-type cell and two HLCs, weighing just 70 g while delivering 20 μA of current at 2.4 Ah in 'standby' mode with 1A pulses during 'active' mode.

MONITORING DEEP-WATER CHANNELS

Researchers studying the impact of rising sea levels in deep-water channels beneath glaciers in Greenland and Antarctica deployed Cryoegg, which was developed at Cardiff University, to monitor changes in temperature, pressure, and electrical connectivity.

Utilizing the same 169 MHz Wireless M-Bus radio technology found in AMR/AMI utility meter transmitter units (MTUs) to transmit signals underwater, Cryoegg eliminated the need for bulky and expensive cables susceptible to damage by glacial movement, using high pulses to transmit data twice per day for up to two years.

FISH TELEMETRY DATA

VEMCO VR4-UWM underwater modem receivers track the migratory activity of aquatic fish and wildlife, including shark warning systems. For example, schools of fish are randomly tagged with transmitters that operate at depths of up to 500 m. The VR4-UWM periodically activates the transmitters to communicate through the OTN (Ocean Tracking Network) or AATAMS (Australian Acoustic Telemetry and Monitoring System) while storing up to 800,000 detections.

These underwater modems are powered by 24 D-sized bobbin-type LiSOCl₂ cells and 12 HLCs that deliver 1600 Wh of energy, enabling 9.5 years of single channel listening or 5.5 years of dual channel listening.

SUB-SEAFLOOR FLUID PRESSURES

Scientists collaborated with the Ocean Drilling Program (ODP) to install Circulation Obviation Retrofit Kits (CORKs) that measure temperature and pressure on the seafloor and within sub-seafloor boreholes. CORKs incorporate a wellhead data logger powered by a LiSOCl₂ battery pack that draws 4 mW of continuous current during 'standby' mode and 100 mW pulses while sampling data at a rate of one second per minute.

The power supply consisted of 6 DD-size bobbin-type LiSOCl₂ cells that delivered 750 Wh of capacity (7.2V, 105 Ah) with a lifespan of up to 7 years. Since data is typically retrieved once per year by deep submersibles, HLCs were not required.



▲ Seismic station near WAIS Divide camp, a location similar to Thwaites. (Credit: EarthScope)

SUBSEA BROADBAND SEISMOMETER

The Monterey Bay Aquarium Research Institute (MBARI) deployed Monterey Ocean-Bottom Broadband (MOBB) seismometers to detect low-frequency seismic activity at depths up to 1,000 m and up to 50 km from seashore for four-month intervals, requiring 2.2 W of continuous with 7 W pulses. The required battery pack delivered 10 kW/hr supplied by 96 D-size bobbin-type LiSOCl₂ cells and 12 HLCs.

SEISMIC MONITORING IN ANTARCTICA

The EarthScope Consortium, formed through the recent merger of IRIS and UNAVCO, assists the research community in procuring, deploying, and maintaining scientific instruments used in geophysics and other Earth sciences, along with related data archiving and distribution services.

In collaboration with Tadiran, EarthScope developed the TLP-93101E battery pack that was specifically designed to survive artic temperatures using Schottky diodes, positive temperature coefficient (PTC-200 thermistors), 18-gauge wire, a weather pack shroud style (WPS) connector, PVC jacketing, and shrink enclosure.

TLP-93101E battery packs combine 50 D-size bobbin-type LiSOCl₂ cells and 5 HLCs to deliver 190Ah of energy at 18.57V along with up to 15A pulses. With an operating life of 1-2 years, these packs remain stable down to -55°C, modifiable to below -80°C. This power management solution features a 93% smaller footprint than an equivalent pack using cold-rated lithium

iron phosphate (LiFePO₄) batteries (13.62" x 2.59" x 6" vs. 28" x 14" x 7.4"), along with an 85% weight reduction (11 vs. 70 lbs.): a space-saving solution that reduced shipping costs and permitted greater numbers of packs to fit into small plane cargo holds and helicopter slings.

These battery packs were deployed in seismometers surrounding Mt. Erebus, an active volcano located 20 miles from the McMurdo Station, supplying real-time data to monitor seismic activity and study the volcano's dynamics while enduring high altitude and katabatic winds. TLP-93101E packs were also deployed throughout a network of seismometers installed at Twaites Glacier that recorded seismic signals produced by cracking or lurching movement of the ice as well as for mapping and characterizing the bedrock beneath the ice.

tadiranbat.com



▲ Cryoegg monitors temperature, pressure, and electrical connectivity by transmitting data underwater via radio waves, powered by bobbin-type LiSOCl₂ cells. (Credit: Cardiff University)

DRILLING UNRAVELS HISTORICAL MYSTERY SURROUNDING GREEK VOLCANIC ISLAND



▲ Rig floor personnel remove the elevator from the section laid in the pipe stabber to slide it into storage. (Credit: Erick Bravo, IODP)

An international team of scientists co-led by Dr. Steffen Kutterolf from GEOMAR has found evidence of a historical submarine eruption of the Kameni volcano on Santorini, one of the best-studied volcanic archipelagos in the world.

The archipelago was formed after the devastating Late Bronze Age Minoan eruption some 3,600 years ago, when the previous volcano erupted vast amounts of ash and pumice and eventually collapsed, creating the iconic caldera walls of Santorini.

Like all volcanic systems, Santorini passes through caldera cycles, typically over tens of thousands of years, and it was thought that Santorini was currently in a phase of magma accumulation—in

other words, a long way from another caldera collapse or any major explosive eruptions.

However, an eruption in the early summer of the year 726 has been detected in drill cores from inside and outside the caldera.

The international IODP Expedition 398 "Hellenic Arc Volcanic Field" set out aboard the drilling vessel *JOIDES Resolution* to uncover remnants of this historical eruption. High-resolution seismic reflection data collected previously hinted at thick sediment layers of unclear origin. Through drilling to depths of up to 300 meters, the team managed to gather compelling evidence of the massive 726 CE underwater eruption: The investigations revealed a layer of grey pumice and ash, up to 40 meters thick, unequivocally linked to a single eruption.

"This eruption must have taken place largely underwater within the flooded caldera, as almost no deposits from the eruption were found on land," said Dr. Jens Karstens, Marine Geophysicist at the GEOMAR Helmholtz Centre for Ocean Research Kiel and second author of the study. "This is in line with the historical eyewitness reports."

It is now believed that the 726 CE eruption was 30 times smaller than the famous Minoan eruption. While there are no indications that a similar eruption is expected any time soon, the new insights into Santorini's volcanic behavior have significant implications for hazard assessment, as the research suggests that even during the early phases of the caldera cycle, larger explosive eruptions can occur. Additionally, the results highlight the need for greater attention to submarine eruptions.

Recognizing the potential for dangerous explosive eruptions in the early stages of caldera formation can be crucial in developing more comprehensive risk mitigation strategies.



▲ The *JOIDES Resolution*. (Credit: Thomas Ronge, IODP)

FRAMO INTRODUCES NEW INLINE TURBINE TO RECOVER ELECTRICAL POWER FROM FLUID FLOWS

Framo, a leading innovator in pump technology, proudly introduces its latest breakthrough—an inline turbine designed to recover electrical power from diverse fluid flows. Successfully tested at the company's state-of-the-art center on Flatøy, just outside Bergen, this cutting-edge technology offers substantial cost savings, energy efficiency, and a sustainable alternative to pressure reduction valves. The product is poised for imminent market launch.

Building on the success of the submerged turbine introduced in 2021, specifically designed for harnessing untapped energy from wastewater on offshore installations, Framo is now expanding its portfolio with a versatile inline turbine.

Njål Vangdal, Head of the Development Department at Framo Flatøy, said: "After receiving positive feedback and initial orders for our submerged turbine, we've

advanced our technology with the inline turbine. This innovation has the capability to generate electrical power across a spectrum of industries and processes where fluid flows through pipes."

The inline turbine presents an ideal solution for offshore installations, offering energy recovery in processes involving continuous fluid flows. However, its applications extend beyond the oil and water sectors. The technology can seamlessly integrate into diverse processes with varying fluids, replacing traditional pressure reduction valves while concurrently generating electrical power.

Vangdal explains the significant impact of this technology: "Fluid flows are inherent in all industries, and pressure reduction valves are commonplace. These valves are not only costly but also consume substantial energy. Our inline turbines offer substan-

tial cost savings and contribute to environmental sustainability by harnessing this untapped energy. Essentially, our turbines can replace all pressure reduction valves."



▲ Njål Vangdal, Department Manager Development standing next to the Framo Inline Turbine. (Credit: Framo)

GONDAN BEGINS BUILD OF INSPECTION USV

GONDAN Shipbuilders has started construction of an advanced remotely operable vessel, in collaboration with USV A/S—an alliance of DeepOcean, Solstad and Østensjø Rederi.

This project focuses on improving subsea operations, targeting a reduction of CO₂ emissions by more than 90% compared to conventional methods.

Designed by Salt Ship Design, the vessel will feature a hybrid diesel-electric propulsion system, allowing remote operation and autonomy of up to 30 days at sea.

Equipped with the latest technology for underwater inspection, it will include remotely operated vehicles capable of reaching depths of up to 1,500 meters.

With the participation of shipowner representatives at the start of the steel-cutting of this newbuilding, GONDAN Shipbuilders underlines its commitment to innovation and sustainability in the shipbuilding industry.

The vessel is scheduled to be operational in 2025, setting new standards in efficiency and environmental protection for maritime operations.

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The advertisement features a red header with the text 'Ocean Power & Monitoring' and 'Transform into the cost-efficient and sustainable future'. Below this, there are three main sections: 'GGG Monitoring' (modular, easy-to-use monitoring for pCO₂ and microplastics), 'Subsea Li-Ion Batteries' (highly reliable, efficient, and safe power solutions for DC + AC), and 'Energy Storage & UPS Systems'. Each section includes images of the respective equipment and a red circle highlighting specific features like 'SOCAT ready' for GGG Monitoring and 'API17F Offshore Certified' for batteries. At the bottom, the SubCtech logo is displayed along with their website and email address, and several certification logos including ISO 9001, UN ECE Resolution 1383, and a United Nations Decade of Ocean Science for Sustainable Development logo.

SAILDRONE LAUNCHES ALUMINUM USV DESIGNED FOR UNDERSEA INTEL MISSIONS

Saildrone has launched the first aluminum Surveyor unmanned surface vehicle (USV) off the Austal USA production line in Mobile, Alabama. Chief of Naval Operations (CNO) Admiral Lisa Franchetti was on site Monday, March 4, 2024, to inspect the vehicle, ahead of these new USVs being tested under contract to the US Navy.

Primarily designed for ocean mapping and maritime domain awareness, the Saildrone Surveyor USV is powered by wind, solar,

and a diesel generator for long-range, long-endurance missions in the open ocean.

The Surveyor carries the latest multibeam sonar equipment for seafloor mapping to depths of 11,000 meters and purpose-built defense and security payloads for accurate, dynamic, and confident decisions and responses to the full spectrum of maritime threats and challenges. Upcoming Navy missions will focus on the ability of the Surveyor to deliver both surface and under-

sea intelligence for a range of high-priority applications, including anti-submarine warfare (ASW).

To meet the increasing demand for Surveyor USVs, Saildrone partnered with Austal USA to leverage their advanced manufacturing production techniques and rapid assembly capabilities. Austal is currently producing one Surveyor every six weeks, with the ability to scale up production as demand requires.

"It is tremendous to see the first vehicle launched of many that will be produced here in Alabama," said Saildrone Founder and CEO Richard Jenkins. "We are honored to have Admiral Franchetti here in person to witness the start of the creation of a new fleet of USVs alongside traditional manned ships. Everyone at Saildrone is very proud to be supporting the US Navy and contributing to our defense and national security."

At 20 meters long (65 feet) and weighing 15 tons, the Surveyor classifies as a medium USV, built to American Bureau of Shipping (ABS) Light Warship code. These first Surveyors are contracted to the US Navy for the initial testing and evaluation of Surveyor-class vehicles in multiple environments.



▲ Saildrone Surveyor SD-3000 USV during initial testing. (Credit: Saildrone)

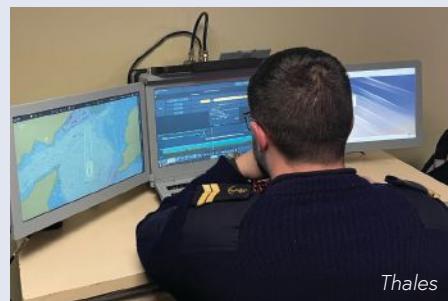
THALES PROVIDES E-POC TO FRENCH NAVY FOR DRONE-BASED MCM MISSIONS

The French defense procurement agency (DGA) has placed an order with Thales, via the Organization for Joint Armament Cooperation (OCCAr), for the provision of an Expeditionary Portable Operations Centre (e-POC) to meet the French Navy's new requirement for a drone-based mine countermeasures capability.

The system was developed in less than six months and has been accepted by the DGA and OCCAr after completing sea trials and delivered to the French Navy. The e-POC demonstrator enables naval forces to conduct mine countermeasures missions quickly and efficiently using only unmanned underwater vehicles (UUVs).

Thales's e-POC demonstrator is an easily transportable solution that will ultimately enable the French Navy to deploy underwater drones for mine countermeasure missions in any theater of operations. It will provide a flexible mission management capability from outside the zone of operations, helping to keep naval personnel out of harm's way.

The e-POC demonstrator runs software developed for the M-Cube (Mine Counter-measure Mission Management system) and MiMap (a mission analysis tool) systems on a single computer equipped with three control screens to plan, execute, and analyze missions requiring the simultaneous deployment of up to three UUVs.



Thales

The system can be set up on board a ship or at a shore station and is small enough to fit into just six transport cases for deployment into the theatre of operations. The transport cases are stowed inside the UUV container to streamline logistics and boost mission effectiveness.

SAAB AND DAMEN SIGN AGREEMENT TO EXPORT DUTCH SUBMARINES

Saab and Damen Shipyards have agreed to export the advanced Expeditionary C-71 submarines. The submarine has been developed for the Royal Netherlands Navy to replace the current Walrus class. The agreement doubles the long-term prospect of employment and income for the Netherlands Naval Cluster with the replacement of the Walrus submarines by Saab-Damen.

Saab and Damen have been working together since 2015 to build, modernize, and maintain the new expeditionary submarine for the Royal Netherlands Navy. This project is so much more than delivering four submarines. Dutch strategic autonomy is, given current geopolitical developments, vital in strategic projects like the submarine replacement, with the Dutch Naval base being the single remaining self-sufficient defense industry cluster in the Netherlands DTIB.

The two companies have now also agreed to offer their advanced Expeditionary submarines to Canada. A country in the initial phase of a similar process to replace their diesel-electric submarines.

The expeditionary submarine is based on the successful, proven, and future-proof design of the A26 submarines. It incorporates the latest capabilities and technologies, while the modular design

allows room for customisability as well as new technologies as they develop, ensuring relevance for decades to come.

Through Saab's business area Kockums, Sweden has a long tradition of producing world-class submarines. For this new expeditionary design, Saab is working closely with Damen Shipyards and a range of Dutch suppliers and is supported by the United Kingdom.



↑ Micael Johansson, CEO Saab AB and Arnout Damen, CEO Damen Shipyards Group. (Credit: Damen)

US NAVY ACHIEVES TESTING MILESTONES FOR LUSV PROGRAM

The US Navy's Large Unmanned Surface Vessel (LUSV) program has reached several pivotal milestones this year with several industry teams successfully completing extended reliability demonstrations of four different engine configurations, officials announced.

The four 720-hour tests demonstrated the capability and durability of different engine plants to operate for extended periods without human intervention—a critical enabler for advancing unmanned maritime operations and the Navy's manned-unmanned Hybrid Fleet concept.

Mandated by a congressional requirement in the 2021 National Defense Authorization Act, the engine testing milestones must be completed before the LUSV can proceed into a formal development phase. An engine system only qualifies for use in the program after successful demonstration events.

Demonstrations of each engine configuration took place over a continuous 720-hour testing period, during which no human intervention or preventative/corrective maintenance on the equipment was permitted. An engine system could not exhibit any failures or issues that would require maintenance of any kind during opera-

tions on an unmanned ship for 30 days to be successful.

Four teams have successfully completed their separate 720-hour testing milestones. The successful teams include:

- Bollinger and Carter Machinery on behalf of Caterpillar in Chesapeake, Virginia was the first team to achieve this milestone in December of 2023. They demonstrated sufficient mechanical reliability of the 1550 kw Caterpillar 3512C model engine.
- Fincantieri Marinette Marine (FMM) and Carter Machinery on behalf of Caterpillar in Chesapeake, VA demonstrated mechanical durability of the Caterpillar 2300 kW rated 3516 main propulsion diesel, lube oil and fuel system.
- Gibbs & Cox and Southwest Research Institute in San Antonio, Texas on behalf of Cummins also validated the reliability of the QSK95 diesel engine paired with an ABB AMG 0560M04 LAE generator.
- HII, in partnership with the US Coast Guard, conducted a successful 720-hour demonstration on behalf of MTU of the MTU 20V 4000 M93L, a Main Propulsion Diesel Engine configuration.

NAVAL GROUP ANNOUNCES SUCCESSFUL LAUNCH OF THIRD BRAZILIAN SCORPÈNE SUBMARINE

On March 27, 2024, the third of the four Scorpène® submarines of the ProSub program was launched at the Itaguaí Naval base. The *Tonelero* has been built entirely in Brazil by Itaguaí Construções Navais (ICN) thanks to years of successful technology transfer and partnership with Naval Group. *Tonelero* will soon start sea trials and be delivered in 2025.

The launching of the *Tonelero* demonstrates the success of the ProSub program, which is a key extension of the French-Brazilian strategic defense cooperation agreement signed in 2008. This program not only provides the Brazilian Navy with new capabilities and contributes to its ambitious Amazonia Azul strategy, but it also enables Brazil to rely more and more on a sovereign national industrial base.

"The launching of the *Tonelero* is a major milestone for the Brazilian Navy, ICN, Naval Group and all our partners. This achievement is a result of our common work to make the ProSub program and its associated technology transfer a success. We are honored by the high level of confidence the Brazilian Navy has placed in our expertise, and we remain fully committed to supporting the needs of the Brazilian Navy and contributing to the development a strong Brazilian naval industry," said Pierre Éric Pommellet, Chairman and CEO of Naval Group.



Naval Group

Scorpène is a modern, high-performance, stealthy submarine designed for Anti-Surface and Anti-Submarine Warfare, special operations, and intelligence gathering.

Each Scorpène is equipped with the latest generation of combat system, SUBTICS®, which addresses the growing challenges of modern submarines missions in blue and shallow waters in the entire domain of submarine warfare. Highly modular and scalable, SUBTICS can be integrated either on new platforms or as part of modernization programs for existing submarines

All of the Brazilian Scorpène submarines will be equipped with Naval Group's new-generation F21 heavy-weight torpedo.

DAVIE TO DESIGN ICEBREAKERS TO REPLENISH CANADIAN ARCTIC FLEET

Chantier Davie Canada Inc. (Davie) has been awarded its first National Shipbuilding Strategy (NSS) contract by the Government of Canada for the design of the six-ship fleet of Canada's future Program Icebreakers.

This major milestone marks the beginning of Davie's NSS work package to replenish Canada's Arctic fleet and each initiative under the contract will help advance upcoming design, construction, delivery, and support phases for these strategic ships.

The Honorable Jean-Yves Duclos, Canada's Minister of Public Services and Procurement (PSPC), said: "This first contract awarded to Chantier Davie under the National Shipbuilding Strategy brings us a step closer to providing the Canadian Coast Guard with the next generation Arctic ships. They will be among the most advanced, sustainable and durable vessels tailored to the world's harshest environments. The new fleet will

be symbolic of Canada's Arctic presence and crucial to keeping our country open for business year-round."

Davie President and CEO, James Davies, added: "This is a momentous first step in our journey to deliver a fleet of the largest

and most advanced icebreakers ever built in and for Canada. My heartfelt thanks go to the dedicated teams at Davie, the Canadian Coast Guard and PSPC. They have spent countless hours preparing for this historic milestone. Now, we can't wait to get working on renewing Canada's Arctic fleet."



Davie Canada Inc.

BREAKING THE ICE

HiAOOS pioneers ROV docking for Arctic exploration

In the realm of ocean exploration, the Arctic stands as one of the last frontiers, its icy expanse hiding valuable information to understand global climate patterns, environmental shifts, and geological hazards. However, accessing data in this remote and harsh region has proven challenging, limiting our grasp on critical ocean processes unfolding beneath the sea ice.

Recognizing this gap, the High Arctic Ocean Observing System (HiAOOS) has embarked on a pioneering mission to revolutionize Arctic Ocean observation. With a focus on developing, implementing, and validating cutting-edge ocean observing technologies, HiAOOS seeks to fill the void of in-situ observations in the Arctic Ocean, particularly in regions obscured by ice cover.

Central to HiAOOS's vision is the establishment of a network of multipurpose moorings anchored at the Arctic seafloor. Equipped with a myriad of sensors, including acoustic and biochemical, these moorings offer unprecedented insights into ocean dynamics, marine biodiversity, and geophysical phenomena.

INDUSTRY COLLABORATION

Moreover, HiAOOS's collaboration with industry leaders in subsea and maritime technologies ensures cost and HSE (Health Safety and Environment) friendly solutions. To reduce cost and carbon footprint, the offshore energy industry has invested consid-

erably in developing resilient autonomous underwater vehicles (AUVs) to service seabed-installed assets. Part of this development has been the introduction of seabed garages, which allow wireless charging and data communication for AUVs. In HiAOOS, we have mounted this new technology onto a small inspection-type ROV developed by Stinger.

This paves the way for the servicing of oceanographic instrumentation while submerged, thereby significantly enhancing the interval between the complex and costly operations related to recovery and redeployment of the instrumen-

tation. At the same time, this technology allows data-hungry scientists to more often get the chance to harvest information from the deployed instrumentation.

The sensor system to be serviced by the ROV comprises acoustic and oceanographic sensor arrays wired to an electronic compartment submerged at depths safe from drifting ice and which provides power management and data storage for the instrumentation.

SYSTEM MILESTONES

The sensor system will capture sound from sea mammals,

geohazards, and variations in water temperature over large areas. This system, developed and produced by Naxys, is based on technology widely used in the oil and gas industry for leak detection and condition monitoring of fixed seabed structures and is qualified for 30 years of continuous deployment.

A recent milestone in HiAOOS's journey was the successful interface test between a Stinger ROV and the Naxys sensor system moored at a depth of 50 meters.

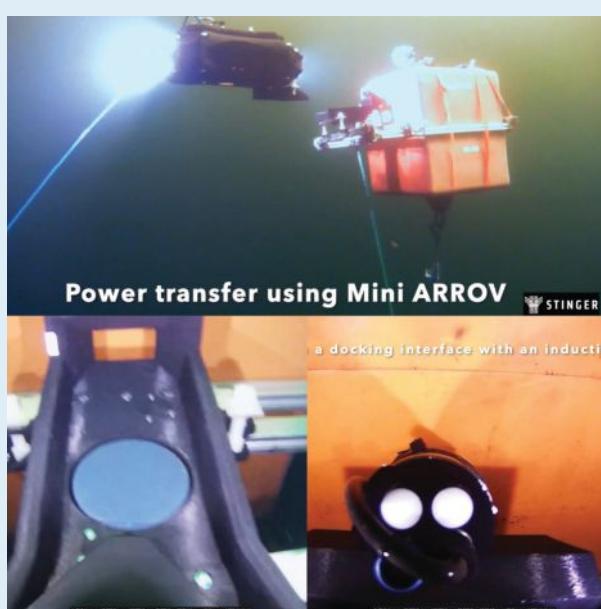
The testing was conducted at Naxys' test center in Bergen, Norway, and showcased the viability of wireless charging of moored instruments and data transfer from it—an essential feature for prolonged, expensive, and difficult operations in remote Arctic waters. With each breakthrough, HiAOOS inches closer to its goal of establishing a comprehensive ocean observing network in the high Arctic.

The HiAOOS adaption of state-of-the-art subsea technology will unlock efforts to collect data, shedding light on previously inaccessible regions of the Arctic Ocean regions.

hiaos.eu



The Stinger ROV.
(Credit: Stinger Technology)



The mini ROV is approaching the buoy with an inductive coupling and a female receptacle. Beneath the ROV, the male stab, including an inductive coupling, is mounted. Below left: ROV is docking. The round inductive coupler in the center of the image is wired to the buoy instrumentation. Below right: shows that the two couples have contact and that charging and data communication is up and running. (Credit: Stinger Technology)

AUSTRALIA SELECTS BAE SYSTEMS AND ASC TO BUILD NUCLEAR-POWERED SUBMARINES

The Australian Government has selected BAE Systems and ASC Pty Ltd to build Australia's new fleet of nuclear-powered submarines in the latest significant development in the AUKUS trilateral security pact between the United States, the United Kingdom and Australia.

Australian Deputy Prime Minister, Richard Marles, and UK Defense Secretary, Grant Shapps, announced the news in Australia, marking the next step in the pathway for Australia to build and operate its own nuclear-powered submarines.

Under the AUKUS agreement, Australia and the UK will operate a common submarine of the future, incorporating technology from all three nations, based on the UK's next generation design which BAE Systems is leading.

BAE Systems and ASC Pty Ltd will now bring together their complementary skills, expertise, and capabilities under a collaborative arrangement in Australia, ultimately leading to the establishment of a long-term, incorporated Joint Venture.

Charles Woodburn, BAE Systems Chief Executive, said: "Drawing on decades of experience in the UK and Australia, we look forward to working with ASC to develop an enduring, sovereign nuclear-powered submarine building capability for Australia. We're already making good progress on the design and development of the next generation submarine in the UK where we have more

than 1,000 people working on the SSN-AUKUS program and major infrastructure investment underway.

"This latest step will ensure an integral connection between the UK design and the build strategy development in Australia as we work together to deliver next generation military capability as well as considerable social and economic value to all three nations."

SSN-AUKUS will be the largest, most powerful and advanced attack submarines the Royal Navy has ever operated and will start to replace the Astute class, which BAE Systems is building at its site in Barrow-in-Furness in the Northwest of England, from the late 2030s. Australia expects to deliver its first SSN-AUKUS submarine in the early 2040s.



BAE Systems

LOCKHEED MARTIN EXTENDS AGREEMENT WITH NATIONAL DEFENSE COMPANY NAVANTIA



The F110 multi-purpose frigate.
(Credit: Navantia)

Lockheed Martin has extended its collaboration agreement with Navantia, Spain's national defense and shipbuilding company and naval Combat System Integration agent.

This agreement signed by Lockheed Martin executives Chauncey McIntosh and Joe DePietro, and by Navantia executives Donato Martínez and José Manuel Mondéjar, will extend the current agreement three years and allow the companies to continue to explore commercial opportunities in surface ships and submarines together to further expand this 27-year story of success.

The collaboration between the two companies equipped the Spanish Navy with the proven and powerful Aegis Combat System in the F-100 frigates.

Lockheed Martin's partnership with Navantia has led to the successful integration

between the Aegis Combat System and frigates for the Spanish Navy, as well as for the Norwegian and Australian navies for over two decades. The two companies also collaborate in the integration of the combat management system and the sonar systems for the S-80 submarines for the Spanish Navy.

"Lockheed Martin values its decades long role as a strategic partner for Spain's national defense and defense industry. Our collaboration on projects such as the F-100 frigate and the F-110 multi-mission frigate is a testament to our commitment to provide Spain the right capabilities for its missions. The extension of our long-standing relationship with Navantia will help sustain high-value jobs in Spain with the goal of further collaboration between our two companies," said Chauncey McIntosh, Integrated Warfare Systems and Sensors Vice President at Lockheed Martin.

GE VENOVA TO SUPPLY ELECTRIC PROPULSION FOR SINGAPORE NAVY'S MRCVs

GE Vernova's Power Conversion business has been awarded a contract by Singapore shipbuilder ST Engineering Marine Limited to supply its Ship's Electric Grid with Integrated Full Electric Propulsion (IFEP) equipment for the Republic of Singapore Navy's six-ship Multi-Role Combat Vessel (MRCV) program.

The six MRCVs will be the first IFEP-powered vessels for the Republic of Singapore Navy (RSN) and will replace its fleet of mechanical drive Victory-class missile corvettes, which have been in service since 1989. Delivery of the electric propulsion systems for the new ships is planned over the next 10 years.

GE Vernova's Ship's Electric Grid delivers the electrical power required by the ship's propulsion, and energizes its operational and mission systems, such as radar and communications. With the ability to share electric power to any load on the ship's power network, the system is more ener-

gy-efficient and cost-effective to operate than a conventional mechanical drive configuration.

GE Vernova's Ship's Electric Grid includes all generators, medium-voltage switchboards, transformers, propulsion variable frequency drives (VFDs), electric propulsion motors, thruster motors, soft starters, a shore power connection, power management system (PMS), and the propulsion control system (PCS).

The modular platform design of the RSN's new MRCVs allows for different naval missions requiring electric power. This includes the ability to host unmanned air and surface vehicles, which will expand the area of each vessel's surveillance capability.

With deep expertise in marine and naval performance requirements, GE Vernova's Power Conversion UK center of excellence (COE) will be responsible for the design, systems engineering, manufacturing and

testing of the equipment. The execution of the project will be supported by the Power Conversion Asia team based in Singapore, who will oversee project engineering, project management, commissioning and sea trials.

GE Vernova's Power Conversion business powers the majority of the UK Royal Navy's large vessel fleet, including Queen Elizabeth Class, Type 45 and Type 26 vessels, as well as many other global naval programs.



▲ Multi-Role Combat Vessel. (Credit: Republic of Singapore Navy)

Logistics Anchored by Logic



Transportation Services
Customs Brokerage
Import/Export Compliance
Supply Chain Management
Warehousing & Distribution
Travel Agency Services



Tie down your next
logistics project

PRESIDENT'S BUDGET FOR FISCAL YEAR 2025 ALLOCATES FUNDING TO BOEM

The Biden-Harris administration has unveiled the President's Budget for Fiscal Year (FY) 2025, outlining crucial funding allocations to advance the Bureau of Ocean Energy Management's (BOEM) mission and drive action on key climate priorities.

The FY 2025 President's Budget has allocated \$242 million to BOEM, supporting the Bureau's commitment to overseeing the nation's offshore energy, mineral, and geological resources through proper environmental and economic stewardship. These strategic investments supporting the American people aim to establish a foundation for sustained growth and prosperity for future generations.

"The 2025 Budget empowers BOEM to fulfill our mission and advance the administration's ambitious climate agenda while creating high-quality job opportunities, advancing economic prosperity, and reinforcing energy security," said BOEM Director Elizabeth Klein. "It ensures our capacity to oversee offshore energy development responsibly, while prioritizing the well-being of the American people."

The FY 2025 Budget includes \$52 million for BOEM's Renewable Energy Program, which supports the Biden-Harris administration's goals of deploying 30 gigawatts (GW) of offshore wind energy

capacity by 2030 and 15 GW of floating offshore wind capacity by 2035.

The FY 2025 Budget includes \$67.5 million for BOEM's Conventional Energy Program. With the Secretary's approval of the 2024-2029 National Outer Continental Shelf Oil and Gas Leasing Program (National OCS Program) in FY 2024, BOEM is positioned to continue to support US energy security and meet its statutory obligations under the OCS Lands Act.

The FY 2025 Budget includes \$14.8 million for BOEM's Marine Minerals Program. BOEM's marine minerals activities help ensure the responsible management of the Nation's OCS mineral resources to enhance natural disaster preparedness, protect shorelines, and assess the availability of critical minerals.

The FY 2025 Budget proposal includes \$86.7 million for BOEM's Environmental Programs. BOEM's Environmental Programs provide a foundation of support to the Bureau by ensuring that programmatic decision-making is guided by the best available environmental research and data to inform the public, stakeholders, diverse ocean users, and external decision-makers about the potential impacts of OCS energy and mineral activities.

REACH SUBSEA EXTENDS VESSEL CHARTER AND ORDERS TWO NEW ROV UNITS

Reach Subsea recently announced a 100-day project charter for the subsea vessel *Olympic Taurus*, with extension options for 2+1+1 years. Reach Subsea has now extended the charter for an additional 2 years and retain options for another 1+1 years.

"With a solid backlog and substantial tender pipeline for the coming periods, we are enhancing our capacity to capitalize on the rapidly advancing global subsea market. Reach Subsea is ideally positioned with a comprehensive service portfolio spanning ocean services and data delivery, catering to both the growing renewables sector and the established oil & gas market," said Jostein Alendal, CEO of Reach Subsea.

Furthermore, Reach Subsea has ordered two new Constructor-type remotely operated vehicles (ROVs) from Kystdesign AS with delivery in May 2024 and will be financed through their equipment leasing frame agreement. The Constructor is a heavy-duty ROV designed for carrying and operating large tools and modules and has a depth rating of 3,000 m. Following delivery, the ROVs will be mobilized onto the Reach Subsea fleet and will expand their subsea service capacity into the 2024 season.

"The addition of the two new Constructor ROVs not only enhances our fleet's flexibility but also bolsters our capability to efficiently execute a diverse range of underwater tasks. These cutting-edge

ROVs seamlessly integrate into our existing portfolio of assets, further solidifying our position to effectively address the demands of our clients. Their advanced technology and robust design align perfectly with our commitment to deliver high-quality services and meeting the evolving needs of our clients across various industries," added Alendal.



▲ *Olympic Taurus* (Credit: Reach Subsea)

SEA-KIT X-CLASS USV AWARDED UMS CERTIFICATION BY LLOYD'S REGISTER

In 2021, leading uncrewed surface vessel (USV) designer and builder, SEA-KIT International, was awarded the first ever Unmanned Marine Systems (UMS) certificate by Lloyd's Register (LR), representing a key milestone for the maritime industry.

Since then, SEA-KIT has continued to work closely with LR to achieve the highest standards for the USV sector. The company's latest 12-meter SEA-KIT X-Class USV, Fugro Blue Essence®, was recently also awarded LR UMS certification, marking the company's 5th certificate and the first LR UMS certificate for a Category 0 certified vessel.

Mathew Palmer, LR Global Naval Business Lead, Submarines and Uncrewed Systems, commented: "Lloyd's Register is delighted to award UMS certification to this SEA-KIT X-Class Fugro Blue Essence®. The USV's state-of-the-art design and capabilities demonstrate the future of marine technology, and this certification underscores the vessel's readiness for remote operation in challenging maritime environments."

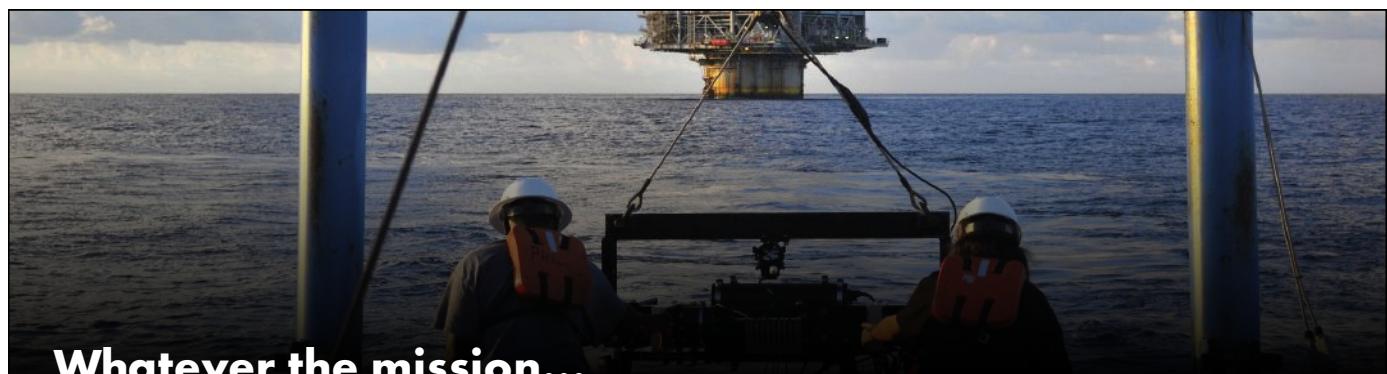
Category 0 approval, the highest level of approval for workboats, was awarded to the vessel by the UK Maritime and Coastguard Agency in January 2024. It is now the largest Cat 0 certified USV to operate fully remotely and with unrestricted service to support



SEA-KIT International

marine projects further offshore while enhancing safety and environmental performance.

Doug Graham, SEA-KIT MD, said: "We continue to push boundaries with the design and construction of our USVs. Certification is essential for the industry to provide a safety assurance framework and it is testament to the team's hard work that SEA-KIT now holds the most UMS certificates awarded to any company. We will strive to maintain this leadership stance and our long-standing relationship with Lloyd's Register, so that we can continue to support the sector in achieving ambitious net zero targets."



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okeanus.com



AMERICAS

CLEANPOWER 2024

Minneapolis, MN | May 6–9
<https://cleanpower.org/expo>

Offshore Technology Conference

Houston, TX | May 6–9
<https://2024.otcnet.org>

Submarine Technology Symposium

Laurel, MD | May 14–16
www.navalsubleague.org/events/submarine-technology-symposium

Canadian Hydrographic Conference

St. John's, Canada | May 27–30
<https://chc2024.org/en>

H2O Conference

Halifax, Canada | June 3–5
www.h2oconference.ca

Offshore Wind USA

Boston, MA | June 17–18
<https://events.reutersevents.com/renewable-energy/offshore-wind-usa>

Dredging Summit & Expo

Tampa, FL | June 24–27
<https://dredging-expo.com>

OCEANS Halifax

Halifax, Canada | September 23–26
<https://halifax24.oceansconference.org>

Industrial Decarbonization

North America 2024

Pittsburgh, PA | October 1–2
<https://events.reutersevents.com/energy-transition/industry-usa>

ACP Offshore WINDPOWER

Atlantic City, NJ | October 28–30
<https://cleanpower.org/offshore-windpower>

International Workboat Show

New Orleans, LA | November 12–14
www.workboatshow.com

Underwater Intervention

New Orleans, LA | November 12–14
www.workboatshow.com/underwater-intervention

EUROPE

Offshore Wind Connections

Hull, UK | May 1–2
www.offshorewindconnections.com

GeoHab

Arendal, Norway | May 6–10
<https://geohab.org/geohab-2024>

Uncrewed Maritime Systems Technology

Wokingham, UK | May 8–9
www.smgconferences.com/defence/uk/conference/Unmanned-Maritime-Systems

All-Energy

Glasgow, Scotland | May 15–16
www.all-energy.co.uk

Underwater Technology Conference (UTC)

Bergen, Norway | June 11–13
www.utc.no

Seanergy

Nantes, France | June 26–28
www.seanergy-forum.com/en/seanergy2024

AMEMR 2024

Plymouth, UK | July 8–11
www.amemr.com

Offshore Wind Foundations & Substations

Bremen, Germany | August 28–31
www.ipqc.com/events-offshore-foundations-substations

WindEnergy Hamburg

Hamburg, Germany | September 24–27
www.windenergyhamburg.com

Sea Tech Week

Brest, France | October 15–17
www.seatechweek.eu

Euronaval

Villepinte, France | November 4–7
www.euronaval.fr

Ocean Energy Europe

Aviemore, Scotland | November 5–6
www.oceanenergy-europe.eu/annual-event/ocean-energy-europe-2024

Marine Autonomy and Technology Showcase (MATS)

Southampton, UK | November 5–7
[https://noc-events.co.uk/mats-2024](http://noc-events.co.uk/mats-2024)

Offshore Wind North East

Sunderland, UK | November 6–7
www.offshorewindne.com

Offshore Energy Exhibition & Conference

Amsterdam, NL | November 26–27
[https://oec.biz](http://oec.biz)

OTHER REGIONS

MSEAS

Yokohama, Japan | June 3–7
<https://meetings.pices.int/meetings/international/2024/MSEAS/Background>

Australia Wind Energy

Melbourne, Australia | July 9–11
www.windenergyaustralia.com

Underwater Minerals Conference

Rarotonga, Cook Island | September 15–21
www.underwaterminerals.org

International Conference on Ocean Energy (ICOE)

Melbourne, Australia | September 17–19
www.ocean-energy-systems.org/icoe/conferences/icoe-2024-melbourne/

WIND EXPO

Chiba, Japan | October 2–4
www.wsew.jp/hub/en-gb/about/wd.html

All-Energy Australia

Melbourne, Australia | October 23–24
www.all-energy.com.au

ADIPEC

Abu Dhabi, UAE | November 4–7
www.adippec.com

MAST Australia

Adelaide, Australia | November 19–21
<https://mastconfex.com/australia2024>

OSEA Energy Week

Singapore | November 19–21
www.osea-asia.com

2024 EDITORIAL CALENDAR

MONTH	DEADLINES	EDITORIAL FOCUS AND SHOW DISTRIBUTION	THEME FOCUS
JANUARY/ FEBRUARY	Editorial: January 17 Ad: February 2	OCEAN SENSORS & DATA MANAGEMENT • Oceanology International March 12–14 • Canadian Underwater Conference & Exhibition (CUCE) March 24–26	Ocean observation, multidisciplinary survey, telemetry, communications
MARCH	Editorial: February 12 Ad: March 1	NAVAL DEFENSE & SECURITY • Underwater Defence Technology April 9–11 • Sea-Air-Space April 8–10	Uncrewed systems, cyber security, marine surveillance systems
APRIL	Editorial: March 11 Ad: March 29	REMOTELY OPERATED VEHICLES (ROVs) IN FOCUS • International Partnering Forum April 22–25 • H2O Conference June 3–5 • Underwater Technology Conference (UTC) June 11–13	ROV development, subsea residency, deployment technologies
MAY	Editorial: April 8 Ad: April 26	OFFSHORE ENERGY DEVELOPMENT • Canadian Hydrographic Conference May 27–30 • Seanergy June 26–28	Infrastructure development for oil and gas, renewables, subsea power
JUNE	Editorial: May 13 Ad: May 31	UNDERWATER IMAGING	Advances in geophysical survey and subsea imaging capabilities
JULY (DIGITAL ISSUE)	Editorial: June 18 Ad: June 28	UNCREWED VEHICLE BUYERS' GUIDE	<i>Special Edition</i>
AUGUST	Editorial: July 15 Ad: August 2	SUBMERSIBLES & THE DEEP SEA	Subsea vehicles, naval archaeology, bathymetric studies, geotechnics
SEPTEMBER	Editorial: August 12 Ad: August 30	REMOTE MARINE OPERATIONS • ACP Offshore WINDPOWER October 28–30 • Offshore Energy Exhibition & Conference November 26–27	Marine autonomy, digital twins, remote monitoring and intervention
OCTOBER/ NOVEMBER	Editorial: September 9 Ad: September 27	UNCREWED VEHICLES & MARINE ROBOTICS • International Workboat Show November 12–14	USV R&D, emerging applications, breakthroughs in remote ops
DECEMBER	Editorial: October 17 Ad: October 28	THE FUTURE OF OCEAN TECHNOLOGY	<i>Special Edition</i>

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TELEDYNE MARINE EXPANDS PORTFOLIO WITH ACQUISITION OF VALEPORT

Teledyne Marine has agreed to acquire Valeport, a market leader in the design and manufacture of underwater sensors and profilers.



Valeport's Matt Quartley (left) with Ole Søe-Pedersen of Teledyne Marine.

The acquisition expands the products and solutions offered by Teledyne Marine, a leading-edge subsea technology company. It sees Teledyne provide customers with a wider range of underwater solutions.

Valeport is one of the UK's leading manufacturers of oceanographic and hydrographic instrumentation. The independent family-owned business, which was established in 1969, designs and manufactures instrumentation for the oceanographic and hydrographic communities with a worldwide customer base that includes: subsea, hydrographic, metrological and positioning, oceanographic, ports, harbors, dredging, energy and scientific research sectors.

Ole Søe-Pedersen, VP & GM Teledyne Marine Europe, said: "We are delighted that Valeport will join Teledyne Marine and

expand our technology offerings. Valeport is a respected and recognized brand of underwater sensors and profilers and will complement the Teledyne Marine portfolio of technologies and solutions."

After 18 years at the helm, Matt Quartley and his leadership team will work with Teledyne Marine over the coming months to ensure a smooth transition for staff and customers alike.

Matt Quartley, Managing Director of Valeport, said: "The prospect of working with the rest of the Teledyne group to bring our customers an even greater range of superb, high-quality products is something that we are incredibly excited about, and will undoubtedly be to the benefit of Valeport, Teledyne, and most importantly, all of our customers."

SLB TO ACQUIRE MAJORITY OWNERSHIP IN AKER CARBON CAPTURE

SLB recently announced an agreement to combine its carbon capture business with Aker Carbon Capture (ACC) to support accelerated industrial decarbonization at scale.

Bringing together complementary technology portfolios, leading process design expertise and an established project delivery platform, the combination will leverage ACC's commercial carbon capture product offering and SLB's new technology developments and industrialization capability. It will create a vehicle for accelerating the introduction of disruptive early-stage technology into the global market on a commercial, proven platform. Following the transaction, SLB will own 80% of the combined business and ACC will own 20%.

The International Energy Agency (IEA) sees carbon capture, utilization, and sequestration (CCUS) playing a critical role in the net-zero transition—estimating that over one gigaton of CO₂ per year will need to be captured by 2030, scaling up to over six gigatons by 2050.

"For CCUS to have the expected impact

on supporting global net-zero ambitions, it will need to scale up 100–200 times in less than three decades," said Olivier Le Peuch, CEO, SLB. "Crucial to this scale-up is the ability to lower capture costs, which often represent as much as 50–70% of the total spend of a CCUS project. We are excited to create this business with ACC to accelerate the deployment of carbon capture technologies that will shift the economics of carbon capture across high-emitting industrial sectors."

SLB will pay NOK 4.12 billion to purchase 80% of Aker Carbon Capture Holding AS (ACCH), which holds the business of ACC, and will contribute the SLB carbon capture business to the combined entity. SLB may also make additional payments of up to NOK 1.36 billion over the next three years based on the performance of the business.

The transaction is subject to regulatory approvals and is expected to close by the end of the second quarter, 2024.



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This year's conference theme, "Affordable Energy", holds significant importance as we've all maneuvered the Energy Trilemma, focusing on energy security, affordability, and environmental sustainability. Energy affordability aims to provide reasonably priced energy for everyone, urging the industry to offer efficient, cost-effective energy solutions through advancements in subsea technology. To us, affordable energy is about letting technology be a key driver to a more efficient energy production.

A selection of speakers at UTC 2024:



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OneSubsea



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OCEAN INFINITY AND SHELL SIGN AGREEMENT FOR SUBSEA DATA CAPTURE SERVICES

Ocean Infinity recently announced the signing of a Global Framework Agreement (GFA) with Shell, marking a significant milestone in the provision of lean-crewed and robotic seabed geomatics, spanning geo-physical and geotechnical services, within the offshore energy sector.

The GFA spans a 5-year period, encompassing all countries where Shell is currently active or plans to operate in the

future. Services governed by the GFA include the Armada fleet of uncrewed and lean-crewed vessels. Designed for today's tasks but with tomorrow's in mind, the fleet of exceptionally fuel-efficient vessels only utilize a skeleton crew onboard, with data processing and payload control conducted from onshore Operations Centers. In due course they will be capable of working with no personnel offshore whilst also consuming solely renewable fuel such as ammonia.

With a history dating back to Ocean Infinity's inception, the partnership with Shell has evolved into a robust collaboration based on a shared vision for transformative ways of working. The journey began with a groundbreaking project in Mauritania, simultaneously utilizing a fleet of uncrewed surface vehicles (USVs), marking the inception of surface robotics working in the oil and gas sector.

"This agreement enables new, lean-crewed vessels into high-value field work," said Katya Krylova, VP Business Development at Ocean Infinity. "Using our robotic fleet to service global offshore energy activities will power the maritime industry's transformation into safer, more efficient new ways of working. It also solidifies a long-standing and valued collaboration between Shell and Ocean Infinity. Working through framework agreements like this allows us to achieve shorter lead-times, reduce risks, improve strategic alignment together with flexibility and scalability, work faster and ultimately supply our partners with their data more quickly. It enables us to optimize resources, making for more efficient and sustainable operations, such as by positioning our fleet more effectively to reduce transit times to and from work sites."



Ocean Infinity

CALWAVE SELECTED FOR WAVE ENERGY PROJECT OFF VANCOUVER ISLAND

CalWave, a California-based wave energy technology developer, has been selected as the technology provider for a wave energy project at Yuquot, British Columbia (BC) with the Mowachaht/Muchalaht First Nation (MMFN).

Located on Nootka Island, just off the west coast of Vancouver Island, Yuquot is the traditional home of the MMFN. It was also the site of first contact between European explorers and Indigenous peoples on the west coast of North America, when Captain James Cook moored his ship in Nootka Sound in 1778. The community existed for thousands of years as a center of fish and fur trading until the late-20th century, when almost all residents were forced to relocate to Vancouver Island.

Now, the MMFN is working to reclaim their land, rebuild their community, and harness the energetic North Pacific waves to help power their new microgrid and establish energy independence.

The Indigenous-led project, funded so far by a grant from TD Bank Group and the Clean Energy in Rural and Remote Communities Program within Natural Resources Canada, includes a consortium of other partners based across Canada: The Pacific Research Institute for Marine Energy Discovery (PRIMED) at the University of Victoria; Barkley Project Group; Canpac Marine Services; and Environmental Dynamics Inc.

As a "first-of-a-kind" (FOAK) wave energy project for coastal community microgrids, the MMFN project may serve as a blueprint for coastal communities along the North American Pacific Coast and around the world. The project is currently in a feasibility and design phase to gather all the necessary information for the MMFN to make an informed decision on full project buildout.



Yuquot is located on Nootka Island, separated from the larger Vancouver Island by a narrow strait, where potential wave energy resources are abundant. (Credit: CalWave)



Seathe Difference

Photos: Aft deck and control room of CSA's R/V Dolphin

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SeaRobotics Corporation, headquartered in Stuart, Florida, specializes in the design and manufacture of intelligent marine robotics, including a line of Autonomous Surface Vehicles (ASVs) for commercial and defense markets around the world. Applications for SeaRobotics vehicles range from bathymetric and hydrographic coastal surveys to, harbor, and riverine inspection and surveillance. From ground-breaking ASV design through to custom manufacturing for theme parks, SeaRobotics designs, engineers and manufactures smart solutions for complex marine challenges. In addition to our ASV line, SeaRobotics also designs and builds hull and tank bio-inspired underwater grooming and cleaning systems.

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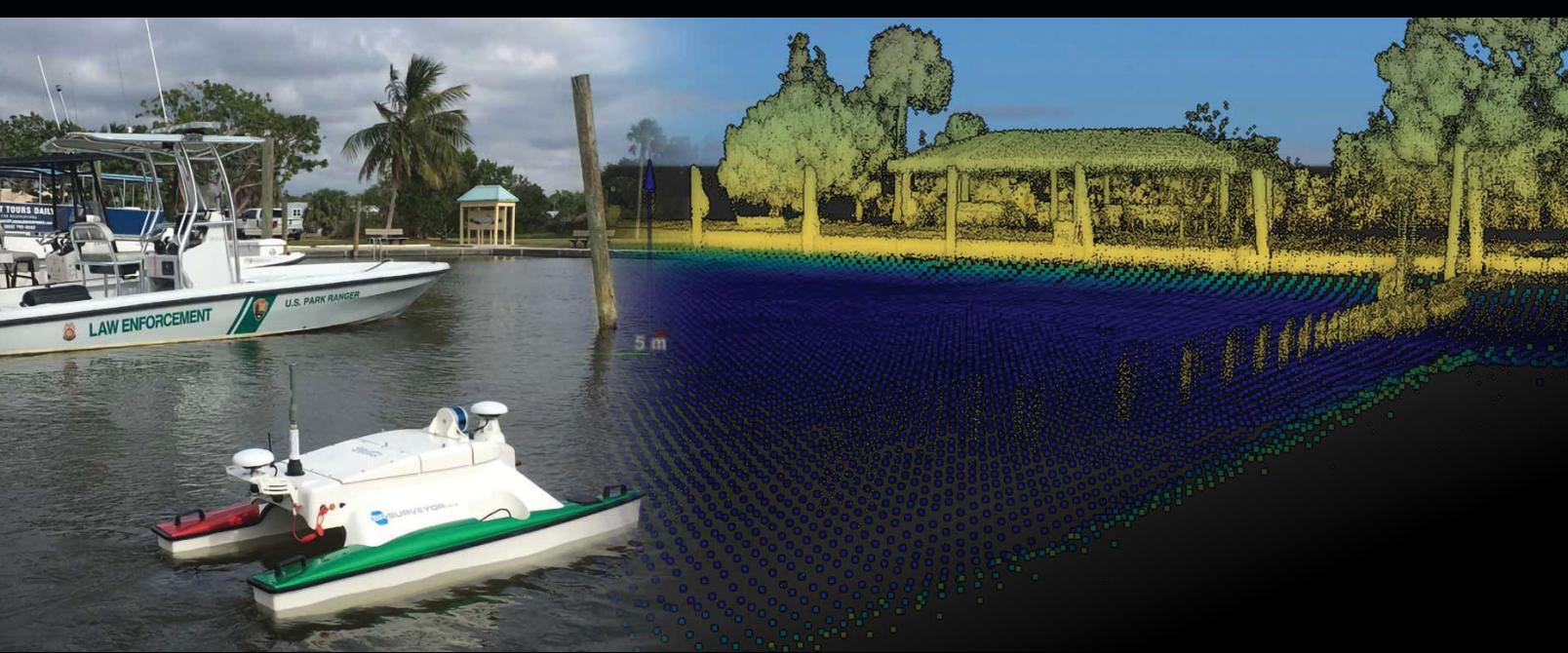
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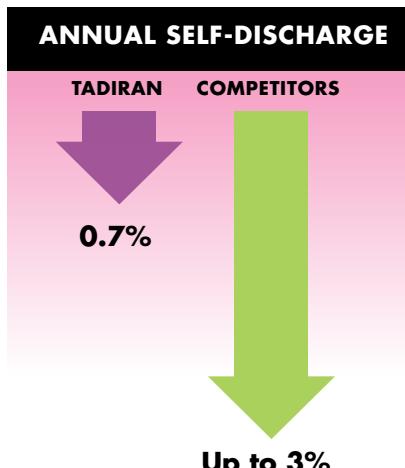
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