



May 2020

# ON&T

Ocean News & Technology

**ESSENTIAL INTELLIGENCE**

**Harvesting The Deep For The Green Transition**  
pg. 10

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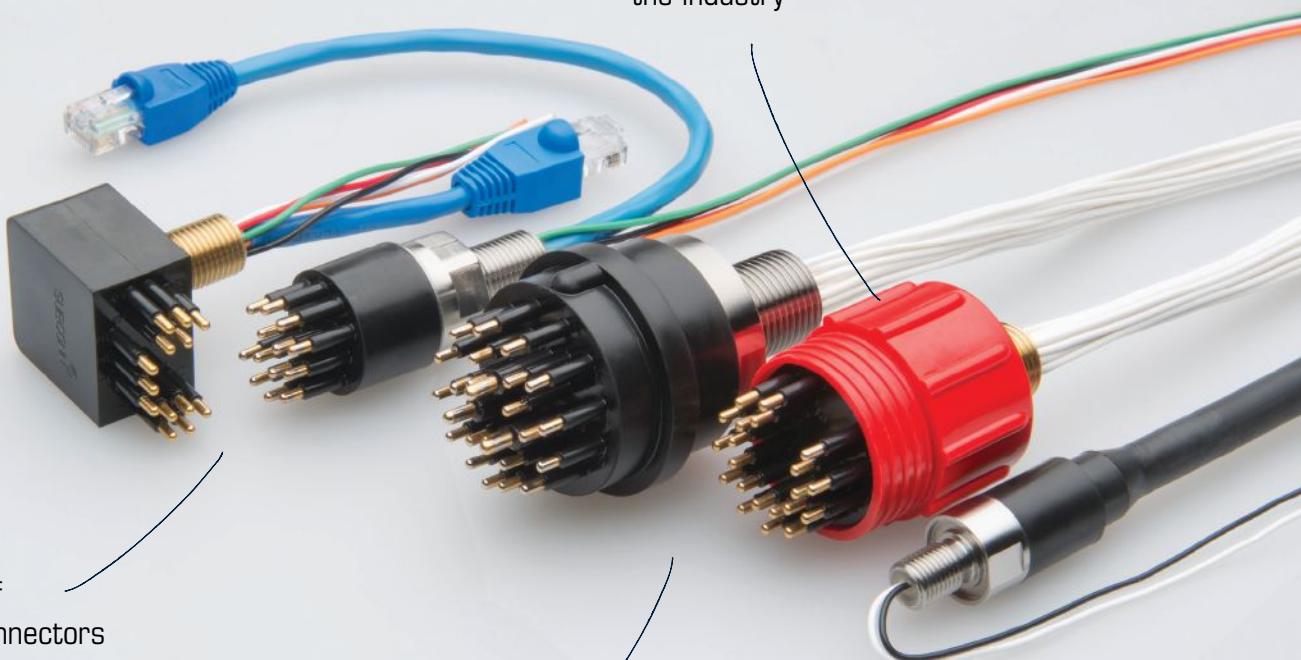
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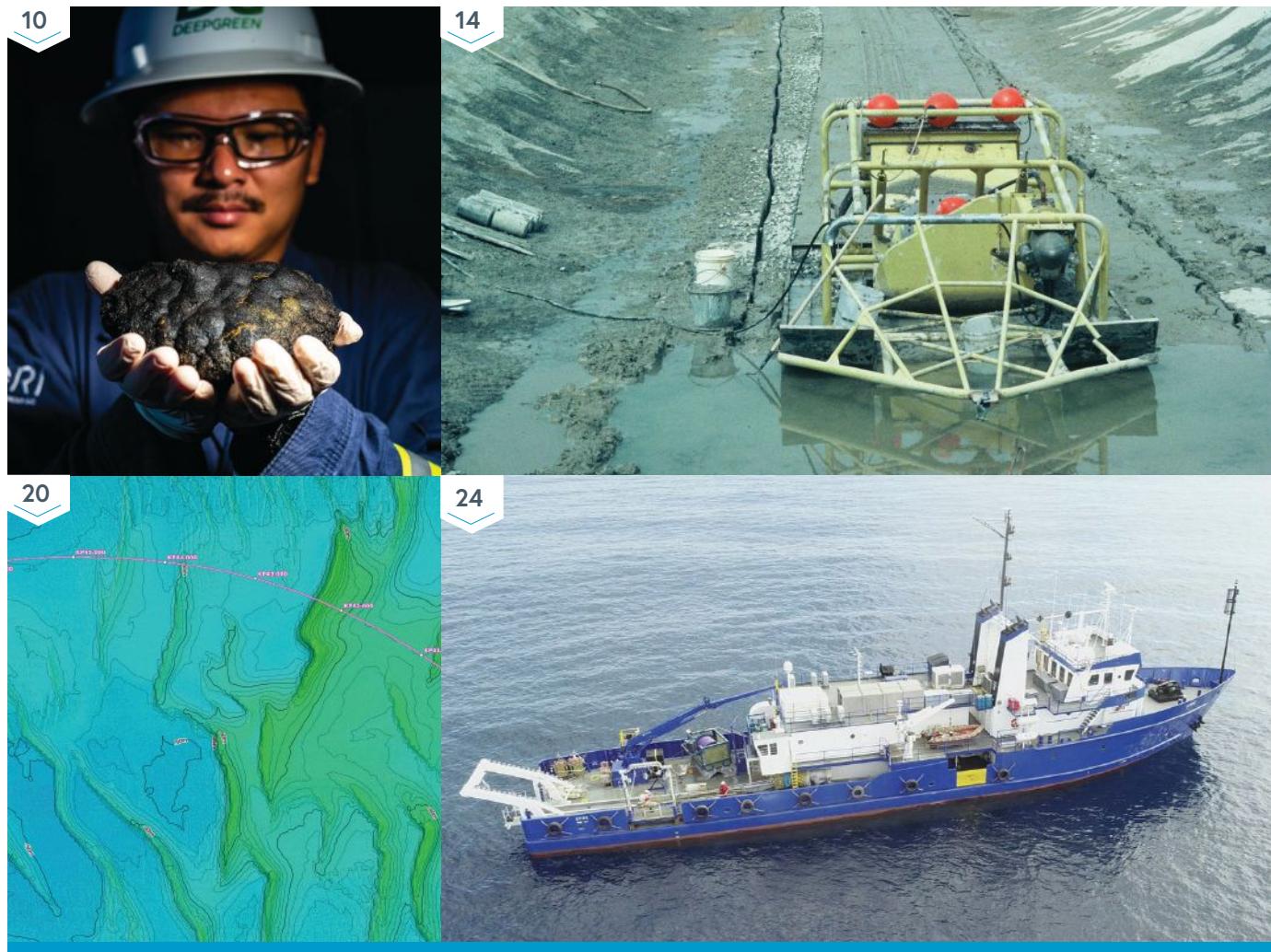
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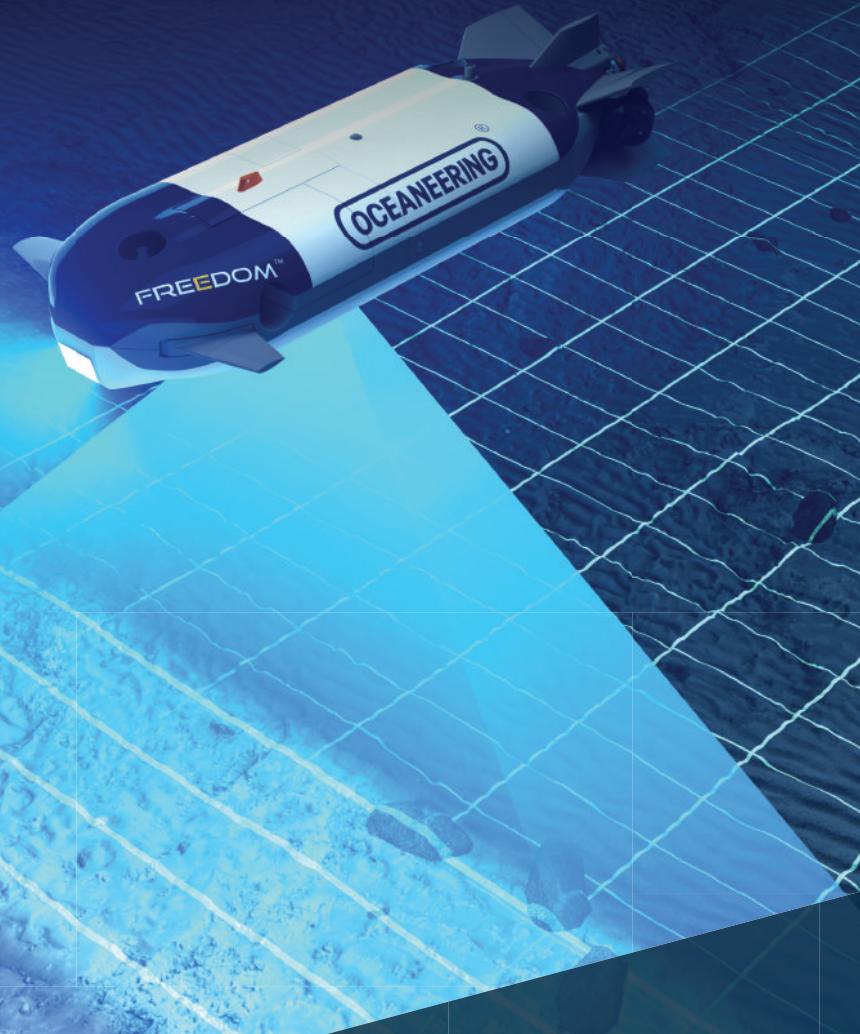
DeepGreen's Box Core Sampler – Built by KC Denmark, deployed by Maersk and used by Bluefield Geoservices to complete geotechnical analysis of seafloor sediments. See full story on page 10.

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# THE DECADE OF DEEP-SEA EXPLORATION HAS BEGUN

**MR. MICHAEL W. LODGE**  
ISA Secretary-General

We are entering an unparalleled decade of deep-sea exploration where advancing scientific knowledge for the benefit of all humanity through renewed international collaboration, technology development, capacity building, and information transfer will be key.

With the global population expected to swell to 8.6 billion by 2030, the world is looking to the deep ocean for renewable energy solutions to meet growing resource demands.

The rich biodiversity and large mineral deposits found on the sea floor are creating exciting challenges and opportunities to further develop a sustainable future.

## Advancing Scientific Knowledge For All Humanity

The International Seabed Authority (ISA)—the UN body mandated to organize, regulate and control mineral-related activities in the deep seabed beyond national jurisdiction—is at the forefront of efforts to advance scientific knowledge of the deep ocean.

In order to ensure dissemination of such knowledge, the ISA launched DeepData in July 2019, the primary global repository for deep-sea geological and environmental information. This scientific data, harvested over the last 40 years, will improve understanding of the natural characteristics of the deep ocean, and identify the best measures to safeguard marine environments from human activities.

## A New Decade Of Collaboration

The forthcoming launch of the United Nations Decade of Ocean Science for Sustainable Development (2021-2030), also known as the Ocean Decade coordinated by UNESCO's Intergovernmental Oceanographic Commission (IOC-UNES-

CO), presents an ideal opportunity to reinforce a global commitment towards increased and targeted collaborative efforts in deep-sea research. This is at the core of the ISA's mandate, as is the mission to promote and encourage scientific research in the international seabed area and effective participation by developing States in deep-sea exploration and research programs.

Recognizing these synergies, the ISA has joined forces with IOC-UNESCO to achieve shared objectives, such as improved mapping of the seabed and enhancing ocean observing networks.

## Fostering Innovative Partnerships For Collective Research Platforms

As of today, most of the investment in deep-sea exploration comes from the private sector. Currently, 30 exploration contracts have been granted by the ISA in the international seabed area.

An essential part of our work is governing the participation of stakeholders and levering industry support in favor of rigorous scientific investigation. This will not only benefit our understanding and knowledge of deep-sea ecosystems and functions but will also help to inform decision-makers and the scientific community on how to anticipate and adjust to technological changes. This is critical, as tomorrow's deep-sea operators will rely just as much on AI, big data, e-DNA, nanoscience and innovative sampling techniques as they do on conventional offshore technology.

## Increasing Participation Of Developing States Through Capacity Development Initiatives

To help foster participation and information exchange, in February

2020, we hosted the first international workshop on "capacity development, resources and needs assessment" in Kingston, Jamaica with a view to identify how to adjust activities to meet the scientific needs of developing States.

The decade of deep-sea exploration has begun. As the world looks towards meeting the objectives of the Ocean Decade, we at the ISA look forward to furthering international collaboration, industry partnerships and scientific knowledge, to ensure a sustainable future for all.

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1- Exploration work in DeepGreen's NORI-D contract area, one of three in the company's portfolio. 2- Nodules collected from box core samples in NORI-D. 3- DeepGreen has successfully derived metal alloy from polymetallic nodules. 4- Box cores and AUVs are key tools for polymetallic resource evaluation in the deep sea.



# HARVESTING THE DEEP FOR THE GREEN TRANSITION

By Gerard Barron,  
Chairman & CEO, DeepGreen Metals Inc.

Tesla founder Elon Musk said recently, "When Henry Ford made cheap reliable cars, people said, 'what's wrong with a horse?'" Fast forward about a century, and people sceptical about electric vehicles cite poor range and a high cost of entry as reasons that the world will never 'go electric'.

Since 2017, however, the world has seen a sea change in attitudes towards electric vehicles, with global sales surpassing 1 million EVs for the first time and subsequently doubling in volume in 2019. Better battery chemistries have increased range and with the cost of batteries falling precipitously — by around 90% in eight years — consumers are responding. To meet this rapidly rising demand, companies are now scrambling to secure new sources of the metals critical to low-carbon technologies.

## THE DEMAND FOR BATTERY METALS

The transport sector contributes approximately 20% of global greenhouse gasses, and emissions from transportation grow at a faster rate than any other sector. Decarbonising transport is a critical part of global efforts to reduce emissions. To do this, however, we need batteries — a lot of them. Demand for battery metals is set to rise elevenfold by 2050, according to the World Bank. For base metals such as nickel, cobalt and copper, the timeframe is even more urgent: shortages are predicted to emerge by 2025. Writing in the journal *Science*, researchers recently noted that "mining, metals and material extraction are the hidden foundation of a low-carbon transition. But it

is far too dirty, damaging, and dangerous to continue on its current trajectory."

Enter DeepGreen, the company that I lead. We are on a mission to supply metals for the green transition with the least possible negative environmental and social impact, and to ultimately accelerate the transition to a circular metal economy. In a bid to radically compress the many negative externalities of battery metal production, DeepGreen has developed a process for producing battery metals from polymetallic nodules, with near-zero solid waste. The journey begins about 4.5 km deep in the Pacific Ocean.

## A BATTERY IN A ROCK

For at least 5,000 years humans have extracted metals from the land, digging deeper for lower quality ores. Now, our planet has reached a tipping point. Our atmosphere is full of carbon and our terrestrial ecosystems — which filter out and store CO<sub>2</sub> — are in peril. We need urgently to quit fossil fuels, but this will require hundreds of millions of tons of new metals to power electric transport, and to store renewable energy. Where will these metals come from?

Roughly the size of a potato, polymetallic nodules are formed over millions of years on the seabed. These nodules are not new to science, nor to industry. They are a unique resource that contains high concentrations of nickel, cobalt and manganese, as well as copper — the same metals that are required for electric vehicle batteries. DeepGreen is currently developing a project in the Clarion-



5- DeepGreen has to date conducted seven exploration campaigns aboard the Maersk Launcher.

Clipperton Zone (CCZ) of the Pacific Ocean, which holds a very large concentration of nodules — containing enough metals to electrify the entire global fleet of 1.3 billion vehicles several times over.

While EVs produce no tailpipe emissions, their manufacture is three times as CO<sub>2</sub> emissions intensive as regular vehicles, due to the manufacturing of the batteries. We believe polymetallic nodules can deliver emissions reductions of more than 70% to produce a billion EV batteries.

To be sure, our endgame is to create a circular economy for metals. However, today we don't have enough metal in the system to live off recycled metal. We need a massive injection of virgin ore into the system.

The advantages of polymetallic nodules are immediately manifold: It is like having the metal contents of several ore bodies compacted into one — which means we need to process almost 4 times less ore. The nodules lie exposed and unattached on the top of the deep seabed, meaning we don't have to shift millions of tons of overburden and waste rock to get at the ore. For every 9 billion tons of metal ore mined and processed each year, over 350 billion tons of waste are produced. Sourcing metals from nodules could reduce the harmful solid waste produced by land-based mining by 100%. Nodules don't contain toxic levels of deleterious elements, meaning metals can be produced without the many harmful by-products that are so prevalent with mining on land. DeepGreen commissioned and just released a comprehensive life cycle sustainability analysis comparing nodules to land ores, across many other impact categories.

Polymetallic nodules were first discovered by the British explorers aboard the HMS Challenger during 1872-1876 expeditions. In the 1970s four consortia started to collect nodules in the North Pacific Ocean, spending approximately \$1 billion in today's dollars. But the activity was paused, because there were no regulations or governing body in place to govern resource use and protect the marine environment in the high seas. The International Seabed Authority (ISA) was set up by the UN in 1994, and they granted the first contract for exploring polymetallic nodules to DeepGreen in 2011.

The early work developing nodule collecting systems was not done in vain. DeepGreen's base case system for collecting nodules — a remotely operated collector vehicle and an air-lift riser — was validated in the 1970s. So we are not reinventing the wheel.



» Polymetallic nodules are effectively an NMC 'battery in a rock', containing high-grade nickel, cobalt, copper and manganese.



» Teng King Kuen, from Malaysia, holds a large 'class 3' polymetallic nodule.

Together with our offshore partner Allseas, we are currently developing DeepGreen's tracked collector vehicle, which will be connected to the surface by an umbilical to provide power and communications. Nodules sitting atop the sediment will be gently dislodged using water jets directed almost in parallel with the seabed to minimize sediment disturbance and will travel inside the collector vehicle along the curvature of the collector head using the coanda effect.

Then nodules will be lifted up a 4500 m riser to a collection vessel at the surface. From there, nodules will be transferred to land for near-zero-waste processing using DeepGreen's proven metallurgical flowsheet.

While producing metals from nodules can dramatically compress or eliminate many life cycle impacts, we still have several impacts to worry about — primarily on the deep-sea environment. Our operations will remove about 85% of nodule cover in our contract area, while certain deep-sea wildlife needs the hard substrate of nodules for critical life functions. While we are working on minimizing seabed disturbance, our collector vehicles will suspend some sediment and depending on how far it travels and how thick the blanketing layer is, it can interfere with wildlife. What are the species living in the CCZ deep-sea? How connected are their habitats? How far would the plumes travel

and what would be their impacts? These are some of the questions we are addressing in our environmental and social impact assessment (ESIA) and DeepGreen, together with other contractors in the CCZ, will generate an immense body of deep-sea knowledge in the next few years before commercial activity can begin.

#### A COLLABORATIVE APPROACH

Since the hiatus after the 1970s, this nascent industry has made massive strides. Alongside technological advancements, the industry has benefitted from the steady hand of the ISA, which was established as an autonomous institution under the 1982 UN Convention on the Law of the Sea (UNCLOS) to organize and control

activities in 'the Area', particularly with a view to administering the resources of the Area, which are defined as the 'Common Heritage' of Humankind.

As a result, companies now benefit from a central regulator with 167 member states, which is mandated to provide for the necessary measures to ensure effective protection for the marine environment. In the CCZ, currently there is more territory set aside as protected area than is allocated for mineral exploration.

While the regulations governing the exploration of polymetallic nodules in the Area have been in place for a while, the exploitation regulations are still taking shape. The fourth draft of the exploitation regulations was published in 2019, and it was anticipated that they would be adopted at the ISA's July 2020 Council Session. At this stage, the proposed schedule will likely be pushed back.

#### A TRANSPARENT JOURNEY

Questions remain over the temporal and spatial scale of the impacts of nodule collection on deep-sea ecosystems and the wildlife that live down there. Shrouded in perpetual darkness, the deep seabed is a food-poor environment with limited biomass, especially in comparison to the terrestrial ecosystems overlaying the remaining reserves of nickel, copper and cobalt. While collecting nodules has the potential to compress the negative externalities of mining, that does not mean we can be complacent about protecting the wildlife in this delicate ecosystem. That is why DeepGreen is undertaking what we consider to be the world's most integrated seabed-to-surface deep-sea discovery program ever undertaken.

While our ESIA is a mandatory part of DeepGreen's application for an exploitation contract from the ISA, we will go far beyond our obligations. Our goal is to enable deep-ocean science to progress and to advance our understanding of the abyssal plain — the largest and most common environment on this planet — which is not yet well understood due to the logistical and financial challenges of operating far out in the open ocean and at 4-6 km depths. Together with some of the top minds and institutions in ocean research, DeepGreen will conduct over 100 studies to better understand our operating environment and assess the true extent of the impacts of our proposed activities. The comprehensive baseline studies planned for one of our contract areas, NORI-D, alone will make the 75,000 km<sup>2</sup> contract area — larger than West Virginia — one of the most intensively studied regions of the North Pacific Ocean. Unlike for terrestrial mining projects, our deep-sea studies will extend to impacts on microbes, which comprise most of the biomass at these depths.

*We are committed to the responsible and equitable development of this common heritage, and to making sure that our contribution leads to a net positive impact on the planet and its people, rather than creating new problems. We are developing an Adaptive Management System that will combine real-time data from our extensive monitoring equipment to create the first deep-sea 'digital twin' for collecting nodules. This system will enable near-real time operational adjustments and give stakeholders and the ISA a transparent view into what's happening in the deep darkness of this tiny patch of seabed in the middle of the Pacific Ocean.*

The COVID-19 pandemic has given the world a glimpse of less polluted skies, a breath of fresher air. We must ride this momentum and urgently decarbonize the global economy. The stakes are high and we still have much to learn, but I am confident that we can bring better metals to meet this challenge.



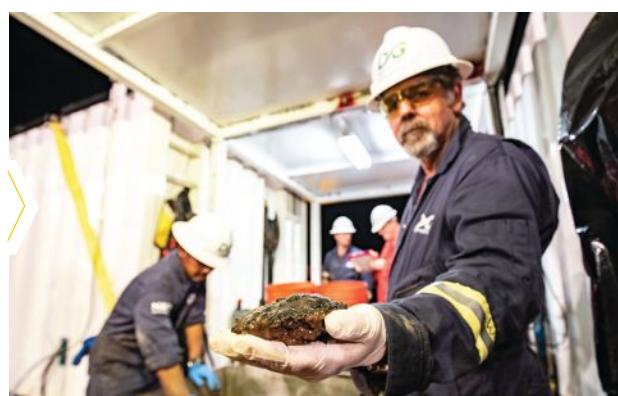
» Lead Geologist Warwick Miller (right) sorts through data with colleagues in the onboard lab.



» All nodules collected during exploration are sorted, weighed and catalogued for resource evaluation.



» Multicores are placed in the sediment to capture biological samples, which are sent to labs around the world.



» Warwick Miller holds a sample nodule brought up from 4.5 km deep.

# OCEAN MINING: LESSONS FROM THE PAST

*ON&T recently caught up with Ted Brockett, one of the pioneers of seabed mining technology, to take a look back at the early days of ocean exploration*



» The RV Valdivia and the DOMCO Hydraulic system.

The Deepsea is often branded as the next frontier in ocean exploration. We have long known that the seafloor, at depths of up to 6000 m, is home to an abundance of rare-earth elements, such as erbium (Er) and promethium (Pm), as well as other prized metals like nickel and cobalt, and our attention now turns to the viability of mining these materials to build out a sustainable future. The harvesting of polymetallic nodules, while only one method of extraction, increasingly seems to be the most feasible in the short- to mid-term. Currently, exploration activities continue in the Pacific Ocean's Clarion Clipperton Zone (CCZ), as commercial and state-led entities carry out their environmental due diligence and test their subsea technologies.

As we assess the viability of full-scale seafloor mining operations there are, perhaps, lessons we can learn from the past. Few people are better placed to comment

on the challenges and prospects of ocean mining than Ted Brockett, the managing director of Okeanus Science & Technology. Mr. Brockett's career stems five decades in the marine mining industry; indeed, he was one of the early pioneers of commercial efforts to harvest nodules from the seabed in the late 1970s. ON&T had the pleasure of interviewing Mr. Brockett recently, as part of our exclusive three-part series that examines The Past, Present and Future of Ocean Mining. This month, we take a look back at the early days of deep-sea mining.



» Ted Brockett,  
Managing Director  
Okeanus Science  
& Technology

## ON&T: TAKE US BACK TO THE EARLY DAYS, HOW DID YOU GET INVOLVED IN DEEP-SEA MINING?

**TB:** I studied mechanical engineering as an undergraduate back in the early 1970s. I wasn't set on any particular career, but I was sure of one thing: I wanted a marine-related future. In fact, it was my love of the ocean—and perhaps the promise of unlimited surfing and diving—that influenced my decision to study a master's degree in Hawaii, with a focus on corrosive forces.

As is often the case, it was my professor that gave me a timely vocational nudge and introduced me to an outfit called the International Nickel Co. (INCO), which has since been incorporated into the Brazilian metal and mining multinational Vale. That connection paid dividends when I graduated and, on the back of some respectable grades, I was invited to work

in their R&D office and so relocated to the Seattle area, which is where I've lived since.

#### ON&T: WHAT DID INCO DO BACK THEN?

**TB:** The company had a long-established tradition of terrestrial mining but also had a growing interest in offshore exploration, in particular how to harvest what we called "manganese nodules" back then (more commonly referred to as polymetallic nodules today) from the seafloor. To that end, the team had solicited the help of external consultants to develop a passive seabed collector. So, my first job was to put this collector through its paces. We took it out to various test sites and mudflats, but it was an unmitigated disaster. No matter what we did, some part or another of the system would always end up failing. To my mind, a passive design just wasn't going to get the job done.

We went back to the drawing board and devised something we called Electro-

Hydraulic, which we dubbed EH. The system was built around one core distinction: to use ambient seawater to perform all of the collector's tasks, that is, to collect and clean the nodules of sediment before feeding a riser pipe. This was central to the design process; our objective was to optimize operational efficiency and limit the need for additional power generation at collection. In short, the fewer moving parts on the seabed, the less likelihood of system failure; the less sediment in the riser pipe, the more nodules can be harvested within any given timeframe.

#### ON&T: CLEARLY, THIS IS COMPLEX ENGINEERING FOR A VERY SPECIFIC TASK. WERE THERE SETBACKS?

**TB:** Plenty. This was custom engineering in its purest form. And the stakes were high. So high, in fact, that companies began forming specialist marine mining consortiums in the mid-1970s. INCO led the way with the creation of Ocean Management Inc. (OMI), a joint venture that also incorporated AMR (a German

consortium), DOMCO (a Japanese consortium led by the Sumitomo group of companies) and SEDCO (a Texas-based offshore services provider). To mitigate against the growing risks associated with marine mining, the strategy was to divide the exploration and extraction process into critical areas of expertise.

INCO assumed the lead for collector development, which included the responsibility for program management, hydraulic and passive collector development, land-based test facility design and construction, and an at sea collector test program.

#### ON&T: SO, GIVEN THAT THERE WERE OTHER CONSORTIUMS, WAS THERE A RACE TO THE SEAFLOOR, SO TO SPEAK?

**TB:** Yes. There were three others. There was the Kennecott Group, Ocean Mining Associates, and the Lockheed Group, all of



» The SEDCO 445.

which incorporated both American and international companies. I'm not sure I would describe it as a race exactly, but one of the consortiums was always going to be the first to run a successful pilot test in the Pacific, and that was us at OMI.

#### ON&T: OK, WE'LL GET TO THE PILOT TEST, BUT FIRST, HOW DID YOU GO ABOUT DESIGNING AND ENGINEERING FAILSAFE EQUIPMENT FOR DEPLOYMENT AT SUCH UNCHARTERED DEPTHS?

**TB:** Designing machinery for deployment in relatively alien environments requires diligence, patience and flexibility. It's not just a case of concept testing, but providing evidence of operational efficacy and safety, and that requires rigorous stress testing. Operating at depths of up to 6000 m comes with inherent risks, and mistakes are extremely costly.

Naturally, there are several stages of development, including conceptual design, laboratory testing of key components, detail test design, and test collector fabrication, which our consortium carried out simultaneously in three countries. With validation of concept, comes the need to apply those designs to the field. For the pre in-situ testing we simulated the subsea environments as best as we could by using pools and mud pits. We found suitable substitutes for nodules and sediment and tested a range of passive collectors (Rhombic Rake, Passive Inverted Plow) and active collectors (Electro-Hydraulic, Active Inverted Plow, DOMCO Hydraulic), among others. This



» Concept Testing: Simulations on Mudflats.

allowed us to eliminate certain designs, before boarding the German RV Valdivia in 1976 to run *in-situ* tests in the Clarion Clipperton Zone (CCZ).

We had a number of systems aboard, but our shortlist for *in-situ* testing centered around the Electro-Hydraulic, the Active Inverted Plow, the DOMCO Hydraulic, and the Cutter Blade Scraper (CBS) collectors. We weren't out there to actually collect nodules but rather see how the systems performed in the deep, which often presents the most challenging marine conditions imaginable. Our time offshore in 1976 was invaluable and allowed us to narrow our design focus.

#### **ON&T: WHAT DID YOU LEARN FROM THE IN-SITU TESTING?**

**TB:** That operating in remote locations, and at such depths, is highly unpredictable. There is so much that can go wrong, and mistakes mean setbacks. In fact, while we were out there, we lost the DOMCO collector altogether due to a tow cable failure. But the *in-situ* testing, more than

anything, allowed us to refine our focus and fine-tune two systems: the 2M and 3M Seafloor Collector systems. They were both passively towed two runner sleds that used a straightforward hydraulic design. As the names suggest, one had a two-meter modular active width with a mere 20 HP for all functions and one was three meters wide and supported by 25 HP. They both used a cloth sail to ensure hydrographic stability and safe bottom landing.

#### **ON&T: WHAT WAS DIFFERENT ABOUT THESE DESIGNS?**

**TB:** Well, the key to their design was their simplicity. We adopted the US Navy's 1960 design principle, K.I.S.S., or Keep It Simple, Stupid. Reliability is the key to operating effectively in the Deepsea, and overengineering solutions is an obvious trap. We persisted with a hydraulic design as we were adamant that seawater—the natural environment—should do the heavy lifting, so to speak, by removing sediment from the nodules, transporting them within the collector, before finally feeding the nodules into the riser pipe. The system

was built around a high volume, low pressure flow that sent nodules up a duct to a containment cage and hopper conveyor.

One key aspect of the design was to reject oversize nodules, not only sediment, to prevent riser pipe clogging and guarantee system optimization. There were two points of rejection, first at the dredge heads (materials wider than 3-1/4" prevented from entering) and then behind the discharge of the dredge heads, where materials 2 – 3/16" were rejected downward between runners powered by a slurry flow up ramp.

#### **ON&T: SO, WHEN DID YOU ACTUALLY GO FROM IN-SITU TESTING TO RUNNING A PILOT TEST?**

**TB:** Not until 1978, when we set sail for the CCZ once again aboard the SEDCO 445. Of course, the collectors were just part of a larger system. 1000 HP submersible pump lift systems were manufactured by

KS, two of which were needed for the deployment of 2M (allowing for 40 metric tons per hour), three for 3M (60 metric tons per hour). The pumps connected to a 5,350-meter long riser system and an interface hose.

#### **ON&T: WAS THE PILOT A SUCCESS?**

**TB:** Absolutely. You have to remember; nobody had attempted to mine the Pacific at these depths before. I believe Deep Sea Ventures had run a pilot test on the Atlantic's Blake Plateau, but at depths of 500 m or so. The CCZ, at depths of over 5,400 m, is another prospect altogether. By measure of success, we were able to collect 1000 tons of polymetallic nodules and the equipment performed as designed. Other pilots followed, run by the other consortiums, but we were the first to mine in this uncharted territory.

#### **ON&T: SO, WHAT HAPPENED AFTER THE PILOT?**

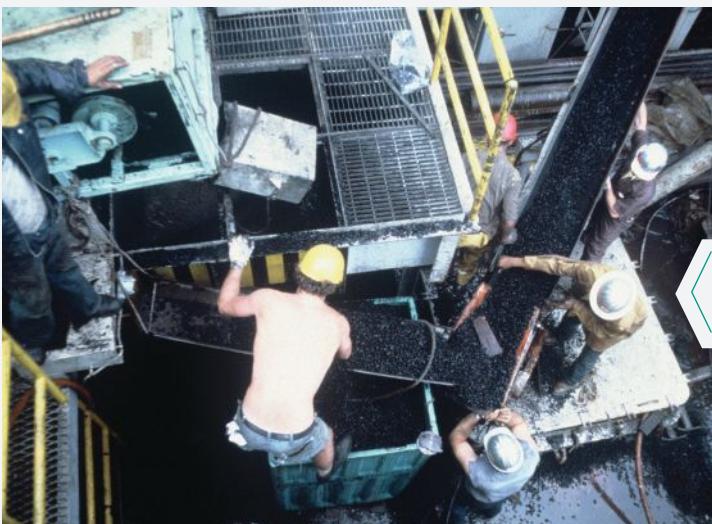
**TB:** Somewhat abruptly, management decided to halt operations. Throughout 1978, there was creeping concern surrounding the jurisdiction of exploration activities in the deep Pacific. Developing nations started to question the motives of operators like INCO carrying out pilots in and around their waters. Much of the scrutiny stemmed from an ongoing legal discussion triggered by a speech made by then Maltese ambassador Arvid Pardo to the United Nations in 1967, in which he proposed that the seabed and ocean floor beyond national jurisdiction be considered the "common heritage of mankind". This gave island nations leverage, a bargaining chip if you will, and they began suggesting that operators wishing to harvest the deep should compensate accordingly and even share their subsea technologies, etc. Mining companies, terrestrial or marine, are notoriously protective of their intellectual property so this was never going to happen. It did, however, add fuel to the question of governance in international waters and this, of course, culminated in the creation of the "Law of the Sea" and the International Seabed Authority (ISA), in 1982. From an INCO perspective, I think there was more of a concern surrounding the financial viability of establishing ongoing operations. The company had just opened a number of



» Rise Pipes.



» Nodules arriving at the surface.



» Polymetallic nodule sorting aboard the SEDCO 445.



» OMI team members in 1978. Left to right: Kip McKeever, operations manager; Mickey McBride, staff systems engineer; John Shaw, president.

terrestrial mines, so I suspect this was a question of investment priority. Had it been more financially viable, I think we would have found a workaround.

#### ON&T: WHAT HAPPENED TO THE TEAM?

**TB:** Some of the team were retained and repurposed, but I left and founded Sound Ocean Systems (SOSI) with other ex-employees. Our first job was with OMI, funnily enough. Our second was for the National Oceanic and Atmospheric Administration (NOAA). NOAA was actually present throughout our pilot test in 1978, aboard their own vessel measuring surface and seabed sediment plumes created by the nodule collection.

#### ON&T: WHAT HAPPENED TO THE NODULES?

**TB:** They were processed, as far as I understand it. I'm not entirely sure where this was done and by which arm of the consortium, but I do know that upper management at the time were presented with these little IMO-branded ingots of nickel as a memento of our endeavors. I was a little irked at the time not to receive one myself but have since managed to acquire two. I intend to donate one to the ISA Gallery at the organization's headquarters in Kingston, Jamaica.

#### ON&T: TODAY, WE ARE LEARNING SO MUCH MORE ABOUT THE DEEPSEA AND AREAS LIKE THE CCZ, BUT BACK THEN IT MUST HAVE BEEN SURREAL TO BE SO ISOLATED AND ON THE BRINK OF DISCOVERY. DO YOU HAVE ANY ENDURING MEMORIES OR REFLECTIONS OF YOUR PILOT TEST?

**TB:** I have many, of course. Today, with so much activity in the CCZ—and considerable investment—my recommendation for operators is to keep things as "simple" as possible. There are so many variables at play in the deep and you need to understand what you can and cannot control.

From a personal point of view, isolation at sea certainly gives you a fresh outlook on how vast the ocean is. It is hard to describe how I felt, on reflection, because the entire process was so abstract. It had never been done before. But there was something quite bizarre about being days out to sea, on the steel deck of a ship in the searing tropical heat and hearing this faint rattling sound made by the nodules making their way up the riser. They took 20 minutes to reach the surface, their arrival evermore noisy and turbulent. What struck me more than anything, and this is something I will never forget – the nodules were freezing to the touch. Still gives me chills to this day, actually!

# CLOUD COVER: TWO BIG DATA INITIATIVES WITH OCEAN APPLICATIONS



Big Data refers to the unprecedented availability of open data that can be used to advance science, fine-tuning compute models and predictions, and improve products and services.

Perhaps the biggest misconception among laymen is that this is nothing like what we've seen from the first few decades of widespread internet usage. The Big Data revolution involves rendering more data from our ongoing activities, often in real-time. In fact, according to the Massachusetts Institute of Technology (MIT) Media Lab, more ocean data has been collected in the last two years than in all previous years combined.

Because there is far more available data than ever before, it can be difficult to process using traditional databases and software techniques, which is where cloud computing, cloud hosting, and cloud data storage and deployment comes into play. Cloud computing refers to the on-demand availability of computing resources delivered

as a service over network. In short, it's a virtual framework. You only pay for what you use, but your ability to share data across an expandable and optimized infrastructure is increased exponentially.

#### **NOAA's Big Data Program**

The National Oceanic and Atmospheric Administration (NOAA) generates tens of terabytes of data a day from satellites, radars, ships, weather models, and other sources. While these data are available to the public, it can be difficult to download and work with such large data volumes.

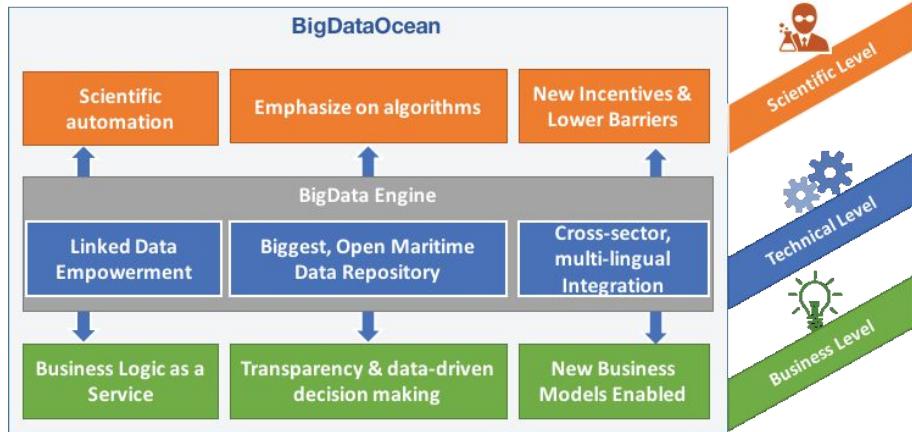
NOAA's vast wealth of data therefore represents a substantial untapped economic opportunity. The NOAA Big Data Program (BDP) will provide public access to NOAA's open data on commercial cloud platforms through public-private partnerships. These partnerships will remove obstacles to the public use of NOAA data, help avoid costs and risks associated with federal data access services and leverage operational public-

private partnerships with the cloud computing and information services industries.

The Big Data Program combines three incredibly powerful resources: NOAA's expansive collection of high-quality environmental data and expertise, the vast infrastructure and scalable computing capabilities of our industry partners, and the innovative energy of the American economy. The BDP currently works with three infrastructure-as-a-service (IaaS) providers to broaden access to NOAA's data resources. These partnerships are designed to not only facilitate full and open data access at no net cost to the taxpayer, but also foster innovation by bringing together the tools necessary to make NOAA's data more readily accessible.

#### **EU BigDataOcean Project**

The main objective of the BigDataOcean project is to propose and validate maritime big data scenarios for the benefit of EU-based companies, organizations and scientists.



This is achieved through a multi-segmented platform that combines data of different velocity, variety, and volume in an inter-linked, trusted, multilingual system, producing a big-data repository of high value and veracity for project participants and local communities.

The BigDataOcean project strives to capitalize on modern technological innovations, utilizing them to revolutionize the way maritime-related industries work. The maritime sector

is ripe for the introduction of innovations such as the big-data-driven economy, interrelated data streams from diverse sectors and languages, and cross-technology innovations that deliver data in several different formats (such as structured and unstructured, or real-time and in batches). These innovations will enable the creation of an entirely new value-chain, which will lead to great economic, societal, and environmental impact.

The infrastructure is being tested and facilitated through four pilots, which will provide the BigDataOcean project with an amount of data in the order of terabytes. This will result in the largest maritime database up until now, providing, among other things, collaborative, data-driven intelligence. Additionally, BigDataOcean will allow participating pilots to upload both private and public resources of data and interrelate them through public and private queries and diagrams. The BigDataOcean system backbone will be domain-agnostic and compatible with most popular established data-processing technologies, sensor types, and common systems of operation.

**For more details and how to participate in both data projects, please visit our website.**

<https://oceannews.com/featured-stories/cloud-cover-two-big-data-initiatives-with-ocean-applications>

**TDI Brooks**

R/V Proteus

R/V Gyre

R/V Brooks McCall

R/V Miss Emma McCall

[www.tdi-bi.com](http://www.tdi-bi.com)

### SURFACE GEOCHEMICAL

### MARINE GEOTECHNICAL

### MARINE GEOPHYSICAL

### MARINE ENVIRONMENTAL

- Multibeam Core Site Selection
- Piston Core Acquisition
- Heat Flow Exploration
- Lab Analysis/Interpretation
  
- Piston / Jumbo Piston Coring
- Box Coring
- CPT Stinger/Gravity CPT
- Stinger Sampler/Shelby Tube
- Geotechnical Lab Analysis
  
- 2DHR Seismic Surveys
- Arch/Hazard Surveys
- Pipeline/Cable Route
- Academic Research
  
- EBS Surveys
- Metocean Surveys
- Oil Spill Response
- Environmental Analysis



FEATURE

# "CABLES ARE GETTING EXPOSED AND WE NEED TO UNDERSTAND WHY"

An interview with LR's Will Hodshon and Nigel Carey

The offshore wind market is beginning to show signs of going global. In spite of the COVID-19 pandemic, the industry remains active and is developing in a number of regions outside of its biggest market—Northern Europe. But offshore wind cables are still a cause for concern. We have all heard the statistic that 80% of the insurance claims for offshore wind losses come from cable problems, but new cable issues are still presenting themselves.

The following is an interview first published in SubCableWorld with Lloyd's Register's (LR) Will Hodshon and Nigel Carey about a developing issue that is just being realized—the unburying of cable due to sediment mobility. Their comments are below.

**Will:** Sediment mobility is very topical in the offshore wind cable industry right now. It's an issue that is being focused on in the United Kingdom as it's something that we need to understand in order to find out why some cables are becoming unburied. There are guidelines for lots of different

» Real data image of a potential cable route through active bedforms/sandwaves.

aspects of installing cables, but one thing that there isn't is a guideline for sediment mobility. The beauty of technology and innovation is that remote presence and remote engineering principles can be applied to address and monitor this issue, anytime, anywhere.

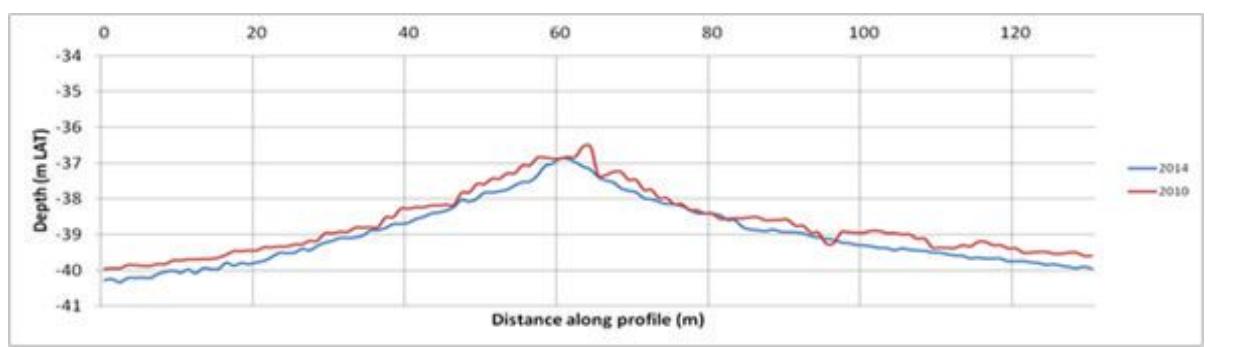
The issue is how to cost effectively monitor sediment mobility through the whole year to properly understand the seasonal sediment transport system in an area. It's only with a more detailed understanding that we may be able to determine exactly how deep to install a cable. It really is an interpretive / subjective process—if there are strong currents, granular sediments and bedforms present there is probably significant sediment movement and try to bury the cable deeper.

What's happening now is that everything is being done to account for sediment mobility, but cables are still being exposed. It's evident that there are no real guidelines for people to follow and interestingly not any physical survey or geotechnical techniques to actually measure sediment stability / movement with depth in the soil profile, which is fundamental to calculating how deep the cable needs to be buried.

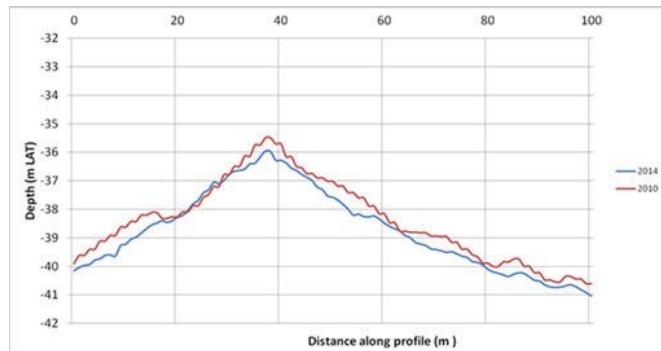
Currently, the technique that uses high-resolution bathymetry survey is used where you can measure bedforms. This is repeated the next year so you can match the ridges of the bedforms from one year to the next and effectively spot the difference both vertically and laterally. Normally you can recognize a lot of the larger bedforms again and you can map the ridges and see if those forms have moved at all. This then shows if sediment is migrating that way or this way with an increase or decrease in aspects such as height.

But what's coming out is an understanding that often these surveys are done at the same time of the year, usually in the summer. A bedform is mapped in June of one year and then in June or July of the next year and it appears that there is not much sediment movement; that things are pretty much in the same place. The best method is to do the mapping at very different times of the year, such as one in the middle of winter and one in the middle of summer and compare those two over the period. You can map the spring and neap tides and perhaps monitor at low tide and high tide. From conducted studies you can see that the bedforms are changing between the tide cycles. When you average it all out there's actually quite a lot of movement in there.





» Comparing a sandwave from 2010 and 2014.



In many cases sediment is being redeposited as fast as it's winnowing away. There are huge volumes of sediment completely replacing itself but the sediment transportation system is set up so perfectly that bedforms are being removed at the same speed as they're being replaced and retaining the same shape, so if you were to map it over time it looks like there's no change.

In the surveys alone, you wouldn't see that. It is something that is quite difficult to monitor. Currently, there isn't a technique where you can look at the quantity of sand grains moving across and site or route which brings us to the next issue—what is the actual depth of the sediment mobility.

This is something that has become really important. The depth of the mobility varies, it's only through the exposure of cables that were buried at significant depth that we know that it's happening. It's key to excavate through a bedform and bury cables below the trough level of the bedform, however that's seemingly not enough and cables are still being exposed.

Continuously monitoring sediment mobility within the soil profile offshore provides the solution; in the absences of this technology, we need to try to stagger surveys more and acquire high resolution bathymetry data in a range of scenarios like: at different times of the year, at neaps and springs, during dry and flood periods near shore, after long calm periods and after storms offshore. I would say at the moment this would be one of the better methods we'd have of understanding the sediment mobility variation of a site or route with the current technology.

**Nigel:** Recently, a body of professionals in the UK have gotten together under the Society of Underwater Technology (SUT) and started a committee to study this problem. There needs to be someone doing this; to create a community and to create guidelines to come up with ideas on how we can deal with this because these cables are getting exposed and we need to understand why.

Export cables are very restricted in the landfall locations and the route they can take. You can only re-route them slightly before it becomes a major issue. That's why there's a lot more focus on the ground conditions of where they're coming in, a lot more focus on things like UXOs and boulders and an understanding on how the cables can be protected for their lifecycle.

I work with an offshoot of SUT called OSIG (Offshore Site Investigation and Geotechnics), which is voluntary. We've just completed a paper on guidelines for the renewable industry in general that also covers cable routing.

This is not just an issue in the United Kingdom. If you're in an area with a temperate climate and you have strong currents and granular soils, you'll probably need to deal with the issue of sediment mobility and how cables can become unburied. In the United States, you especially see these conditions as you move down the east coast. Groups in the U.S. and other countries that are looking at guidelines for cable laying will have to consider these conditions in light of what we're learning about sediment mobility. Sharing information will help everyone to understand this issue.

Lloyd's Register supports some of the most ambitious clean energy projects around the globe, every day. From wind power generation, to grid connection, to carbon capture storage—LR provides clients with independent perspectives, deep domain expertise and engineering excellence along the full project cycle, ensuring project risks are reduced and asset performance is optimized.



» Cable ship during laying operations around Outer Hebrides.



» XOCEAN XO-450 USV equipped with Sonardyne's pressure monitoring transponders on a data harvesting mission in Norway.

## PIONEERING SEABED-TO-SHORE DATA DELIVERY OPERATION COMPLETED

Sonardyne International Ltd. and XOCEAN have successfully completed a live seabed-to-shore data harvesting mission using an unmanned surface vessel (USV) for A/S Norske Shell, as part of a seabed monitoring campaign at the giant Ormen Lange field offshore Norway.

The project, completed early Monday (April 20) morning, without a single person having to travel offshore or from their home office, was achieved with significantly less emissions, health and safety risk and cost than could be done with a manned vessel.

By using an XOCEAN XO-450 USV to harvest data from an array Sonardyne's long-endurance Fetch pressure monitoring transponders, an estimated 5.4 tonnes of CO<sub>2</sub> per day was prevented from being emitted into the atmosphere, had a manned vessel had been used.

XOCEAN's USVs have a negligible carbon footprint—around one thousandth of the emissions of a conventional vessel—and all other emissions are offset, resulting in a fully carbon neutral operation.

The project, which saw the USV transit a total of 300 km from Kristiansund out to

the Ormen Lange field and back, over just three days, is also thought to be one of the largest data harvesting missions, using a USV, to date.

In addition, it proved the ability to support this type of operation remotely without anyone involved having to travel, safely meeting current Covid-19 movement restrictions. The vessel was 'posted' to Norway and then launched by local marine operations service provider, SafePath AS. All other team members, including Sonardyne's remote operations specialists in the UK, XOCEAN's USV pilots in Ireland and Shell's geophysicists in Norway and the US, remained working from their home offices.

The Fetch PMTs were deployed in 800 - 1,100 m water depth at the Ormen Lange field last September to support a long-term seabed monitoring campaign.

The Fetch PMTs accurately collect pressure, temperature and inclination data at the seafloor, at pre-programmed intervals. Using this data, any vertical displacement of the seabed can be calculated. The data will help Norske Shell to proactively inform its reservoir management strategy.

Sonardyne's long-life Fetch PMTs incorporate a high-speed acoustic modem, which allows stored data to be extracted at any time, wirelessly through the water, on demand. On this mission, the XO-450 was equipped with a compatible Sonardyne acoustic transceiver attached beneath its hull.

Shaun Dunn, Sonardyne's Global Business Manager for Exploration and Surveillance said, "We have always been big advocates of collecting data from our subsea instruments remotely using autonomous platforms. This technology is now coming of age and makes complete sense when thinking about the environment, the safety of offshore personnel and minimizing cost. What's more, thanks to the low hull and propulsion noise USVs can achieve, the data gathering is also faster, adding further to the efficiencies of this approach."

James Ives, CEO of XOCEAN said, "Our USV platform has demonstrated itself to be a safe, reliable and ultra-low carbon solution for the collection of ocean data. We are delighted to be working with A/S Norske Shell and Sonardyne International on this ground-breaking project."



# REDEFINING GEOSCIENTIFIC FRONTIERS

Whether in the name of science or industry, the next ten years will be the defining decade for ocean exploration. This bodes well for subsea survey operators, especially geotechnical service providers. This buoyant demand is, in part, thanks to the growing viability of offshore renewables, in particular offshore wind and marine mining. Both industries look to tread new ground. But are they suitably served?

One innovative outfit looking to challenge the long-established order of geotechnical survey is Bluefield Geoservices. Established in 2018, the company was built upon three pillars: **Geoservices**—the equipment and personnel for rigorous offshore geotechnical data acquisition, processing, QC, site management, and analysis; **Geotechnology**—the design and development of custom technologies and ROV-deployed geotechnical survey tools; and **Geoengineering**—innovative subsea engineering solutions for a complex range of seabed situations.

## GEOSERVICES: DATA SOLUTIONS

In little over two years, this pioneering start-up has made significant strides to develop and deploy breakthrough *in-situ* seabed investigation methods and custom technologies that deliver best-quality geotechnical data and analysis. This commitment to data quality has become the hallmark of Bluefield's work in the field and has helped position this experienced team as a preferred partner to the global offshore oil & gas, renewable energy, telecoms, marine mining and trenching industries.

"Offshore exploration begins with data, but the long-term success of any offshore development is contingent on the quality of that data," explains Jim Edmunds, Co-founder and Managing Director of European operations. "This promise of data excellence, underlined by our unwavering commitment to safety, is what cements the Bluefield proposition".

## GEOTECHNOLOGY AS A DIFFERENTIATOR

Bluefield's services include conventional seabed soils testing and sampling systems—including piston core, vibrocoring, and box-core sampling, as well as heavier duty CPT and penetrometer systems—but it is the custom technology that demands particular attention. Bluefield currently have a number of leading-edge systems in the field, including the BOXcone and the ROVcone—both ideal for route surveys, pipeline-soil interaction studies, subsea developments, drill cutting surveys, and marine mining site investigations. Exciting news is in the pipeline regarding geotechnical drilling capabilities, due for launch in a few weeks'

time. Besides proprietary technologies, the company also provides technical R&D expertise to clients seeking to develop their own systems and equipment for subsea soil sampling, testing, and drilling equipment.

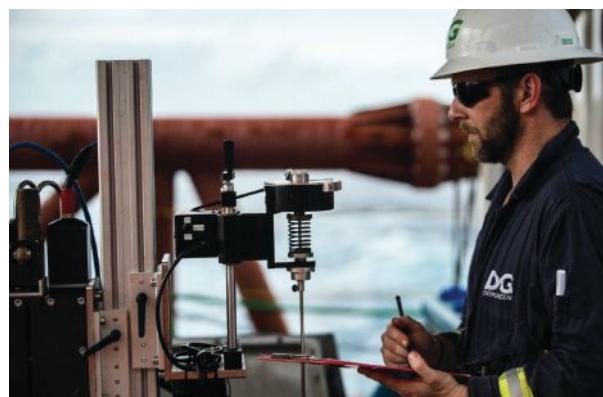
## EXPANSION TO THE AMERICAS

In late 2019, Bluefield expanded its operations to the Americas, setting up offices in Rhode Island—to serve the immediate demands of the offshore renewable energy market—and Florida, to support ongoing operations in the Gulf of Mexico energy markets as well as projects in Central and South America.

Through strategic partnerships, the company has also broadened its suite of services to incorporate geophysical and environmental survey, to offer: Physical Sampling; Geophysical & Hydrographic Survey; Offshore Oil and Gas EBSs and Monitoring; Compliance Monitoring; Habitat Monitoring; and Environmental Impact Studies.

## OFFSHORE ENGINEERING FOR TOMORROW

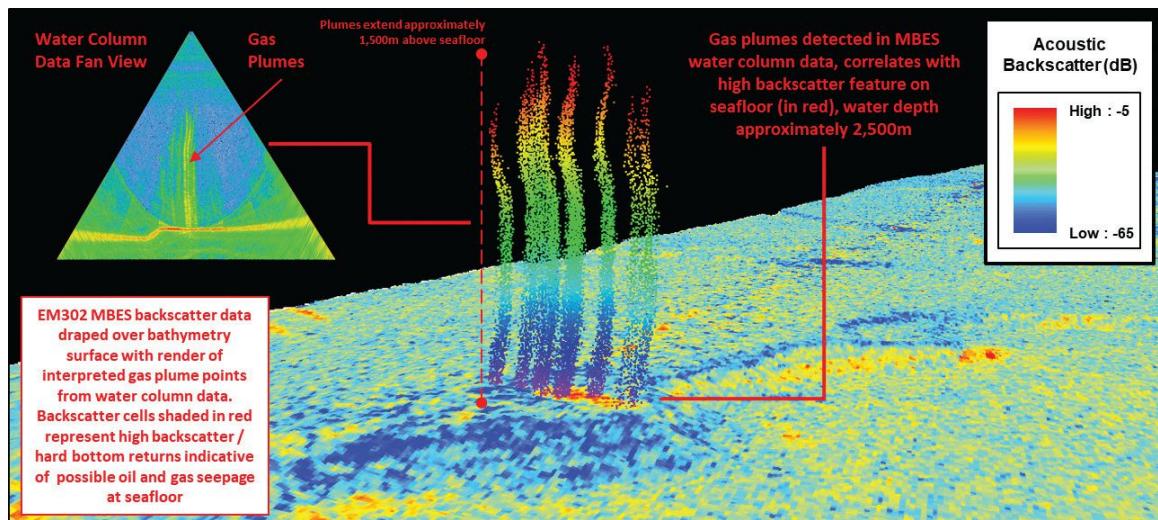
Bluefield's mission is to redefine geoscientific frontiers and exemplified by the company's drive to engineer efficiencies for the offshore structures of tomorrow. Current concepts include robotically installed foundations for offshore floating wind anchors and pipeline stabilization, as well as ROV-conveyed geotechnical soil investigation techniques and tools.



» In-situ CPT and lab shear vane testing aboard the Maersk Launcher as part of Campaigns 6a and 6b Nori-D for DeepGreen.

For more information, visit  
[WWW.BLUEFIELDGEO.COM](http://WWW.BLUEFIELDGEO.COM)

# THE ART & SCIENCE OF SEEP HUNTING AND GEOCHEMICAL EXPLORATION



» MBES Data collected by TDI-Brooks vessel R/V Gyre for the TGS Nigeria Multibeam & Seafloor Seep Sampling Program.

## TDI-BROOKS COMPLETES MSGBC FIELD DATA ACQUISITION FOR TGS AND COMMENCES ANOTHER OFFSHORE NIGERIA

TDI-Brooks International, Inc (under contract to TGS), has completed the offshore "seep-hunting" surface geochemical exploration (SGE) and geotechnical campaign of the MSGBC Basin, from Northern Senegal through The Gambia and AGC zone, into Guinea-Bissau down to the Guinea transform fault.

The R/V Gyre acquired 114,000 square kilometers of high resolution multibeam echo sounder bathymetry and performed the offshore advanced analysis where 80 active hydrocarbon seeps were detected in the multibeam water column data to date. The R/V Proteus completed phase 2 performing the coring program which included 260 piston cores, 23 jumbo piston cores, and 23 heat flow measurements.

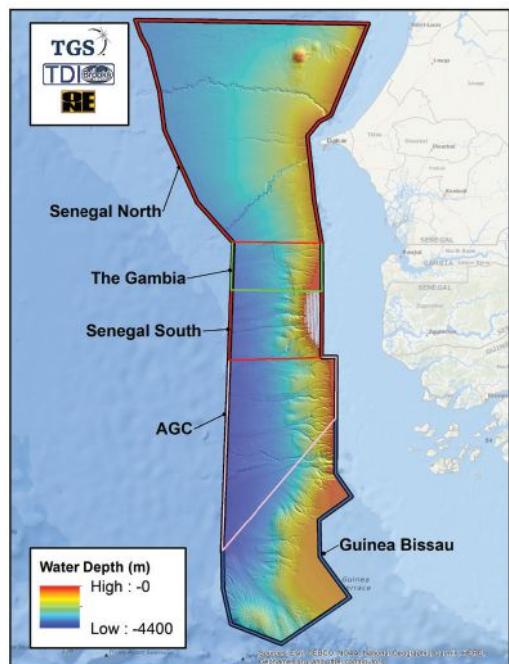
The R/V Gyre is currently performing a further SGE program offshore Nigeria.

This is Nigeria's first regional multi-client Multibeam and SGE (MB&SGE) Study. After just 3 days of field operation, two prominent water column anomalies and bubble plumes were observed in over 2,000 meters water depth with associated surface slicks.

These programs follow the successful multibeam and coring program in Brazil's Campos and Santos Basins in 2019 covering over 213,000 square kilometers. This program included 342 piston cores, 29 jumbo piston cores and 33 heat flow measurements.

## SURFACE GEOCHEMICAL EXPLORATION – INSIGHTS INTO DEEP RESERVOIRS THROUGH SEAFLOOR SEEPS

Surface Geochemical Exploration is a petroleum prospecting tool based on the premise that traces of upward migrated petroleum from deep source rocks and reservoirs can be detected in selected seabed sediments and used to evaluate exploration potential.



» MBES Bathymetry Data collected by TDI-Brooks vessel R/V Gyre for the TGS MSGBC Multibeam & Seafloor Seep Sampling Program.

At the seafloor, hydrocarbon seeps occur as point sources or clusters of point sources due to the vertical migration of hydrocarbons focusing into vertical chimneys. Hydrocarbons will follow a path of least resistance while migrating and therefore tend to form relatively small pathways compared to the overall volume of rock and sediments. As a result, surface expressions of seepage occur as discrete features like mud volcanoes or pockmarks. Hydrocarbon seepages also frequently sustain chemosynthetic communities, where hard-shelled animals can be distinguished from the surrounding soft seafloor.

### THE HUNT FOR HYDROCARBON SEEPAGE – INTEGRATED APPROACH YIELDS SUCCESSFUL RESULTS

Modern Surface Geochemical Exploration campaigns utilize an integrated approach to identify seepage on the seafloor, pinpoint core locations, and accurately characterize geochemical results. The science and art of this seep hunting involves (1) proper selection of core sites from the geophysical records, (2) safe and skillful acquisition of seabed cores at these exact sites, (3) analytically distinguishing promising samples from samples with varying levels of natural background concentrations, and (4) properly interpreting the geochemical results in a geologic context.

TDI-Brooks uses a sequence of specific procedures that we developed and improved over several decades. Our method consistently yields highly accurate identification and a quantitative evaluation of potential sites with migrated oil. Our interpretation of survey results is made even more robust by comparison with our world-wide database of SGE survey results from 100,000+ samples we have collected, analyzed, and interpreted over the years. The process consists of the following sequential steps: Core Site Selection, Core Acquisition, Laboratory Analysis, and Interpretation.

### INTEGRATING MBES AND SUBBOTTOM SONAR DATA WITH PHYSICAL SAMPLING

TDI-Brooks utilizes high-resolution multibeam echo sounders and subbottom profilers to accurately image the water column, seafloor, and shallow subsurface. This enables the examination of discharge plumes in the water column, seepage-related morphologies on the seafloor, and any gas accumulation or leakage pathways that can be detected in the shallow subsurface. When combined, MBES bathymetry, backscatter and water column data give trained interpreters a powerful and cost-effective tool for identifying potential hydrocarbon seep sites.

Bathymetry provides the shape of the seafloor, enabling us to decipher seepage-related morphologies. Backscatter adds a measure of the

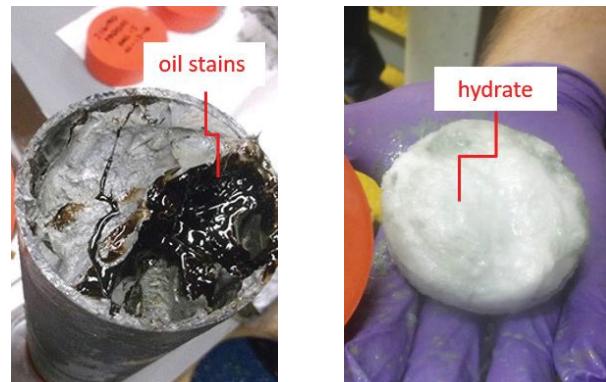


» TDI-Brooks research vessel R/V Gyre.

relative physical character of the seafloor and is defined as the amount of acoustic energy being received by the sonar after interaction with the seafloor. These data can be used to characterize bottom type, because different bottom types "scatter" sound energy differently.

Through careful scrutiny of newly-acquired geophysical data, core targets are selected, and our vessels are deployed to sample the core targets. These real-time on-site surveys are used to correlate the seabed or sub-bottom feature to be cored with the corresponding seismic record used originally to high-grade the site. This process can refine the best core target location, and provides sub-bottom structure, bottom hardness, and features associated with migrated petroleum on the seabed.

TDI-Brooks utilizes Ultra Short Baseline (USBL) acoustic positioning beacons on its piston core tools to ensure accurate sampling of small seep feature targets even in water depths greater than 3,500 m. Piston coring offers several advantages over gravity coring: greater penetration depths, better core recovery, and higher quality samples.



» Piston core samples collected from oil and gas seep sites detected with MBES data.

A custom-designed and purpose-built clean shipboard laboratory area is used to process collected geochemistry cores in a hydrocarbon-free environment. Sections of the core are sampled based on a systematic sampling scheme dependent on core length. Geochemical, interstitial gas analysis and archive samples are collected from the bottom portion of each core and stored in a -20°C freezer until analysis.

### TYING IT ALL TOGETHER – ACCURATE INTERPRETATION OF PETROLEUM GEOCHEMISTRY

Petroleum geochemistry is nuanced, and precision is key to meaningful results. Hydrocarbon levels at seeps are often very low, and such levels require specialized procedures and facilities to accurately complete these analyses. As a global leader in Surface Geochemical Exploration, TDI-Brooks operates a custom-designed, purpose-built geochemistry laboratory that specializes in analyzing and interpreting these low-level hydrocarbons. All samples undergo specific geochemical screening analyses to analyze both hydrocarbon gasses and liquids, and highest potential samples are selected for advanced analyses.

Upon completion of analyses, geochemical data are combined with geophysical and geological datasets to provide insight into migrated hydrocarbons, their type and maturity, and to prove up charge. Surface geochemistry exploration campaigns are a low-cost exploration tool that provide insight into reservoirs at depth before a well is ever drilled.

# CHECK THE TECH

## SWORD: GROUNDBREAKING TECHNOLOGY FOR NEW FRONTIERS

The exploration of new frontiers calls for groundbreaking innovation. This is particularly true when it comes to the application of offshore technology engineered to meet the future challenges of the oil & gas, renewable energy, telecoms, marine mining and trenching industries.

Royal IHC recently announced that its heavy duty and remotely operated subsea drilling and geotechnical site investigation rig SWORD has successfully completed its testing phase. This will come as welcome news to offshore operators and developers, especially those in the offshore wind and mining sectors looking to explore challenging ground conditions.

SWORD was developed by TI Geosciences LTD, a corporate start-up supported by Royal IHC's global reach, office network, and engineering facilities, based in Blyth, UK.

### Sonic Drilling Technology

SWORD (Sonic Wireline-Operated Remote Drill) incorporates sonic drilling technology into a seafloor sampling tool, enabling users to collect high quality undisturbed soil samples and *in-situ* testing geotechnical data for the purpose of designing foundation or

anchoring of offshore structures, or alternatively for assessing mineral resources for mining.

The drill rig is powered by a *Sonic-Samp-Drill* (SSD) compact rotosonic drilling drive, together with full size drill pipe strings, which are automatically assembled at the seabed from a storage carousel. The rig is fully integrated with an A.P. van den Berg (APB) *in situ* CPT testing system and NGL designed push and piston samplers. It uses high-frequency vibrations to push casing sections, drill rods and sampling tubes into the seafloor.

### Efficiencies At Depth

The advantages of integrating drilling and sampling technology are several, but they ultimately equate to efficiency gains—SWORD testing suggests it is a quicker, more accurate alternative to conventional drilling, and suitable for all soil types, including bedrock. In sonic coring mode the system offers greatly enhanced sample recovery in deposits which are particularly difficult for other systems to deal with, such as glacial tills (hard mixed soils which can include gravel, cobbles, and boulders), or deep water subsea mineral deposits (which can include large voids).

SWORD is also remotely operated and deployed directly on the seabed. Unlike with conventional drilling vessel assets, this distinction means that SWORD mitigates against heave effect and weather dependency. It also means that SWORD is not bound to any one specialized vessel and can be controlled from any suitable medium or large marine asset.

But it is in the ultra-deep that SWORD's drilling credentials demand attention; most conventional drill ships have depth limitations of 800 – 1000 m but SWORD can be used in depths of up to 3,000 m. Furthermore, it has a drill-depth capability of up to 120 m. This extended capacity greatly reduces the operating costs of deep-sea geotechnical survey projects.

With testing complete, the SWORD is now ready to start sea trials, the final milestone before entering the market.

Commenting on the potential impacts that unmanned technology could have on the future of offshore exploration, Martijn Schouten, Executive Director at TI Geosciences, said: "SWORD will be disruptive in its contribution to lowering costs and reducing uncertainties in the development of offshore projects."



» Royal IHC's next generation seafloor drill rig, SWORD, has completed its testing phase and now sets sights on the offshore wind, oil and gas and marine mining industries.

# MACARTNEY BEGINS PRODUCTION OF FIRST ALL-ELECTRIC eLARS SYSTEM

MacArtney has started manufacturing of the first eLARS system, expected to come out of production in summer 2020.

In line with customer demands, to meet the green agenda for more eco-friendly products, the all-electric eLARS, developed in collaboration with MacArtney customers, features a number of eco-friendly benefits. Zero pressurised oil over water significantly reduces the risk of oil spillage, and energy efficiency is improved by more than 30% compared to hydraulic systems.

The new eLARS provides a low cost of ownership with Plug-and-Play mobilization, maintenance

work reduced by up to 50% and cost-efficient spares with minimum lead times. Designed with a high degree of integrity, the actuation of the system is based on tried and tested MacArtney technology with built-in system redundancy and an emergency recovery mode.

MacArtney A/S Product Manager, Klaus Brix, comments: "The system is fully equipped with several features designed to improve functionality including docking head feedback, an Emergency Recovery Mode and integrated controls between the winch and MERMAC eA A-frame, an A-Frame designed to meet any customer specifications. Winch options with the eLARS include the MERMAC R ROV winch series, the MERMAC S

that can fulfil and surpass our customers' expectations".

MacArtney strives to be at the forefront of industry advancements, and the eLARS is a highly versatile and future proof system. The eLARS provides real-time condition monitoring, automated operations and offers custom options.

A technology solution for tomorrow, the eLARS, surpasses existing LARS key performance criteria, boasts a compact design to increase workspace on the skid and is fully scalable to support any payload.

The all-electric eLARS includes the new MERMAC eA scalable A-frame, an A-Frame designed to meet any customer specifications. Winch options with the eLARS include the MERMAC R ROV winch series, the MERMAC S

multipurpose winch series, the MERMAC Q stainless steel winch series and MERMAC M modular stainless steel winch series or custom winch options.

The first eLARS in production is designed to accommodate a wide range of Inspection and Observation Class ROV's and is designed around an ISO 20 ft High Cube container size for easy transport and installation. SWL (Safe Working Load) is 3500 kg with a cable capacity covering a range from 3500 m of Ø17 mm cable to 1250 m of Ø31 mm cable.

The first complete, compact eLARS in production will be tested and undergo sea trials in Summer 2020.

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# USING FIBER OPTICS TO ADVANCE SAFE AND RENEWABLE ENERGY



» Berkeley Lab is working to address barriers to more widespread deployment of offshore wind in California, where floating wind turbines could be a viable option. Photo Credit: SarahGower/iStock.

Fiber optic cables, it turns out, can be incredibly useful scientific sensors. Researchers at Lawrence Berkeley National Laboratory (Berkeley Lab) have studied them for use in carbon sequestration, groundwater mapping, earthquake detection, and monitoring of Arctic permafrost thaw. Now they have been awarded new grants to develop fiber optics for two novel uses: monitoring offshore wind operations and underground natural gas storage.

"A fiber cable has a glass core that allows you to send an optical signal down at the speed of light; when there is any vibration, strains, or stresses or changes in temperature of the material that is being monitored, that information will be carried in the light signal that is scattered back," said Berkeley Lab scientist Yuxin Wu, who is leading both projects.

The California Energy Commission has awarded Berkeley Lab \$2 million for the offshore wind project and \$1.5 million for the natural gas project. Both projects are in collaboration with UC Berkeley, and for the natural gas project, Berkeley Lab will also collaborate with PG&E, Schlumberger, and C-FER Technologies (a Canadian company), to carry out the tests.

## From Gearbox Failure To Humpback Whale Movements

Europe is at the forefront of offshore wind development. Other parts of the world are only in the early stages of commercialization, but it is growing quickly, including in the U.S., where the Department of Energy (DOE) has been supporting development of the technology. Offshore wind resources in the U.S. are abundant and have the potential to provide nearly double the total amount of electricity

currently generated in the U.S., according to a 2016 DOE report.

One of the advantages of offshore wind for the U.S. is that the resource is close to dense coastal populations. Therefore, energy transmission is a lesser challenge compared to other renewable energy sources such as onshore wind and solar farms, which are typically located farther away from population centers due to the availability and cost of real estate.

Off the California coast, the ocean floor drops off steeply, making floating wind turbines—which are tethered to the ocean floor by mooring chains, unlike conventional "fixed bottom" offshore wind turbines—the only viable option. But this technology faces several obstacles, including how to do maintenance and operations on remote installations in the ocean economically and how to monitor if hazards such as

earthquakes or extreme weather conditions disrupt operations.

This is where the fiber optic cables come in.

"One of the most expensive components of a wind turbine is the gearbox; they also tend to be the part that's most vulnerable to failure," said Wu, who is also head of Berkeley Lab's Geophysics Department. "Often before they fail they produce abnormal vibrations or excessive heat due to increased or irregular friction. We intend to use fiber optic cables to monitor the vibrational, strain, and temperature signal of the gearbox, in order to pinpoint where problems are happening."

Wrapping fiber optic cables around the entire gearbox can provide a 3D map of changes with resolution at the millimeter scale. "It could help identify problems with the gearbox at an early stage, which would trigger emergency management, before a catastrophic failure causing loss of the whole turbine," Wu said.

What's more, Wu said the project intends to explore how the fiber optic cables can be used to detect marine mammal activity. The sensitivity of the fiber signal could allow for differentiation between, say, crashing waves and a pod of whales swimming by.

"Environmentally sustainable development of offshore wind is critical," he said. "With a large offshore wind farm, there would be many of these mooring lines securing the turbine structures to the ocean floor. If a humpback whale swims by, what are the impacts of these mooring lines on their activities? Will the whales generate unique vibrational signals that can be picked up by the fiber optic sensors? If we can track the signals of a whale swimming by, it will allow us to evaluate whether and how the offshore wind turbine impacts marine mammals."

Wu added that he is looking to learn more about whales and other marine mammals from marine biologists and also seeking a partner to collaborate with to test the sensors in the ocean.

### Making Underground Gas Reservoirs Safer

Similarly, Wu and his research partners hope to use fiber optic cables to monitor the boreholes of underground natural gas storage reservoirs. The borehole is used to inject and withdraw gas from vast underground storage reservoirs. Like any pipe, these boreholes degrade and corrode over time. The massive gas leak at Aliso Canyon in 2016, in which thousands of families had to evacuate their homes, was concluded to be caused by corrosion damage of the borehole.

Thus, borehole integrity is of paramount importance to safe storage of natural gas in the subsurface. It is currently monitored mostly using tools that are intrusive, expensive, and incapable of providing frequent, real-time data. "It is difficult to predict borehole degradation trajectory with the sparse data generated by traditional methods. Having higher frequency datasets covering the entire borehole is key to provide an early warning of potential borehole failures," Wu said.

In the new CEC-funded project, Berkeley Lab will work with UC Berkeley, PG&E, Schlumberger, and C-FER to test a novel suite of technologies for autonomous real-time monitoring using two methods, one based on distributed strain, vibration, and

temperature sensing in fiber optic cables and the other using electromagnetic wave reflectometry.

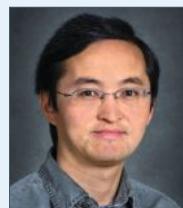
EM-TDR (or electromagnetic time domain reflectometry) is similar to the fiber optic technology except that it uses longer wavelength electromagnetic waves instead of visible light (also an electromagnetic wave but at much short wavelength) as signals. "EM-TDR sends electromagnetic waves into an electronically conductive material, and when there is a change due to damage, such as corrosion, you get an EM signal back which can help you identify corrosion or other degradations," Wu said.

And because the borehole is made of steel, which is electrically conductive, no downhole equipment will need to be installed. Thus, EM-TDR is very easy to deploy and can be used under many circumstances that prevent the use of other types of sensors. On the other hand, EM-TDR is still an early-stage technology; this new project will allow further testing and development.

For both the offshore wind and natural gas projects, the scientific challenge, Wu said, is optimizing the technology design and sensitivity and developing real-time edge computing technologies. "In addition to using commercial systems, our team is developing new fiber interrogators that will allow us to not only get to the original raw data but also play with the physics to better design a system that can give us the most sensitive signal we want," he said. "In addition, we will be developing machine learning-based edge computing methods to turn raw data into actionable intelligence quickly. This is key for real-time monitoring."

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*Founded in 1931 on the belief that the biggest scientific challenges are best addressed by teams, Lawrence Berkeley National Laboratory and its scientists have been recognized with 13 Nobel Prizes. Today, Berkeley Lab researchers develop sustainable energy and environmental solutions, create useful new materials, advance the frontiers of computing, and probe the mysteries of life, matter, and the universe. Scientists from around the world rely on the Lab's facilities for their own discovery science. Berkeley Lab is a multiprogram national laboratory, managed by the University of California for the U.S. Department of Energy's Office of Science.*



**Yuxin Wu**

Berkeley Lab scientist

Photo Credit: Berkeley Lab

## OFFSHORE WIND TURBINES FOR THE CVOW PILOT PROJECT ON THE WAY TO US

Dominion Energy and Ørsted have announced that the turbine components and monopiles for the Coastal Virginia Offshore Wind (CVOW) pilot project have started their journey to North America. The project team and vessel crews have been successful in navigating the impact of the worldwide coronavirus pandemic to keep the team safe and the project on schedule.

The foundations, consisting of the turbines' monopiles, transition pieces and anode cages fabricated by EEW SPC, have been loaded onto the Bigroll Beaufort cargo ship in Rostock, Germany. The components for the two, 6-megawatt Siemens Gamesa turbines were loaded in Esbjerg, Denmark, before the vessel embarked in mid-April on the approximately two-week transatlantic journey to Halifax, Nova Scotia, Canada.

"This is a monumental step toward the installation of the first offshore wind turbines in federal waters, which will deliver clean, renewable energy to our customers," said Mark D. Mitchell, Dominion Energy vice president of generation construction. "The construction of these two turbines will help us reach our goal for net zero emissions and position Virginia as a leader in offshore wind."

"This announcement marks yet another milestone in the U.S. offshore wind industry and reinforces Ørsted's leadership in facilitating a robust U.S. market," said Thomas Brostrøm, CEO of Ørsted North America Offshore. "Ørsted's experience and the hard work of its colleagues have made it possible to keep the project on time and on budget in spite of the disruption of global commerce."

"Even though this project consists of two monopiles and transition pieces, it has profound importance for the development of the U.S. offshore wind market, as this is the first project that successfully has passed all phases of BOEM approval," said Christoph Schorge, CEO of the EEW Group. "This milestone will pave the way for the large-scale commercial projects to follow. Both Dominion Energy and Ørsted are key developers in the U.S. and the collaboration on this project demonstrates the determination toward the rapid development of U.S. offshore wind."



» Photo credit: Dominion Energy

Installation of the two turbines, located 27 miles offshore, is expected to begin later this spring and they are expected to enter service by the end of the year. Onshore construction for the pilot project began last year in June to facilitate the interconnection of the turbines at a company substation near Camp Pendleton. At peak production, the pilot project will power 3,000 homes.

The CVOW pilot project was first announced more than two years ago and received approval in November 2018 from the State Corporation Commission. The construction process is on a strict timetable, in order to minimize environmental impacts to the sea bottom and aquatic life.

Also this month, Dominion Energy is conducting ocean surveys to map the seabed of the 112,800-acre lease area where the company's 2,600-megawatt CVOW project will be built beginning in 2024. These surveys will help the company determine potential impacts to ocean and sea life and will support the development of the project's Construction and Operations Plan to be submitted to the Bureau of Ocean Energy Management (BOEM) later this year.

Dominion Energy's offshore wind projects are part of the company's comprehensive clean energy strategy to achieve net zero carbon dioxide and methane emissions from its power generation and gas infrastructure operations by 2050. To accomplish this goal, the company is rapidly expanding solar and wind energy across Virginia, in partnership with zero-carbon nuclear and low-carbon natural gas. Additionally, the company is investing in renewable natural gas, battery storage, pumped hydroelectric storage and other resources that can support the intermittent nature of solar and wind.

For more information, visit  
[WWW.DOMINIONENERGY.COM](http://WWW.DOMINIONENERGY.COM)

## ONS 2020 CANCELLED DUE TO COVID-19

The Norwegian Authorities have prohibited all events of more than 500 people until 1 September 2020 due to the COVID-19 outbreak. As a direct consequence, the ONS Foundation is forced to cancel ONS 2020. For ONS, the decision is truly hard to take, but the health and safety of

all our visitors, exhibitors and other participants must be the number one priority. ONS gathers around 70000 people from over 100 countries during the four-day event. "It is with a heavy heart that we have to cancel ONS 2020. This is the first time in our 46-year-long history that we have been forced to cancel. ONS is of great importance for many; however, health and safety must come first," says CEO and President of ONS, Leif Johan Sevland.



# DNV GL TESTING METHODOLOGY FOR OIL & GAS INDUSTRY DIGITAL TWINS

DNV GL has issued an international call to oil and gas operators and the supply chain to pilot a methodology that will prove whether the data generated by digital twins can be trusted, and if the technology is delivering value.

Companies manufacturing hardware across the oil and gas value chain must prove the safety, quality and integrity of components, equipment and assets through recognised quality assurance principles. However, no standard process exists to provide the same mechanism of trust and value for digital representation of a physical asset and its behaviour.

DNV GL is developing and testing a methodology for the qualification of digital twins which will provide that assurance, and ultimately encourage wider adoption of the technology in the oil and gas sector. An initial partnership with TechnipFMC has led to the creation of the pilot, which is now being opened to the wider industry.

Digital twins are a rapidly developing technology widely expected to become a significant contributor to the future management of major industrial sites. The digital twin market is estimated to grow from USD 3.8 billion in 2019 to USD 35.8 billion by 2025.

DNV GL's Technology Outlook 2030, a research report identifying transformative technologies in key industries, highlights a digital value chain run by machines and algorithms as a prevailing trend for the oil and gas industry in the decade ahead.

The research expects cloud computing, advanced simulation, virtual system testing, virtual/augmented reality and machine learning will progressively merge into full digital twins which combine data analytics, real-time and near-real-time data on installations, subsurface geology, and reservoirs.



*Liv A. Hovem, CEO, DNV GL - Oil & Gas*

"Solving the digital trust challenge will be key to the dramatic evolution that we expect to see in digital twin technology in the years to come. If more sophisticated digital twins are to be widely accepted and developed at scale by the oil and gas industry, they need to be supported by accurate, valuable and trusted technology," said Liv A. Hovem, CEO, DNV GL - Oil & Gas.

"Technology decision-makers in our sector will increasingly offer support to the use of digital twins when they see the technology provide consistent, accurate information which brings tangible value against the investment needed. Our work with TechnipFMC and other partners through this new pilot aims to provide the industry benchmark to qualifying that a digital twin will perform as intended," Hovem added.

DNV GL's methodology will address the fact that many digital twins—some created at point of the construction or completion of a new

asset—currently represent an asset's initial form and struggle to reflect developments in their physical counterparts as the asset matures.

Digital twins must evolve, mature, and reflect the current condition of the real asset they represent. At present, the use of twins and trust in their accuracy is restricted by the fact that the data they contain does not always reflect the most up-to-date condition of the physical asset.

*Kjell Eriksson, Vice President, Digital Partnering, DNV GL - Oil & Gas*



"Our methodology is a process of providing evidence that a digital twin will provide valid information, predict system performance within well-defined limits and to a stated level of confidence over time. Following our process, you should have a twin that creates value, and that you can trust," said Kjell Eriksson, Vice President, Digital Partnering, DNV GL - Oil & Gas.

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# OCEAN DEMO AWARDS

## TO SUPPORT TO TEN OFFSHORE RENEWABLE ENERGY DEVELOPERS

The EU-funded Ocean DEMO project has awarded recommendations for support to ten offshore renewable energy developers under its 2nd call. The awards will support developers on their path to commercialization and ease the transition of ocean energy towards multi-device farms by providing free access to open sea test sites.

Funded by Interreg North-West Europe, Ocean DEMO is a €13 million project aiming to accelerate ocean energy's transition from single prototype to multi-device farms by providing free access to world-leading test centers: EMEC (UK), DMEC (NL), SEM REV (FR) and SmartBay (IE).

Successful applicants will receive free access to test their ocean energy products and services in real sea environments at the project's network of test centers. Technology developers can apply for support packages to test multi-device arrays or single devices looking to scale up to multi-device in the future.

The following technology developers were recommended for support packages

under the 2nd call by the Ocean DEMO Selection Board:

- AWS Ocean to deploy a scaled Waveswing wave energy converter at EMEC
- Dublin Offshore Consulting to test a scaled version of the Load Reduction Device on a mooring line at SmartBay
- EOLink to operate a 5MW floating wind demonstrator at SEM-REV
- Hydrogroup to demonstrate its innovative quick release connector at SEM-REV
- HydroWing to deploy the first scaled demonstrator of the HydroWing device at EMEC
- Ideol to monitor the mooring lines and umbilical systems of their floating offshore wind turbine at SEM-REV
- Nautricity to redeploy the CoRMaT tidal device at EMEC

Pytheas Technology to test an innovative PTO at SEM-REV

TFI to demonstrate a new elastomeric mooring component for floating offshore wind at SmartBay

WaveRam to deploy 2 scaled Waveram wave energy converters at SmartBay

The support packages will provide a real boost to technology developers by allowing them to test their pioneering ocean energy technologies at sea. It will also help them attract further investment and move along the path to commercialization.

Ocean Demo support is enabling our team to accelerate the development of the innovative HydroWing technology, through access to the world-renowned testing facilities and expertise at EMEC. This testing period will allow the demonstration of the HydroWing's cost, O&M and power reliability advantages and open the door to a pipeline of larger scale HydroWing deployments in the coming years.



# THE HELSINKI ENERGY CHALLENGE MARCHES ON

*Registration Phase of the Helsinki Energy Challenge Extended*

As disruptive as the novel coronavirus has been in recent months, it won't jeopardize Helsinki's commitment to combatting climate change and becoming carbon-neutral by 2035. This is the defiant message presented by organizers of the Helsinki Energy Challenge, a global competition designed to find the future of urban heating, which was launched in February this year.

The decision has been made, however, to extend the registration period for the Helsinki Energy Challenge to give sufficient opportunity for interested parties to get involved amid the current disruption caused by COVID-19. The registration phase will now run until 30 September 2020.

Registration remains open, inviting applications from consortiums, start-ups, more established commercial entities, research institutions, universities, research groups and individual experts. In fact, the only stipulation is that participants enter as a team. The challenge? To propose a practical means of decarbonizing Helsinki's heating system using as little biomass as possible. As if clean energy wasn't reward enough, the winning team will also be awarded the grand prize of one million Euros.

The City of Helsinki is very much seen as a guiding light in the fight against climate change and as such is committed to sharing the results of the competition openly, in the hope that other cities will benefit from implementing some of the proposed ideas in the future. Organizers feel strongly that the role of urban centers in reversing the current climate crisis is critical and that, even in these uncertain times, investing in climate initiatives must remain a priority.

## EQUINOR AND PARTNERS MAKE OIL DISCOVERY IN GULF OF MEXICO

Equinor and co-venturers Progress Resources USA Ltd and Repsol E&P USA Inc. have encountered oil in the Monument exploration well in the US Gulf of Mexico.

The Monument exploration well found approximately 200 feet (c. 60 meters) of net oil pay with good reservoir characteristics in Paleogene sandstone.

This provides an early indication of the productive reservoir interval at the well location. The well was drilled to a total depth of 33,348 feet (10,164 meters) using the Pacific Khamsin rig.

"We are pleased to have proved an accumulation of movable hydrocarbons in the Monument exploration well. However, determining the full potential of the discovery will require further appraisal drilling," said Bjørn Inge Braathen, senior vice president of Exploration in North America.



"Our competition got off to a great start at the end of February, and the reception has been overwhelmingly positive both in Finland and abroad. It is clear that we have started something unique. However, the changed world situation caused by the coronavirus comes at a difficult stage in respect to our competition. Innovators and potential competitors now need time to adapt to the new situation and prolonging the registration phase of the competition is necessary at this point. The competition process will remain otherwise unaltered. Despite the coronavirus, we need to stick to the climate goals. We still have to get rid of coal and we want to replace it with long-term sustainable solutions. We are fulfilling our responsibility in the fight against the global climate crisis and we will not let it wait until the coronavirus crisis has blown over. Both the Helsinki Energy Challenge and our other climate efforts continue at full strength", notes Helsinki Mayor Jan Vapaavuori.

During this extended registration phase, organizers will be hosting a series of webinars and other virtual events designed to give entrants ample opportunity to learn more about the competition and interact with peers. Those interested in participating are encouraged to form cross-disciplinary teams. Those selected to progress to the second phase of the competition will be announced at the beginning of November, with the overall winners revealed in March 2021.

To find out more about the revised competition schedule and further information about the Helsinki Energy Challenge: [www.energychallenge.hel.fi](http://www.energychallenge.hel.fi)

The Monument exploration well is located in the central US Gulf of Mexico. It is operated by Equinor (50%) with partners Progress Resources USA Ltd (30%) and Repsol E&P USA Inc. (20%).

Monument is Equinor's first operated exploration well in the US Gulf of Mexico since 2015.



» The Pacific Khamsin drilling ship.

# SMD DELIVERS DEEP DIG-IT TRENCHER TO VAN OORD



» DBT2400 Deep Dig-It by SMD.

Marine contractor Van Oord is due to complete final tests of its new Deep Dig-It trenching machine, designed and engineered in collaboration with world leading sub-sea technology experts Soil Machine Dynamics Ltd (SMD).

SMD delivered the Deep Dig-It to Van Oord in December 2019, loading it onto the MPI Adventure from the Swan Hunter dock in Tyne and Wear, UK. The team has since been testing the subsea Deep Burial Tractor 2400 (DBT2400), ahead of deployment to the HKZ Offshore Wind Farm in The Netherlands.

Once deployed, the Deep Dig-It will lay and bury four export cables deep underwater, running from the windfarm to shore, via the busy Rotterdam Maasmond shipping lane. Installation of the new cables into the North Sea seabed will begin in July 2020.

The new Deep Dig-It is a so-called "Tracked Remotely Operated Vehicle" (TROV), which drives unmanned over the seabed, creating a deep trench for the

cables, while simultaneously inserting the cables and then closing the trench again. Significantly, it is the largest and most powerful machine in its class. Delivery of Deep Dig-It follows the successful deployment of SMD's QTrencher 1600 on Van Oord's latest offshore wind projects.

The DBT 2400 can achieve a 5.8 m trench depth and represents an advancement in cutting technology which has changed the way the industry approaches difficult seabed conditions. A powerful variation from SMD's Burial Tractor (BT) range, the vehicle is equipped with the latest advancements in chain cutting technology, housing a 5.8 m jetting and cutting tool. In addition to the 2400hp of power housed within the DBT2400, additional surface located water pumps feed the jetting and cutting to enable this impressive trench depth.

Paul Davison, Managing Director of SMD's Equipment Business commented, "This 5.8 m jetting and cutting tool is the deepest cutting tool that SMD have ever supplied. Van Oord approached us

with their contract requirements, and we have worked in collaboration with them to develop a unique and cable friendly solution. Van Oord are one of the most experienced marine contractor in the offshore wind industry and we are delighted to supply them with this second piece of kit to further strengthen their trenching capability."

SMD Services' dedicated customer training team have delivered bespoke training courses to ensure Van Oord's operational team are equipped with the necessary operating skills to get the best out of their machine. Alongside the trenching equipment, SMD Services have supplied critical spares for use during trenching campaigns. SMD's specialist team of Offshore Support Engineers have accompanied Van Oord during testing of the vehicle, to offer support and assistance to the crew.

For more information, visit  
[WWW.SMD.CO.UK](http://WWW.SMD.CO.UK)

# VIDEORAY AND DEPRO PARTNER FOR LIGHTER, LESS EXPENSIVE UNDER- WATER OPERATIONS EQUIPMENT

Depro AS and VideoRay LLC have jointly announced a new partnership to develop and field lighter and less expensive equipment for underwater operations, primarily in the oil and gas sector.

Depro AS, with headquarters in Bryne, Norway, is a leading Engineering, Procurement, Construction (EPC) supplier with expertise in building remotely operated tools used in underwater operations for offshore oil and gas production. Ninety percent of Depro's customers are outside Norway.

VideoRay LLC is the global leader in inspection-class remotely operated vehicles (ROVs). VideoRay's Mission Specialist Technology is a customizable and flexible platform that uses a system of interchangeable, modular components. The philosophy behind the Mission Specialist approach is fitting each system to the exact sensors, tools, depth rating, and thrust needed for the job at hand, rather than retrofit accessories to a standard ROV.

With its new partnership, both companies are expanding the capabilities of companies in the oil and gas sector to inspect and clean their underwater assets rapidly, effectively, and at a much lower cost.

VideoRay and Depro are working under the VideoRay Integrator program, which empowers partners to develop and customize Mission Specialist technology to meet specific customer missions. Depro is VideoRay's first Offshore Oil & Gas Integration Partner.

"We believe the collaboration will strengthen the companies' position globally," said Kåre Stokkeland, CEO of Depro AS.



"These are two companies that fit well in terms of both size and complementary technology. We have already sold the first ROV solution based on both technologies to a large customer."

Stokkeland believes strongly that the collaboration will result in new, attractive solutions that can challenge traditional ways of handling subsea operations, and which will be both simpler and significantly more affordable for operators and service companies.

"Our new partnership with Depro AS will result in the development of submersibles that will not only be lighter and easier to use, but will also be far most cost effective," said Scott Bentley, CEO of VideoRay. "In addition to the oil and gas industry, this collaboration will benefit other commercial and private customers. Our Mission Specialist systems were designed to be expanded by companies like Depro, and we're excited by what we've fielded so far, and the acceleration of this adaption for specific challenges and missions."

For more information, visit  
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## FUGRO WINS ROV AND SURVEY SUPPORT CONTRACT WITH GLOBAL MARINE GROUP

Fugro has secured a long-term contract for two remotely operated vehicles (ROVs) and a full survey positioning package on Global Marine Group's (GMG's) newly chartered vessel, the Normand Clipper. GMG are in the process of upgrading the Normand Clipper in preparation for projects this summer and both the ROV systems and

the survey package will be installed ready for future operations from Fugro's remote operations centre (ROC) in Aberdeen, Scotland. As part of the contract, Fugro will provide two Fugro core vehicles (FCVs) from their FCV600 model portfolio. The FCV600 is a versatile work-class ROV (WROV) and will allow Fugro to support the Normand Clipper across a range of operations, with primary focus on subsea cable-laying for the offshore utilities and renewables markets. The FCV600 model can be fitted with a custom-built tracked skid, which improves operability by up to 30% in strong currents compared to free-flying ROVs.

## BAE SYSTEMS TARGETS INCREASING EFFICIENCIES IN THE DEPLOYMENT OF UUVS

Back in June 2019, BAE Systems Inc. acquired the key assets of Riptide Autonomous Solutions, the Massachusetts-based provider of innovative, affordable unmanned underwater vehicle (UUV) technology and solutions. The Riptide team were quickly incorporated into the defence contractor's FAST Labs organization, an incubator that looks to transition and scale breakthrough technologies to the Allied Naval Forces.

While still a relatively small company, founded in 2015, Riptide was able to quickly establish itself as a disruptor in the growing field of UUVs, so it's not hard to see what attracted BAE Systems to the deal. The synergy was natural; Riptide had developed an electro-mechanically efficient architecture that simplifies vehicle design and enables strategically meaningful endurance, and this made them the perfect addition to BAE Systems' expanding sensor, processing, communications, and autonomy software development capabilities.

### Efficient Endurance

Greater endurance at a lower cost is the key to extending the reach of ocean exploration, and this can only be good news for industry, academia, and defence markets alike. UUV applications vary enormously across markets, naturally, but BAE Systems clearly recognizes that by developing a modular, scalable, and flexible platform, almost any mission payload can be integrated into a vehicle to satisfy specific end-user requirements.



» BAE Systems' Riptide family of autonomous undersea vehicles can be easily and affordably scaled and customized to solve undersea challenges.



» By combining best-in-class hydrodynamics, ultra low-power processing, and game-changing compact payloads, BAE Systems aims to bring next-generation capability to the undersea vehicle market.

The wider industry adoption of UUV technology is, however, contingent on the manufacturer's ability to manage platform cost (not just extend its performance) and, to that end, the team at BAE Systems is working closely with payload developers to field new capabilities, with a particular emphasis on more compact, affordable, and efficient solutions.

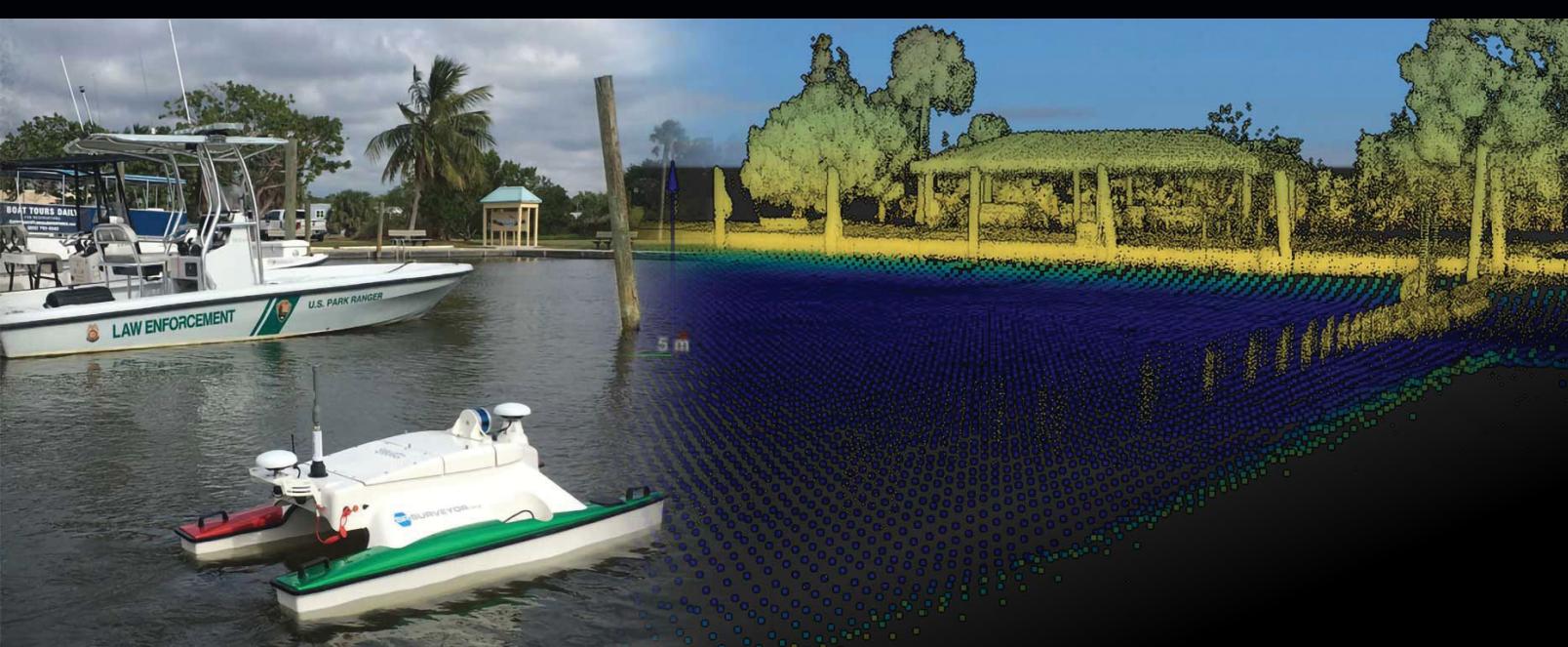
### UUVs for Mine Countermeasures

One emerging area of interest is how the "Riptide family of autonomous underwater vehicles" can support Mine Countermeasures (MCM) operations. The diameter of today's MCM UUVs are determined by the legacy programs of record, but there is, again, an opportunity for efficiencies in terms of cost and endurance. BAE Systems' objective remains to provide the modern-day warfighter with the tools needed to accomplish the mission, and this means leveraging the logistical and operational advantages associated with smaller diameter UUVs. By reducing the logistics footprint and increasing the performance capabilities, at a cost advantage, the firm strongly believes it can enable MCM and EOD missions.

So, in less than a year, much has been achieved. And the future looks bright. BAE Systems is making a sizable investment in developing a new UUV prototyping facility in Plymouth, MA and this, alongside the ongoing investments in the people and processes needed to develop game-changing technology, outlines the company's intention to develop a broader mission space for UUVs.

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# KRAKEN AND GREENSEA SYSTEMS ADVANCING MARINE ROBOTICS

Kraken Robotics Inc. has entered into a Partnership Agreement with Greensea Systems, Inc., creator of OPENSEA, an open architecture robotic platform. This partnership will expand upon the collaborative efforts already undertaken between the two companies to rapidly advance the capabilities of marine robotics. Under the agreement, Greensea will support development, integration, and testing work with Kraken across several of Kraken's technology platforms.

The companies have worked together over the last twelve months to utilize the OPENSEA Platform and provide a robust, modular, and extensible software architecture for Kraken's autonomous underwater vehicles and towed systems.

This Partnership Agreement simplifies contracting between the companies and allows for ongoing collaboration for software and hardware technologies. Greensea will support Kraken in maturing ongoing programs and accelerating new commercial offerings, including supporting Kraken's R&D programs under the scope of the OceanVision project.



» Kraken's SeaVision 3D Underwater Laser Scanner integrated onto the Greensea Hull Crawler, with foam to maintain neutral buoyancy.

The companies also intend to work together specifically in the areas of seabed residency and hull inspection and have already demonstrated successful efforts by integrating Kraken sensors into the Greensea OPENSEA Platform and Greensea hardware products, including the newly developed Greensea Hull Crawler system. The first phase of this work was completed in February 2020, with the integration of Kraken's SeaVision® 3D RGB Underwater Laser Scanner into a prototype of the Greensea Crawler (see below). The system was fielded in Florida and demonstrated inspections of a real-world vessel.

## Kraken Management Quote

Karl Kenny, Kraken's President & CEO stated: "We originally began working with Greensea in 2018, when we were looking to expand the capabilities of our ThunderFish® AUV platform. Throughout that project, I was very pleased to observe how well our teams worked together, the synergies between culture and capability, and to see the full capabilities of the Greensea software architecture in action. Since then, we have expanded our work together to include the KATFISH™ system, and integration of our SeaVision® laser scanner. This partnership agreement will allow Kraken to engage Greensea in a larger capacity and enables a framework for ongoing collaboration and cooperation."

For more information, visit  
[WWW.GREENSEA.COM](http://WWW.GREENSEA.COM)  
[WWW.KRAKEN.COM](http://WWW.KRAKEN.COM)



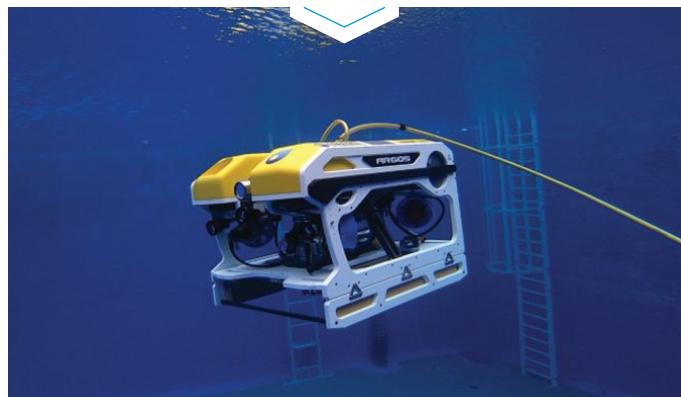
» Greensea Crawler & Kraken Seavision scanner on ship hull.

# FORSSEA ROBOTICS' SMART ROV FOR PLUG & PLAY USV INTERFACING

Forssea Robotics' standard ARGOS version currently comes with "smart" piloting modes including latency management, auto-diagnosis features, dynamic positioning which is based on visual, acoustic and/or Inertial Navigation System/Doppler Velocity Log (INS/DVL) sensors and GO-TO features. Visual docking can be used to safely dock the ROV back inside its Tether Management System (TMS) especially in challenging weather conditions.

In addition to the Smart Piloting modes of ARGOS, the base system is supplied with a Transmission Control Protocol/Internet Protocol (TCP/IP) surface control unit and therefore is perfectly adapted to be installed on an Unmanned Surface Vessel (USV) with the capacity to perform either full autonomous operations or through the use of remote piloting from an on-shore control center.

Gautier Dreyfus, CEO of Forssea explains, "We believe that the home for resident ROVs is not the seabed but USV. The requirements are similar: long immersions cycles and all electric design to



» Photo credit: Forssea Robotics.

reduce maintenance, supervised piloting mode with low latency, and autonomous features to deal with communication loss and pre-programmed operations such as pipe survey or asset inspection."

For more information, visit  
[HTTPS://YOUTU.BE/1JYE4EST73I](https://youtu.be/1JYE4EST73I)  
[WWW.FORSEAROBOTICS.FR](http://WWW.FORSEAROBOTICS.FR)



» BlueROV2. Photo credit: Seaview Systems



## SEAVIEW SYSTEMS POWERS UP BLUEROV2

A custom upgraded BlueROV2 vehicle powered by six batteries linked together by SeaView's groundbreaking new MBM-150 Multi-Battery Manager recently enabled completion of a survey of a restricted access treated water sewer tunnel.

The target of the survey was too constricted for access by a Seaeye Falcon or any other observation class ROV. Using the BlueROV2 also allowed for a much more efficient, streamlined, and low-cost mobilization, transport, and demobilization than would ever have been possible with a larger ROV such as the Falcon, even without the prohibitive 24" diameter restriction.

"The BlueROV2's ease of mobilization & deployment makes loading out for a job incredibly efficient, Operations Manager Geoff Cook said. "Also, the extra battery power made possible by our MBM-150 battery manager meant to not having to rush the inspection due to worries about running out of power. The ability to able to take the time to do a thorough inspection and cover all the bases without having to keep a constant eye on a quickly draining single battery is invaluable."

For MBM-150 Multi Battery Manager details and ordering info visit <https://www.seaviewsystems.com/products/blue-robots-bluerov2-and-accessories/multi-battery-manager/>

# "NOW MORE THAN EVER, WE NEED TO KNOW HOW OUR NETWORKS WORK"

By John Manock, SubCableWorld Editor and Subsea Cable Consultant



***Editor's Note:** Submarine cables are a critical infrastructure even during normal times, but as the world deals with COVID-19, the global submarine fiber optic cable network takes on an even greater importance.*

As SubCableWorld has noted, the U.S. government has identified workers at submarine cable landing stations and cable depots, as well as crews aboard cable ships, as essential during this crisis because making sure that global Internet traffic continues to flow is paramount.

With this backdrop, we wanted to speak with Gil Santaliz, CEO of NJFX, which operates a combined cable landing/colocation campus in Wall, New Jersey. We wanted to get his views on how the pandemic is impacting his company, especially given its proximity to New York State, which has been hard hit by COVID-19, and New York City, with its massive telecom market, as well as the broader questions of disaster recovery and the activity level of the industry. The following are his comments:

**Mr. Santaliz:** NJFX is still working in this time of crisis. We're not on lockdown, we're installing customers every day. In fact, there are three major installations going on right now [at the

time of the interview]. We're at Stage Yellow, as we call it. We're monitoring the movement of people more closely.

Inside, what we've done is taken extra precautions to separate employees from vendors coming into the building—separate bathrooms, run temperature checks for people coming in, filling out forms explaining that you've not been exposed to anyone with COVID-19. We've taken lots of precautions. We got lucky because the building was designed in such a way that you don't touch anything when you come in—it's all card keys with automatic faucets, soap dispensers, hand dryers, etc. I'm not going to say it was done on purpose, but we're lucky that there are not a lot of surfaces that you touch at NJFX, so everyone goes straight to their space and when you finish your work, you leave the building.

What we're seeing during this pandemic is that every multinational organization has put in place their disaster recovery (DR) plans.

Their employees are working either from their homes or are being asked to go to their DR sites. They're creating quadrants of employees; basically telling them who goes where and we're seeing this at NJFX. We're seeing traffic being re-routed. How do I get that DR site the kind of IP it needs? Remember, those sites really were meant to be a place to work from for two or three days, not three or four months.

In the 1990s, companies like Comdisco existed and they were the places that people could go to for a day or two. Hurricane Sandy taught us that this could last for a long time and that was eye-opening – wow, it lasted two weeks. And now the game plan is "where do I go for the next three months?" You have to re-route traffic and it has to be working from the DR sites. Or, if you have your employees at home, did you ever plan for your New York employees to interact with your Frankfurt and London offices, but they're all going to be at home? It still needs to be secure. It still needs to go through a centralized data center on both sides of the pond. Again, all of the employees have to get into those data centers and then go across the cables between Europe and the United States.

Did they know how their networks were orchestrated so they could change them? If you have an international or domestic issue, but you don't know how your network works or you don't know which cable your traffic uses, you really can't make decisions on re-orchestrating what you have. Now more than ever, we need to know how our networks work. You know you have cable diversity terrestrially and you know you have cable diversity at the subsea level, but if New York City will be suffering potential issues for a period of time and you have to re-route your traffic, what do you do? Do you know who to call and that they are going to do it? Hopefully, you will because someone thought "I may need to do this someday" and put it into the agreements and built it into the infrastructure so that it could be done dynamically or by dialing in because guess what, I can't travel to NYC anymore. I'm not allowed to go in and move things around. I can't coordinate the way I did before. So, your plan had to think that through – that people can't move around easily any longer.

Unfortunately, things are not going to get better. Are you ready to lose a major PoP and if you do, can the other PoPs take over? The example that keeps coming up is NYC. It survived 9/11 and back then we were all focused on it. We said we can never let that happen again. So, many of the data centers went to New Jersey. Then Hurricane Sandy happened, and we said we have to make sure we have alternate sites and alternate ways to do things. But they left all of the international communications - the subsea systems and backhaul - in NYC. The data was sitting outside NYC, but all the important interconnection points for the global networks were left in Lower Manhattan. Now, once again we have a major issue where getting to Lower Manhattan is a problem and the legacy subsea systems, the ones built between 1999 and 2004, are still handing off 85% of their traffic through Lower Manhattan.

We have several customers that have been quick on their feet. For example, Aqua Comms has a wholesale model only, as opposed to others. The benefits of that is that if you sign a contract with three or four national providers that come into NJFX, then you can have thousands of customers running across the Havfrue transatlantic system in a couple of days. They have the MSA paperwork with everyone, they have the backhaul – it's all in place.

We also have a customer, Bulk Infrastructure, who has large customers via a spectrum ownership model. They turn up those customers and they're up and running in just a matter of days because of the scale of their operations. Bulk has been public about Amazon Web Services being their customer and Aqua Comms is the landing party for its partners, such as Facebook and Google on the Havfrue system, and can also turn their capacity on immediately.

Migrating customers from one cable system to the next requires lots of planning. TAT-14 will be retired at the end of the year, so everyone is planning on moving their capacity over. The natural cable that they'd move it to is Havfrue/AEC-2, because it lands in the same place in Denmark so you can use the backhaul and your existing systems. All you have to do is take your couple

of hundred Gigabits and find a home on Havfrue through Aqua Comms or Bulk and off you go.

The other cables that land at NJFX are TGN-1 and TGN-2. They were built by TyCom back in 2004. They have thousands of customers and Terabits of capacity, but it's no secret that most of that capacity goes through NYC. Seabras-1, a Seaborn cable of which TI Sparkle owns half of the fibers, runs to Brazil non-stop bypassing the hurricane activity in the Caribbean, but they too initially had all their traffic going to NYC. Now, they're handing off traffic at NJFX, rightfully so, because we have a community of carriers that can buy from there. As mentioned, we also have the Havfrue cable that is going RFS soon. They have their gear ready to go at NJFX so they can offload customers by working with their carrier community.

Meanwhile, NJFX is prepared and working through this crisis and helping our carrier and subsea clients augment network architectures where needed. We're still active, still working, nothing has changed. We're just monitoring more closely across every level.



*Gil Santaliz is the Founder and CEO of NJFX, as well as the visionary behind developing NJFX as North America's preeminent international hub for subsea communications, interconnecting many international carriers across three continents with multiple predictable, private backhaul and U.S. termination options.*

# SUBSEA POWER CABLES: A CRITICAL LINK IN THE U.S. OFFSHORE WIND SUPPLY CHAIN

The Business Network for Offshore Wind recently partnered with SubCableWorld, the data and information source for the submarine cable industry, to release a new white paper, Forecasting the Next Decade of US Offshore Wind Cable Demand, that suggests demand for submarine cables to offshore wind farms in the U.S. could surpass 13,500 kilometers by 2030, at least an \$8 billion market.

The news comes amid growing commitment by the Northeastern states to develop offshore wind in the U.S. under an ambitious and encouraging timetable. Questions remain, however, about the urgent need to develop a robust wind cable supply chain that can satisfy the long-term demand for cable and installation services.

"Tomorrow's offshore wind farms electricity infrastructure will bring hundreds of jobs and manufacturing opportunities to America's shores," said Liz Burdock, president and CEO of the Business Network for Offshore Wind. "The offshore wind industry is a blossoming new market opportunity worth millions of dollars – modeling future demand will allow the U.S. to plan for future production and infrastructure."

The white paper, published by SubCableWorld, provides in-depth data and analysis to help companies and policymakers scale



the opportunity and challenge ahead. All forecasts are based on SubCableWorld's proprietary model for calculating offshore wind cable demand, the methodology of which is detailed in the report, and there are a number of plausible scenarios that could play out over the coming years. As the white paper describes, the compound annual growth rate of demand for subsea cables for U.S. wind farms could approach 11 percent per year from 2019 to 2030.

"Our model projects three possible scenarios in the U.S. over the coming decade, the first of which assumes a baseline demand built around state procurement commitments and lease awards to date," said John Manock, editor of SubCableWorld. "The second and third factor in additional state procurements and varying timetables for floating wind deployment."

To find out more and to purchase the report visit  
[WWW.SUBCABLEWORLD.COM](http://WWW.SUBCABLEWORLD.COM)

## DEMAND FOR PURPOSE-BUILD CABLES FOR DRONES AND ROBOTIC VEHICLES

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### Application:

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- Environmental monitoring
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- Protection and surveillance activities
- Search and rescue operations

Specialist in custom cable design and manufacturing for advanced technology since 1975, NOVACAVI develops these application-specific cables entirely tailored to customer's requirements with engineering expertise, comprehensive knowledge of materials and a high degree of manufacturing.

For more information visit [WWW.NOVACAVI.IT](http://WWW.NOVACAVI.IT)

# TRELLEBORG TO SUPPLY CABLE PROTECTION SYSTEM FOR HORNSEA TWO

Trelleborg's applied technologies operation has been awarded a contract by leading renewable energy provider, Ørsted, to provide four integrated cable protection systems for Hornsea Two, the world's largest offshore windfarm. Trelleborg's NjordGuard cable protection system will be used to protect the inter array power cables from fatigue, over-bending and abrasion, at the entry point of the monopiles.

Andy Smith, Product Group Manager for renewables at Trelleborg's applied technologies operation, states: "Trelleborg's NjordGuard provides lifetime protection of the cable at the critical monopile entry point and is easy to both install and remove without diver intervention. We are extremely pleased that Ørsted has selected Trelleborg to supply NjordGuard for Hornsea Two and welcome the opportunity to continue our successful relationship."

Patrick Harnett, Senior Program Director for Hornsea Two, said: "In our continued bid to support and promote a strong national supply chain, we are pleased that Trelleborg's product will be made locally in the North of England. Once complete, Hornsea Two will be the world's largest offshore wind farm and it is important to us at Ørsted that where possible, we are able to utilize UK industry for the manufacturing

and fabrication of components for this global accolade."

Design, testing and manufacture of the NjordGuard cable protection system will take place in Trelleborg's state-of-the-art manufacturing facility in the North of England. Project engineering works will commence immediately, with installation activities scheduled for execution in 2021.

Daniel Bate, Sales Manager for renewables at Trelleborg applied technologies operation states: "We are very proud to be a part of this prestigious project, in addition to the recent contract award of Greater Changhua 1 & 2a. We look forward to supporting this and future projects as part of our six-year framework for the supply of our NjordGuard cable protection systems."

NjordGuard is an integrated cable protection system, designed and developed to protect offshore windfarm

and substation static power cables from over-bending, fatigue, abrasion and impact, in both monopile and J-tube applications. NjordGuard has an innovative design that protects the cable both during installation and throughout life. The product can be easily configured and is suitable for any diameter of cable. NjordGuard can be easily installed, removed and reused without the need for Remotely Operated Vehicles (ROVs) or diver intervention, using a patented field-proven ball and groove connector technology.

Hornsea Two comprises of 165 turbines will provide a combined total capacity of 1.4 GW. Located in the North Sea, 89 kilometers off the Yorkshire coast of the UK, Hornsea Two will provide green electricity to well over 1.3 million homes and is set for completion in 2022.

**WWW.TRELLEBORG.COM/APPLIED-TECHNOLOGIES**



» Photo credit: Trelleborg's NjordGuard cable protection system.

## PRYSMIAN'S LEADERSHIP INVESTMENTS

The Prysmian Group's leadership team has informed the Company that it has accepted the Chief Executive Officer's proposal to invest 50% of its net incentive—granted for the positive performance achieved at the level of 2019 results, in line with the objectives set by the Company—in shares of Prysmian S.p.A.

The incentive will fall due in late May 2020, following the approval of the Financial Statements by the Shareholders' Meeting of 28 April.

The scheme that the leadership team will use to execute the investment will involve giving instructions to purchase shares of the Company on the market to a specifically authorized financial intermediary. These instructions will also include an order to hold the shares purchased in portfolio until the end of 2022.

# COOPERATIVE DEPLOYMENTS: AN INDISPENSABLE TOOL FOR PREPARING FOR THE HIGH-END FIGHT

By David Wallsh and Eleanore Douglas, via CIMSEC



» ATLANTIC OCEAN (Sept. 16, 2019) The Spanish navy Álvaro de Bazán-class air-defense frigate *ESPS Álvaro de Bazán* (F 101) transits the Atlantic Ocean before participating in Spanish Naval Exercise Maritime Surveillance (MARSUR) 2019 with the Arleigh Burke-class guided-missile destroyer *USS Porter* (DDG 78), Sept. 16, 2019. *Porter*, forward-deployed to Rota, Spain, is on its seventh patrol in the U.S. 6th Fleet area of operations in support of U.S. national security interests in Europe and Africa. Photo credit: Photo by Petty Officer 3rd Class Timothy Keown.

Chief of Naval Operations (CNO) Admiral Gilday's December 2019 Fragmentary Order (FRAGO), "Design for Maintaining Maritime Superiority," emphasizes the importance of building alliances and partnerships to enhance U.S. warfighting capability, with a particular focus on "full interoperability at the high end of naval warfare." This objective is critical—Washington's ability to credibly threaten combined warfare across the full range of the competition to conflict spectrum enhances its ability to deter war and improves its ability to win if forced to fight one.

The U.S. Navy's Cooperative Deployment Program (CDP), a framework for integrating partner nation (PN) navy units into deploying U.S. Navy strike groups, offers a particularly valuable instrument for advancing this goal. The Navy has many security cooperation tools for advancing interoperability, to be sure, but there is little substitute for months-long, real-world deployments. The Navy should therefore think creatively about how best to adapt this pre-2018 National Defense Strategy

(NDS) program to the demands of the era of great power competition.

## DEPLOYING FOR THE HIGH-END FIGHT

Cooperative deployments come in many flavors. At the advanced end of the spectrum, cooperative deployers participate in pre-deployment planning, training, and all or part of a real-world deployment. These highly integrated deployments tend to include traditional NATO allies.

The Royal Danish Navy (RDN) frigate HDMs Peter Willemoes' 2017 cooperative deployment with the USS George H.W. Bush Carrier Strike Group (GHWBCSG) provides an illustrative example. The Willemoes deployed with the GHWBCSG in the U.S. 5th and 6th fleet areas of operation (AO) from February to May 2017, but integration efforts began much earlier. Beginning in early 2016, RDN personnel participated in staff talks, the GHWBCSG commander's conference, and synthetic training. In December 2016, the Willemoes physically participated in the

GHWBCSG's pre-deployment composite training exercise (COMPTUEX). Willemoes commanding officer (CO) Commander Bo Overgaard later concluded, "Looking back at the start of the deployment...What we, the Royal Danish Navy, have learned and gained from being part of [GHWBCSG] most likely could not have been achieved anywhere else."



» Nato Flag.

Cooperative deployments such as that of the Willemoes are ideally suited to advancing the CNO's vision of full interoperability for high end warfare, but the Navy should not lose sight of the value of providing partners with opportunities

for smaller-scale integrated deployments. Indeed, CNO Gilday's FRAGO also reminds us that, "Though we are not exchanging fire with our competitors, we are battling for influence and positional advantage today." The CDP thus derives considerable value from its scalability. In late 2018, for example, the forward-deployed Ronald Reagan CSG conducted multiple weeklong mid-deployment integrations with Japan Maritime Self Defense Force (JMSDF) warships, including with the destroyer JS *Kirasame* in October and with the helicopter destroyer JS *Hyuga* one month later.

These are only a few examples of the ways in which the CDP provides essential value for advancing the CNO's recent warfighting guidance. Cooperative deployments, if pursued strategically, are uniquely capable of preparing the Navy for the fights of both today and tomorrow.

For today's challenges, cooperative deployments increase the power of U.S. Navy units putting out to sea right now. Many of U.S. allies possess valuable niche capabilities in which they have prioritized investments, while others may be more accustomed to operating in environments where the U.S. Navy is less experienced. Before the Harry S. Truman CSG in 2018 became the first U.S. aircraft carrier to operate in the Arctic in thirty years, for example, the Norwegian frigate HMNoS *Roald Amundsen* joined her for months of pre-deployment planning and training. Truman CSG CO Rear Admiral Gene Black later said of his time in the High North, "the Norwegians went out of their way to partner with us...one of their frigates joined my [CSG] and operated with every bit of the intensity and professionalism of one of our ships. And it was an absolute highlight that we could show up, never having operated together, and come together and operate at the highest level and in one of the most demanding environments that we could face."

Deploying with partner nation ships in formation can also free up scarce U.S. resources for national tasking. This gives a commander flexibility to dispatch a ship for missions she might not otherwise pursue or to fill unexpected gaps. When the USS Fitzgerald collided with a Philippine container ship in June 2017, the New Zealand frigate HMNZS *Te Kaha* "flawlessly transitioned to help provide

security and protection as part of the Nimitz Carrier Strike Group," according to CNO Admiral John Richardson.

As for the future, cooperative deployments are uniquely positioned to advance CNO Gilday's objectives for high-end interoperability. Combined planning, training, and deployment over extended periods of time provide all parties involved with unparalleled opportunity to test and advance the limits of integration. It allows sailors time to identify and resolve kinks in systems linkages, to learn about one another's planning processes, doctrine, and capability, and to work through the human factors of building trust, language, and cultural proficiency. The real-world stakes of a deployment, moreover, provide a critical forcing function for problem-solving in the face of the unexpected.

Still another distinct advantage—both for today and tomorrow—involves the strategic messaging opportunity to showcase partners' willingness to stand shoulder-to-shoulder with the United States military in real-world conditions. Strong alliances and partnerships constitute one of the United States' most important assets in the battle for influence and strategic position that CNO Gilday describes. In this context, cooperative deployments involving, say, drills in the

South China Sea with the Royal Navy or aerial operations in the Arctic with the Norwegians send a more powerful message than Washington sailing alone. Conversely, they can also provide Washington with a bellwether to understand the limits of some relationships. Last summer, for example, the Spanish frigate ESPS *Mendez Nunez* detached from the Abraham Lincoln CSG when Washington deployed it to the Middle East in response to rising tensions with Iran.

## RECOMMENDATIONS

In light of the value proposition described above, we submit the following recommendations for adapting cooperative deployments to the goals of the CNO's *Design* and the era of great power competition more broadly.

First, the Navy should explore creative variations on cooperative deployment execution. The Navy should strive to integrate its ships into select partner nation deployments just as it recruits others to join its own. These deployments would send the important strategic message that the U.S. is willing to support its partners in the same way they support the U.S., while enhancing the U.S. Navy's future combined warfare capabilities. France recently deployed the Charles de Gaulle aircraft



» SOUDA BAY, Greece (Oct. 1, 2019) Sailors man the helm in the pilot house as the Arleigh Burke-class guided-missile destroyer USS Lassen (DDG 82) arrives in Souda Bay, Greece for a scheduled port visit, Oct. 1, 2019. Lassen, homeported in Mayport, Fla., is part of the East Coast Surface Action Group (SAG) and is operating in the U.S. 6th Fleet area of responsibility as part of a scheduled deployment and will conduct routine maritime security operations, improve interoperability and engagement with allies and partners and demonstrate the combat power flexibility of naval forces.  
Photo Credit: Petty Officer 2nd Class Tamara Vaughn.



» CORAL SEA (July 11, 2019) The U.S. Navy Nimitz-class aircraft carrier USS Ronald Reagan (CVN 76) leads a formation of 17 other ships from the U.S. Navy, U.S. Coast Guard, Royal Australian Navy, Royal Canadian Navy and Japan Maritime Self-Defense Force (JMSDF) during Talisman Sabre 2019. Talisman Sabre 2019 illustrates the closeness of the Australian and U.S. alliance and the strength of the military-to-military relationship. This is the eighth iteration of this exercise. Photo credit: Petty Officer 3rd Class Jason Tarleton.

carrier to the Eastern Mediterranean with the Hellenic Navy frigate HS *Spetsai* among its escorts.

Second, the Navy should adhere to a minimum definition of what constitutes a cooperative deployment. A cursory internet search of the term yields press releases of engagements ranging from the Willemoes' approximately year-long effort to plan, train, and deploy with the GHWBCSG in 2016-2017 and Japan's various week-long integrations with the Reagan CSG in 2018 to various instances of what appear to be single-day training events with other partners. We recognize that the CDP derives value from its flexibility, but if every engagement is a cooperative deployment then nothing is a cooperative deployment, and that will dilute much of the substance of what makes cooperative deployments valuable in the first place. If the U.S. Navy wants to drive toward "full interoperability at the high end of naval warfare," it must be honest with others and itself about what it takes to get there.

Lastly, the Navy should deepen the complexity of cooperative deployments with key allies in the Indo-Pacific Theater. Washington has a number of treaty allies in that region, many of whom operate U.S. military equipment and enjoy longstanding information sharing agreements with the United States. This goal may be easier said than done, but for the era of long-term competition it represents an important north star toward which to chart a course.

## CONCLUSION

CNO Gilday's FRAGO directs the Navy to prepare for tomorrow while working with what it has today. Cooperative deployments are a critical variable in that equation, and the Navy should continue to pursue them in the present while ringing the bell about what agreements it needs to begin negotiating now in order to advance them in the future. Doing so will sharpen an important and in many ways unique tool through which to pursue full interoperability with U.S. allies and partners for the high-end fight.

*Dr. David Wallsh is a research analyst at the Center for Naval Analyses (CNA), where he specializes coalition operations, security cooperation and Middle East security. He earned his PhD in International Security at the Fletcher School of Law and Diplomacy at Tufts University.*

*Dr. Eleanore Douglas is a research analyst for CNA's Strategy and Policy Analysis team, where she specializes in security cooperation, strategy and defense planning. She earned her PhD in Public Policy from the LBJ School of Public Affairs at UT Austin.*

*The views expressed in this article are theirs alone and do not reflect the official policy or position of CNA, the Department of Defense, or the U.S. government.*

# IRANIAN VESSELS CONDUCT UNSAFE INTERACTION WITH U.S. NAVAL FORCES

On April 15, eleven Iranian Islamic Revolutionary Guard Corps Navy (IRGCN) vessels repeatedly conducted dangerous and harassing approaches of the USS Lewis B. Puller (ESB 3), USS Paul Hamilton (DDG 60), USS Firebolt (PC 10), USS Sirocco (PC 6), USCGC Wrangell (WPB 1332) and USCGC Maui (WPB 1304) while the U.S. vessels were conducting joint integration operations with U.S.

Army AH-64E Apache attack helicopters in the international waters of the North Arabian Gulf.

The IRGCN vessels repeatedly crossed the bows and sterns of the U.S. vessels at extremely close range and high speeds, including multiple crossings of the Puller with a 50-yard closest point of approach (CPA) and within 10 yards of Maui's bow.

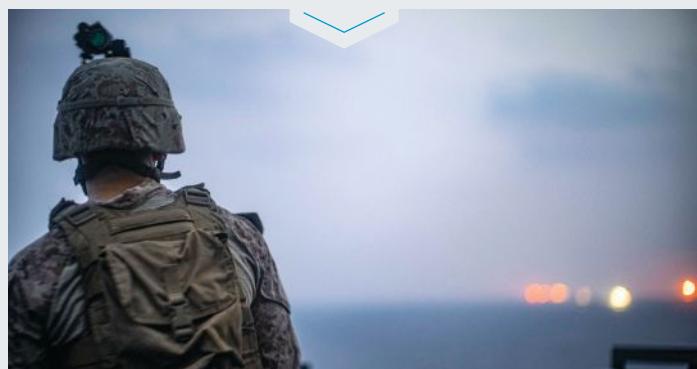
The U.S. crews issued multiple warnings via bridge-to-bridge radio, five short blasts from the ships' horns and long-range acoustic noise maker devices, but received no response from the IRGCN.

After approximately one hour, the IRGCN vessels responded to the bridge-to-bridge radio queries, then maneuvered away from the U.S. ships and opened distance between them.

The IRGCN's dangerous and provocative actions increased the risk of miscalculation and collision, were not in accordance with the internationally recognized Convention on the International Regulations for Preventing Collisions at Sea (COLREGS) "rules of the road" or internationally recognized maritime customs, and were not in accordance with the obligation under international law to act with due regard for the safety of other vessels in the area.

The U.S. Navy, Coast Guard, Marines and Army have been conducting joint interoperability operations in the North Arabian Gulf since late March.

U.S. naval forces continue to remain vigilant and are trained to act in a professional manner, while our commanding officers retain the inherent right to act in self-defense.



» Image credit (marine): Photo by Cpl. Adam Dublinske, USMC. Image does not imply or constitute DoD endorsement.



## KLEIN MARINE SYSTEMS INTRODUCES μMA-X NADIR IMAGING SONAR

Mitcham Industries, Inc. has announced that its Klein Marine Systems unit has recently delivered the first micro-MA-X ("μMA-X System™") in support of US NAVY Next Generation Small-Class Unmanned Undersea Vehicle ("UUV") evaluation sponsored by the Defense Innovation Unit ("DIU"). DIU is a defense organization focused exclusively on fielding and scaling commercial technology across the U.S. military to help solve critical problems.

The μMA-X system is the first in a series of new imaging products based on Klein's previously announced MA-X™ technology and designed for both commercial and military unmanned vehicle markets. The reduced size and power requirements of the μMA-X system make it an ideal payload for the rapidly growing UUV market. MA-X technology represents a high quality, cost-effective nadir imaging solution that has long been sought by the industry. Traditional side scan sonar imaging creates a nadir gap directly under the path of the vehicle. The μMA-X system fills that gap, when paired with conventional side scan, eliminating the need for additional time for overlapping survey lines to achieve 100% coverage. For UUVs, this translates into extended mission duration, or shorter time to cover the same area. One of the key discriminators of the μMA-X, particularly for the defense sector, is the ability to produce high-quality imagery of the nadir area that is comparable to the traditional side scan images. This allows for the data acquired by the system to be fed directly into existing automatic target recognition ("ATR") software allowing for automated detection and recognition of targets of interest.

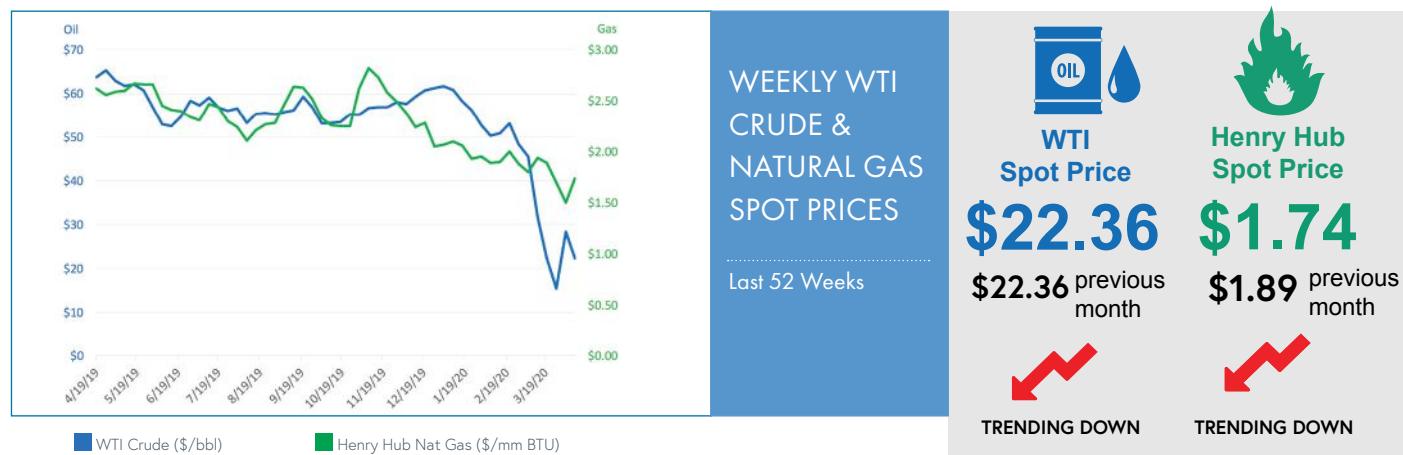
"The μMA-X system is the result of a fast-tracked, internally-funded development, and we are excited to have the US Navy evaluate its effectiveness for the Maritime Expeditionary Mine Countermeasure Unmanned Undersea Vehicle program." Said Guy Malden, Co-CEO of Mitcham. "We consider the US Navy to an excellent reference customer and our team has worked hard to meet their expectations."

[www.kleinmarinesystems.com/products/  
side-scan-sonar/micro\\_ma-x/](http://www.kleinmarinesystems.com/products/side-scan-sonar/micro_ma-x/)

# CRUDE & NATURAL GAS Spot Prices

PRICES IN US DOLLARS AS OF APRIL 10, 2020

The lengthy decline in oil prices culminated on April 20 with WTI Futures for May contracts moving into negative territory for the first time ever – an event that caused a large drop in stock prices and caused concern throughout a global economy already struggling with the COVID-19 pandemic. CNBC, however, noted that Futures for June and July are in the \$20-30 per barrel range and said that this is "a better reflection of the reality in the oil market." WTI Spot Prices were \$22.36 per barrel as of press time in mid-April (exactly where it was on March 20), a far cry from the \$60 per gallon that 2020 began with.



## KEY EQUITY Indexes

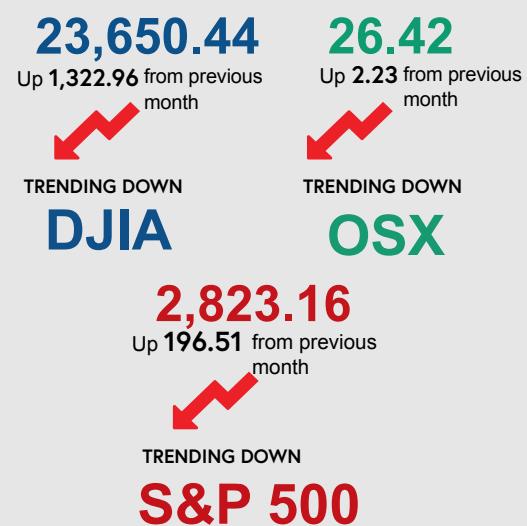
PRICES IN US DOLLARS AS OF APRIL 20, 2020

In the past month, equity indexes gained back some the huge losses of the previous month. Following a close of below 20,000 points on March 16, the Dow Jones Industrial Average pushed back up above 22,000 points by the end of the month and over the 24,000-point mark during the week of April 13. A sharp drop in oil prices, however, led to the Dow losing more than 500 points and closing at 23,650.44 at press time on April 20, when WTI Futures moved into negative territory for the first time ever and with Dow Futures pointing to

further losses imminently. The S&P followed a similar pattern except that it continued to gain through the close on the 20th, reaching 2,823.16 points. S&P Futures, however, pointed to the index turning negative as well.

The Philadelphia Oil Services Index (OSX) stabilized a bit following severe losses the previous month, due to Coronavirus concerns and low oil prices. The OSX moved up slightly from its low point in mid-March to close at 26.42 points on April 20.

### SELECTED EQUITY INDEXES



# UNDERWATER MINING CONFERENCE UMC 2020

## Marine Minerals: Solutions for a Clean Energy Future

**September 27 – October 2, 2020**  
**The Vinoy Renaissance**  
**St. Petersburg, Florida, USA**



**COVID 19 UPDATE: Virtual Participation will be offered to those unable to attend in person!**

**REGISTRATION IS OPEN!**

**Visit [www.underwatermining.org](http://www.underwatermining.org) to register or submit abstract:**

- **Deadline for abstract submission (3000 characters max.) - June 5, 2020**
- **Notification of acceptance - July 5, 2020**
- **Deadline for final full paper submission - July 30, 2020**
- **Deadline for Early Bird Registration - May 31, 2020**

**SPONSORSHIP OPPORTUNITIES AVAILABLE!**

### About UMC 2020

For nearly half a century, the UMC has provided a forum for timely presentations and workshops on underwater mineral exploration, environmental research, regulatory issues and mining technology by bringing together hundreds of the leading scientists, policy makers and engineers from over 25 countries.

This year's five day Conference will be hosted by the USF College of Marine Science and will be held at The Vinoy Renaissance, a waterfront resort in beautiful St. Petersburg, FL, USA. We've negotiated unbelievably low rates - see the UMC website for more information.

### About IMMS

IMMS hosts this annual gathering to advance the dissemination of research related to marine mineral exploration worldwide, with a focus on responsible and sustainable development of offshore mineral resources. Presentations and workshops feature scientific research in environmental, geological, oceanographic, legal and technical disciplines.

International Marine Minerals Society  
USF College of Marine Science  
140 7th Ave S, MSL 140E,  
St. Petersburg, FL USA 33701  
[www.immsoc.org](http://www.immsoc.org)  
[www.underwatermining.org](http://www.underwatermining.org)



**For inquiries contact Laura Azevedo - [lazevedo@immsoc.org](mailto:lazevedo@immsoc.org)**



## HOW WILD CAN COMMODITY MARKETS GET?

BY G. ALLEN BROOKS | Author, *Musings From the Oil Patch* | [www.energymusings.com](http://www.energymusings.com)

### CRUDE OIL:

We envisioned turmoil in the world's oil market from the outbreak of the coronavirus and the Russia Saudi oil war. We didn't envision history being made when the May oil futures contract's price went negative. Assets with no value are not unusual, but one where buyers are paid to take away the oil was unthinkable. We have clearly entered an unusual period; a world for which the industry was unprepared.

Government response to the coronavirus was to shut down economies, causing a massive decline in energy use – not just for oil, but all forms of energy. Estimates are for a decline of 25-35 million barrels a day in April, or a quarter to a third of global oil consumption. Without an immediate stop to global oil output, inventories will explode. But not only did producers not stop producing, Russia and Saudi Arabia engaged in a battle for who could boost oil output the most. In a world with supply already exceeding demand due to rising shale oil output from America, oil prices have been crushed.

After weeks of demand destruction, falling oil prices and mounting political pressure, OPEC plus Russia finally agreed to cut output starting May 1st. Their decision assumes other oil producers outside of the OPEC+ group, particularly the U.S., Canada, Norway and Brazil, would also chip in with output cuts. Until demand picks up, the crude oil supply tsunami will overwhelm the market.

The excursion of oil futures into negative pricing territory was partly a technical issue. Many recent futures contract buyers failed to understand that if you still held the contract at expiration, you had accept having the oil delivered. People unprepared to own barrels of oil panicked and willingly paid buyers to bail them out.

What does all this chaos mean for future oil prices? As demand rebuilds as the world's economy reopens, oil prices will rise. How quickly? How high? The futures price curve suggests oil will be in the upper \$20s a barrel by year-end, but it is not until the end of 2023 that prices reach \$40. Even at that level, many oil projects will be unprofitable. Long-term price projections reflect buyers' views that oil demand will grow slower than historically, and the substantial supply overhang of lower-cost oil will weigh on prices.

Under this scenario, renewable energy will benefit. Technological improvements will boost its competitive position against fossil fuels. More importantly, renewables offer stable pricing, enabling people to better budget their energy expenditures. The oil price trajectory will be determined by the pace of the economic recovery and OPEC+ producers' willingness to add to supply. Nothing is clear right now.

### NATURAL GAS:

Universally, among all the fossil fuels, natural gas is projected the winner of the economic shut-down. Natural gas prices have been struggling in recent months as the surge of shale oil brought forth a tsunami of associated natural gas. So much gas was produced in the Permian Basin that what couldn't be taken away and had to be burned to not restrict oil well output. The associated gas tsunami pushed prices well below \$2 per thousand cubic feet, a longstanding floor price.

Natural gas futures prices bottomed at \$1.55/Mcf in early April, coinciding with growing fear for the future of the oil market in light of the coronavirus. The inverse relationship of oil and gas prices was not a surprise, as roughly 75 percent of gas withdrawals come from shale wells. With crashing oil prices, drilling for new oil wells ceased, and with oil prices falling below breakeven levels, companies were even shutting in producing wells, cutting associated gas output.

The natural gas industry's greatest challenge is falling electricity demand given the economic shut-down. Not only is use lower, but its daily pattern has shifted due to the shelter-in-home orders. As one utility executive described it, today's pattern is similar to what is experienced on a snowy day in New England: demand begins rising later in the morning with a daily peak never reaching traditional levels. The usage shift mirrors closely the production pattern of renewable energy, helping to further erode natural gas-generated electricity.

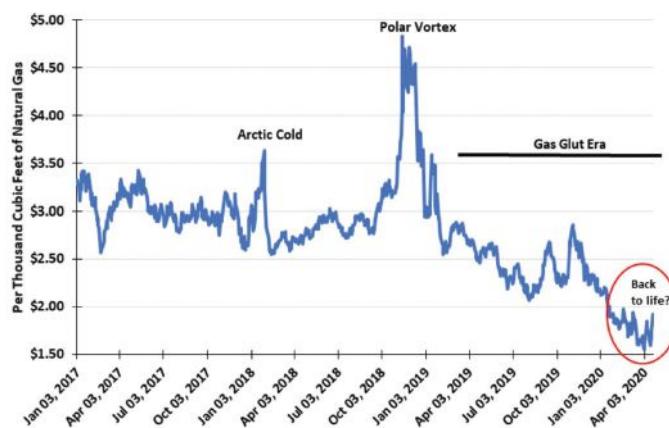
LNG is the other natural gas wildcard. So far, about 20 cargoes from Gulf Coast terminals have been cancelled by buyers, but under the "take or pay" terms of contracts, some of these cargoes will still be shipped, with them then looking for alternative buyers. As long as LNG volumes remain around nine billion cubic feet per day, there will be support for gas prices.

The impact of the prospective loss of meaningful volumes of associated natural gas production is sending signals to producers that they may need to begin drilling for conventional dry gas supply. That is why natural gas futures prices are now in the \$3-\$3.50/Mcf range for this winter, about \$1.25/Mcf above the current price. Another signal for improved health of the natural gas market is prices averaging 30-cents/Mcf higher for next summer than for this summer. That premium may widen as gas production falls and demand remains seasonally stable. The greatest risk for gas prices is they rise to levels that makes American LNG uneconomic in the key Asian gas market. Keep an eye on the natural gas star within the energy complex for signals about the health of the U.S. economy, as well as that of the rest of the world.

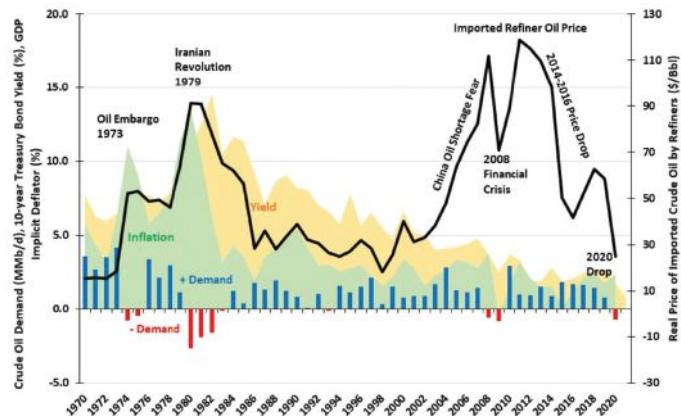
2020 Oil Prices Are  
Mirroring 2014-2016  
and 2018-2020



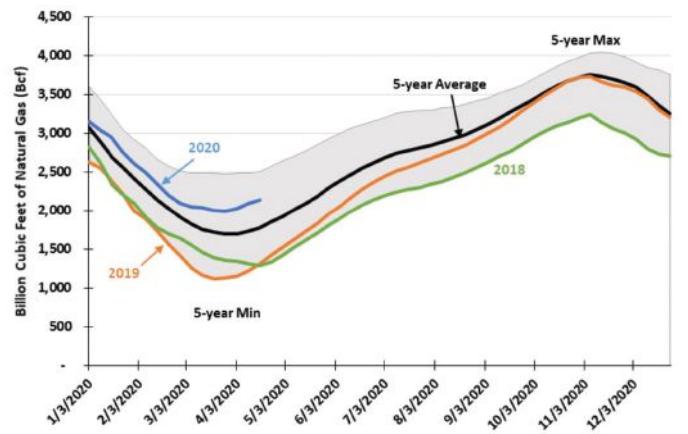
2020 Natural Gas  
Prices: Rising From  
The Dead?



A Continuation  
of Recent Economic  
Conditions Suggest  
Little Help For Oil  
Price Recovery



Low Prices and High  
Output Rebuilt  
Gas Storage





## AMERICAS

### **US Offshore Wind**

Online Only » June 18-19  
[events.newenergyupdate.com/offshore-wind](http://events.newenergyupdate.com/offshore-wind)

### **Int'l Conference on Ocean, Offshore, & Arctic Engineering (OMAE)**

Ft. Lauderdale, FL » June 28-July 3  
[event.asme.org/OMAE](http://event.asme.org/OMAE)

### **IPF**

Online Only » June-August  
[www.offshorewindus.org/2020ipf](http://www.offshorewindus.org/2020ipf)

### **Financing Wind North America**

Boston, MA » September 2-3  
[northamerica.financingwind.com](http://northamerica.financingwind.com)

### **Underwater Mining Conference**

St. Petersburg, Florida  
 » September 27 - October 2  
[www.underwatermining.org](http://www.underwatermining.org)

### **OilComm**

Houston, TX » October 14-15  
[www.oilcomm.com](http://www.oilcomm.com)

### **OCEANS'20 Gulf Coast**

Biloxi, MS » October 19-22  
[gulfcoast20.oceansconference.org](http://gulfcoast20.oceansconference.org)

### **AWEA Offshore WINDPOWER**

New York, NY » October 13-14  
[www.awea.org/conferences/awea-offshore-windpower-conference](http://www.awea.org/conferences/awea-offshore-windpower-conference)

### **Clean Gulf**

San Antonio, TX » October 20-22  
[www.cleangulf.org](http://www.cleangulf.org)

### **MTS Dynamic Positioning**

Houston, TX » October 12-14  
[www.dynamic-positioning.com](http://www.dynamic-positioning.com)

## EUROPE

### **Deep Sea Mining Summit**

London, UK » August 18-19  
[www.deepsea-mining-summit.com](http://www.deepsea-mining-summit.com)

### **MCE Deepwater Development**

London, UK » September 7-9  
[www.mcedd.com](http://www.mcedd.com)

### **All-Energy**

Glasgow, UK » September 14-15  
[www.all-energy.co.uk](http://www.all-energy.co.uk)

### **WindEnergy Hamburg**

Hamburg, Germany  
 » September 22-25  
[www.windenergyhamburg.com/en](http://www.windenergyhamburg.com/en)

### **Int'l Naval Engineering Conference**

Delft, The Netherlands » October 6-8  
[www.imarest.org/events/inec-2020](http://www.imarest.org/events/inec-2020)

### **Offshore Energy**

Amsterdam, The Netherlands  
 » October 26-28  
[www.offshore-energy.biz/offshore-energy-2020/](http://www.offshore-energy.biz/offshore-energy-2020/)

### **Ocean Energy Europe**

Brussels, Belgium » December 1-2  
[www.oceanenergy-europe.eu/annual-event/oee2020](http://www.oceanenergy-europe.eu/annual-event/oee2020)

### **Oceanology International**

London, UK » December 1-3  
[www.oceanologyinternational.com](http://www.oceanologyinternational.com)

### **UDT**

Rotterdam Ahoy, NL » December 8-10  
[www.udt-global.com](http://www.udt-global.com)

## OTHER REGIONS

### **PHILMARINE**

Manila, Philippines » June 16-18  
[www.philmarine.com](http://www.philmarine.com)

### **Offshore Well Intervention APAC**

Kuala Lumpur, Malaysia  
 » September 17-18  
[www.interventionasiapac.offsnetsevents.com](http://www.interventionasiapac.offsnetsevents.com)

### **Submarine Networks World**

Singapore » September 23-24  
[www.terrapinn.com/conference/submarine-networks-world](http://www.terrapinn.com/conference/submarine-networks-world)

### **Mediterranean Offshore Conference**

Alexandria, Egypt » October 13-15  
[www.moc-egypt.com](http://www.moc-egypt.com)

### **Telecoms World Asia**

Bangkok, Thailand » October 28-29  
[www.terrapinn.com/conference/telecoms-world-asia](http://www.terrapinn.com/conference/telecoms-world-asia)

### **Telecoms World Middle East**

Dubai » November 3-4  
[www.terrapinn.com/conference/telecoms-world-middle-east](http://www.terrapinn.com/conference/telecoms-world-middle-east)

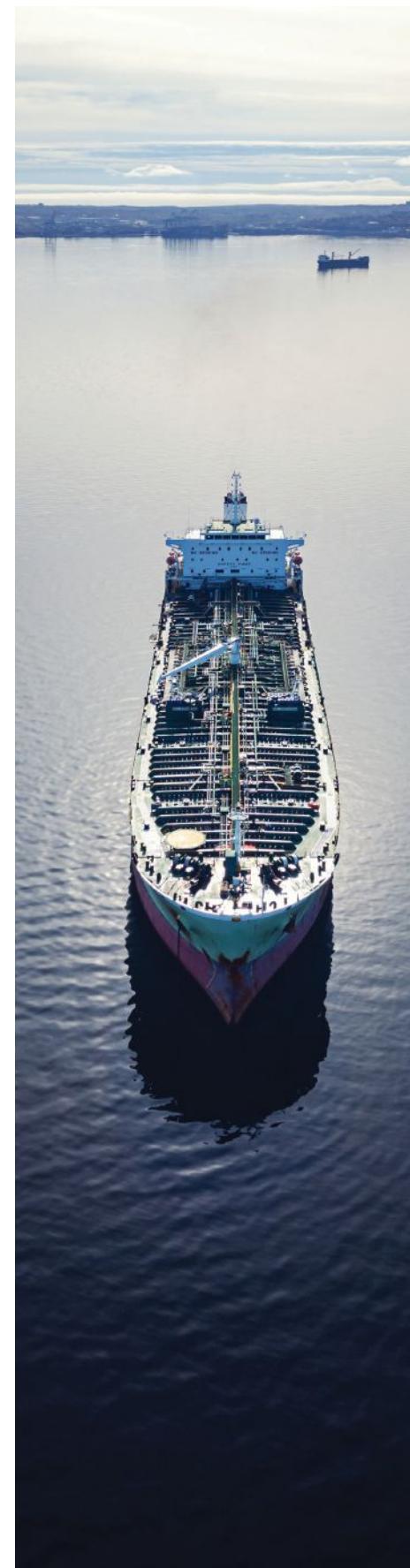
### **ADIPEC**

Abu Dhabi » November 9-12  
[www.adipec.com](http://www.adipec.com)

### **MAST Asia**

Tokyo, Japan » November 9-11  
[www.mastconfex.com/asia2020](http://www.mastconfex.com/asia2020)

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| » Mapping / Survey<br>» Unmanned Vehicle<br>Tooling                        | Manipulator Arms & Tools; Pumps,<br>Hoses & Hose Connectors; Cam-<br>eras, Lights; Bathymetric Mapping<br>& Charting  | Underwater Intervention » February 4-6<br>Subsea Expo » February 11-13<br>Canadian Hydrographic » February 24-27 |
| <b>FEBRUARY</b>  |   |  |
| » Oceanology<br>» Metocean   | Data Acquisition & Processing;<br>Metocean Buoys; Transducers; Hy-<br>drophones, Altimeters, Profilers,<br>Velocity Loggers, Telemetry, &<br>Pressure Sensors   | Oceanology International » December 1-3  |
| <b>MARCH</b>   |   |  |
| » Offshore Technology<br>» Subsea Cables                                   | Simulators; Autopilots; Digital<br>Twins; Cybersecurity Services;<br>UAVs; Echosounders and ADCPs   | IPF Virtual » August 18-21<br>AUVSI XPONENTIAL » August 10-12<br>Deep Sea Mining Summit » August 18-19           |
| <b>APRIL</b>   |   |  |
| » Deepwater Inspection,<br>Repair, and Maintenance<br>» Defense & Security | Sonar Systems & Vessels; Imaging<br>& GIS, Magnetometers, Open Ar-<br>chitecture Robotics & Unmanned<br>Defense Systems   | UDT » December 8-10  |
| <b>MAY</b>   |   |  |
| » Offshore Exploration   | Mining Machines; Cloud-based<br>Computing & Software  | Deep Sea Mining Summit » August 18-19  |
| <b>JUNE</b>  |   |  |
| » Surface Vehicles   | Mounting Systems & Gimbals;<br>Small Survey Boats; Control<br>Systems; USVs; Towed Vehicles &<br>Gliders  | IPF Together » August 18-21<br>AUVSI XPONENTIAL » August 10-12   |
| <b>JULY</b>  |   |  |
| » Buyers' Guide: Unmanned<br>Vehicles                                      | ROV, AUV, USV, Gliders & Towed<br>Vehicles  | TBD  |
| <b>AUGUST</b>  |   |  |
| » Submersibles   | Cranes & Winches; LARS & Con-<br>trol Systems; Sensors, Profilers &<br>Measurement; Thrusters; Umbili-<br>cal, Tether, Cables & Connectors  | TBD  |
| <b>SEPTEMBER</b>   |   |  |
| » Marine Renewables  | Current Meters / ADCP, Wave /<br>Metocean Buoys, Bottom Survey<br>Equipment, Cable Protection<br>Equipment, Inspection Services<br>and Equipment, Service Vessels,<br>Materials and Coatings, Installa-<br>tion Equipment | Offshore Energy » October 26-28<br>Ocean Energy Europe » December 1-2  |
| <b>OCTOBER</b>   |   |  |
| » Ocean Science &<br>Technology  | Acoustic Modems; Acoustic<br>Releases, Transponders, Com-<br>mand & Control Systems; Oil Spill<br>Prevention; Oceanography Tools,<br>UW Video Cameras   | OCEANS'20 » October 19-22  |
| <b>NOVEMBER</b>  |   |  |
| » Maritime<br>» Tracking and Positioning                                   | Transponders / AIS; S/P Power<br>Systems; Workboats & Supply<br>Vessels   | UDT » December 8-10  |
| <b>DECEMBER</b>  |   |  |
| » Future of Ocean<br>Technology  | Ocean Technology  | TBD  |



## NEW OCEAN TECHNOLOGY PODCAST LAUNCHES IN JUNE!

Ocean News & Technology magazine is excited to announce the launch of a new ocean technology podcast, called Sea State! More than 165 million people in the US have listened to a podcast. That is over half the population in this country. Last year alone, over 100 million people listened to a podcast every week. Podcasts connect people to the world, inspire conversation and build brand recognition. Listeners tune in at home, in their office, cars, and on the run using their smartphones and computers. Why are podcasts so popular? Simple... they offer listeners an efficient way to consume content.

Our new podcast series, Sea State is just another avenue to inform customers and prospects about important innovations and trends in the ocean technology marketplace, and to update customers, prospects, and partners on the latest news. The podcast will offer insight, news and historical context regarding the state of our industry. Each episode will include in-depth interviews with veteran scientists, manufacturers, engineers, and entrepreneurs in the maritime industry. The podcast series will cover a range of topics, including technologies used to explore and do business in the ocean environment. Subjects will include submersibles, autonomous and remotely operated vehicles, satellite telemetry, maritime security, deep-sea exploration, diving, buoys, AI, ocean mapping and much more.



» Ronda J. Moniz

The monthly podcast series will be hosted by Rhonda J. Moniz, former Editor for ON&T magazine. "Rhonda is a great choice to host this podcast. She has over 25 years in the industry and has a diverse background," said Jessie Lewis, Director of Operations at TSC Publishing.

"I couldn't be more excited to work with ON&T again on this venture. It is a perfect example of how new media can



extend the reach and impact of what is going on in our industry," said Rhonda.

Rhonda specializes in diving technologies and subsea systems. Trained as a Scientific Diver and Dive Safety Officer, Rhonda has overseen multiple projects, expeditions, and training programs. She has achieved Master Instructor Rating and specializes in Underwater Forensics and Marine Technology. Rhonda consults as an Underwater Forensics Investigator for UIG (the Underwater Investigative Group, LLC), and is an adjunct professor teaching Underwater CSI techniques. She has been on multiple expeditions around the world including several large-scale, deep-sea archaeology projects with depths in excess of 4,000 m.

Rhonda has worked to create training programs for Remotely Operated Vehicles (ROV) Autonomous Underwater Vehicles (AUV), and multiple platform sensors. She has worked as a journalist and filmmaker in the ocean technology industry, and has published multiple articles in numerous publications. She is President of The Marine & Oceanographic Technology Network (MOTN), Chairman of the Board for the Marine Technology Society (MTS), New England, and is also on the Board of Directors for NERACOOS. Rhonda has given talks around the country and is Sales Manager for Oceanographic Programs at Woods Hole Group, a subsidiary of CLS France.

## OKEANUS EXPANDS RENTAL FLEET WITH NEW SIDE SCAN SONAR TECHNOLOGY

Okeanus Science & Technology (Okeanus) revealed the latest additions to its growing portfolio of survey equipment, three leading side scan sonars from Klein Marine Systems, Inc. The Klein System 4900, System 4000, and MA-X View 600 side scan sonars are now available for rental worldwide.

The 4900 systems operate with dual, simultaneous frequencies of 455/900 kHz, in broadband Chirp and CW transmission modes, feature smart telemetry, operate on either AC or DC power, and are rated to depths up to 300 m. System 4000 operates with dual, simultaneous frequencies of

100/400 kHz, with FM Chirp and Selectable CW transmission modes, and are rated to depths up to 2000 m.

The innovative MA-X View 600 sonar features revolutionary "gap filler" technology ensuring complete nadir coverage which results in a 40% increase in survey efficiency. The 300 m rated sonar operates at frequencies of 600 kHz side scan/850 kHz nadir and includes Klein's "Blue Technology" for superior performance. It also features smart telemetry, operates on either AC or DC power, and features an ergonomic design allowing it to be man deployable.

According to Benton LeBlanc, Okeanus Managing Director, "The new Klein technology will be an excellent complement to our already comprehensive pool of leased equipment. Our goal has always been to stay on the cutting edge of the technology available in the market, and this capital outlay solidifies that position. These side scan sonars can be leased globally, and Okeanus can also provide the winch and cable necessary for a safe and efficient deployment."



## BLUETECH EXPO – A VIRTUAL EXPERIENCE IN 2020

Rich Lawson, CEO, IOSTIA

These are indeed strange and challenging times. With the onset of the COVID-19 pandemic, we've seen some of our industry's most anticipated and noteworthy events cancelled. From Oceanology International in London to the Offshore Technology Conference in Houston, both having just celebrated their golden anniversary, there has been massive disruption to our spring line-up of conferences and trade shows. As we all work from home, I've been thinking a lot about the impact on sales strategies and planned new product and service launches. At a minimum, those valuable face-to-face relationship building with prospective customers and catching up with old friends are lost for the first half of 2020 and perhaps even longer.

As you may already know, beginning in 2020 our own BlueTech Expo is scheduled to be run alongside Capitol Hill Ocean Week here in Washington DC. We were obviously very excited see this inaugural joint event come together with over a thousand attendees from industry, government, and academia convening during the second week of June. CHOW's program helps bring attention to larger ocean issues and adding BlueTech Expo's complementary technology focus, running the events in tandem will provide attendees a convenient and high-impact single event.



» Rich Lawson

From IOSTIA's perspective, with our event scheduled in June, we've had the benefit of seeing all that's unfolded and approach our decisions strategically, and in a manner to best support our members, sponsors, and exhibitors. Our feeling all along was that BlueTech Expo was becoming increasingly important as perhaps the last opportunity for industry and government to connect before summer. The organizers of CHOW felt the same way.

On April 6, and after careful consideration, CHOW and IOSTIA each announced that this year's event will be moving online in the form of a virtual conference and exhibition. This new event format will feature a compressed program held on June 9, 2020.

Because of the strong synergy, we felt it was important to maintain the connectivity between CHOW and BlueTech Expo. Both events will be on a common technology platform and feature both live and on-demand content. The virtual tradeshow will allow our members and exhibitors and opportunity to discuss their products and services from the safety of their remote offices. We believe the platform will allow for a great deal of creativity in how products are demonstrated through both live and produced video content. BlueTech Expo is most definitely open for business in 2020 and it's time to get creative!

I'd be remiss for not mentioning our sponsors who have been incredibly supportive through this process. Kongsberg, Oceanology International, Teledyne Marine, and eTrac have truly had a collaborative "tell us what you need" approach to these challenges. The idea of moving traditional industry events to a virtual environment, while not unheard of, is really new territory for our industry. In many ways, we are all in this together, and a rising tide lifts all boats. Visit [www.bluetechexpo.org](http://www.bluetechexpo.org) for more information.

## CSA OCEAN SCIENCES PERFORMS SEAGRASS SURVEYS FOR ESSENTIAL FPL PROJECTS



CSA Ocean Sciences Inc. (CSA), a marine environmental consulting firm, has recently performed pre- and post-construction seagrass surveys associated with the repair of three marine power distribution cables in West Palm Beach, Miami Beach, and Bay Harbor Islands. The repair of the cables, owned by Florida Power & Light Company (FPL), is considered essential work.

CSA is currently subcontracted by Underwater Engineering Services Inc. to perform seagrass and other sensitive benthic resources surveys prior to and following repair of marine power distribution cables throughout Florida on an on-call basis and within 24 hours of notification. The recent field surveys were among the first conducted under CSA's recently implemented COVID-19 Mitigation Plan, which includes health and safety protocols specific to keeping CSA employees and partners safe during the COVID-19 pandemic. Mr. Kevin Peterson, CSA's Chief Executive Officer commented "The safety of our employees, customers, and partners is an absolute priority. Our ability to safely perform work in the field is facilitated by an aggressive set of protocols developed early in this process. With input from our own scientists and operational experts, as well as external HSSE and medical Subject Matter



Experts, we have developed comprehensive protocols that are constantly updated as we gain additional knowledge and experience."

Seagrasses were found at two of the three project locations, including turtle grass (*Thalassia testudinum*) and paddle grass (*Halophila decipiens*), which required post-construction surveys to be conducted following repairs. The pre- and post-construction survey results were provided to UESI and FPL.

To learn more about how CSA is conducting operations during the COVID-19 pandemic please visit [www.csaocean.com/blog/csas-response-to-the-coronavirus-covid-19-pandemic](http://www.csaocean.com/blog/csas-response-to-the-coronavirus-covid-19-pandemic).

## MOTIVE OFFSHORE REPORTS IMPRESSIVE START TO 2020 WITH NEW APPOINTMENT

Motive Offshore Group, a specialist in marine equipment fabrication and rental, has reported an impressive start to 2020 for its Rentals division, with first quarter results exceeding initial expectations.

The recent appointment of David Leith as Rentals Division Manager is indicative of the company's focus on the specialized rental of high capacity winches, umbilical deployment and subsea equipment.

Discussing 2020 results so far, he commented: "I am delighted that our Rentals division has made such a positive start to the year. Having been a part of the Motive journey for over eight years, I can confirm that our success so far is based not only on our extensive range of rental products - we offer Scotland's largest fleet of Hydraulic Power Units (HPUs), including a range of ATEX units - but also our continued investment in both new and existing rental equipment.

"We have been manufacturing the highest quality equipment since we began trading in 2010. Those proven, in-house engineering capabilities allow us to re-engineer our catalog of products to suit specific requirements, working to the shortest of lead times and deploying from our locations across the globe."

James Gregg, Motive Offshore COO added: "Whilst recent events have impacted across the entire offshore oil and gas supply chain, I am hugely encouraged by the excellent start to the year, made by David and Motive Rentals.

## TRENDSETTER VULCAN OFFSHORE COLLABORATE TO DEVELOP CORONAVIRUS PPE

Trendsetter Vulcan Offshore (TVO), a developer of innovative solutions for the offshore industry, has collaborated with local pulmonary and critical care physician Luis E. Chug, MD, to introduce personal protective equipment (PPE) for healthcare workers fighting the coronavirus pandemic. The patent pending ViraBox is an impervious transparent enclosure that is placed over patients to shield them and healthcare workers from potential contamination by the coronavirus.

"TVO has a history of solving difficult offshore safety challenges, but before one of our employees introduced us to Dr. Chug, we had never considered problem-solving for the medical field," says TVO CEO Jim Maher. "When the opportunity presented itself, we quickly realized that we could apply our team's ingenuity and creativity to help Dr. Chug transform his concept into a valuable piece of PPE. We are

"Our diverse range of rental products was created to suit global market requirements and includes high capacity winches, HPUs, marine cranes, subsea baskets and smaller tooling and test equipment. With market conditions at their most challenging for some time, I fully expect the industry to take further advantage of asset rental and believe our investment in this area remains key to our preferred supplier status. We certainly have plenty to celebrate in 2020, as Motive reaches its ten-year anniversary."

Launched in 2010 by James Gregg and Dave Acton, Motive Offshore Group is headquartered in Boyndie, Banff, Scotland, with additional offices in Aberdeen, Houston, Norway and the Middle East. [www.motive-offshore.com](http://www.motive-offshore.com)



» (left) James Gregg and David Leith. Pictured at Boyndie with Motive's recently completed, biggest build to date: 320Te WLL Hydraulic Drum Winch.

immensely proud of helping to fast-track the development of a solution that could save lives."

Dr. Chug recognized the need for better protective equipment when he started a rotation in intensive care in March 2020 and faced the challenge of providing specialized care in an environment where preventing exposure to the coronavirus is a matter of life and death for compromised patients and potentially for frontline healthcare providers.

"One of the biggest challenges in curbing the spread of this virus is that it is communicable in droplets, but during certain manipulation of the airway (or airway procedures), the virus can be aerosolized, which increases risk of exposure to the healthcare workers," Chug explains. "The containment system I wanted to produce would have to provide a physical barrier."

As Chug began sketching a design for PPE that would restrict exposure while allowing safe execution of medical procedures, he discovered a box-like structure being used in China. Though the concept was similar, this type of box was not adequate for Dr. Chug's purpose. He needed more functionality, including

the ability to accommodate different sized people and permit easy access to the patient to allow the dexterity required for precise medical procedures. In the span of a week, Chug developed a design that could tick all the boxes, but he needed engineering assistance.

Luis Mario Rodriguez, a mechanical engineer at TVO, brought the preliminary design to the company and worked with the engineering team to develop the ViraBox, a large, plastic enclosure that covers the upper part of a patient while allowing medical personnel to use sealed access holes to provide care.

"Within three weeks, we were able to move from the original idea through several iterations of prototypes, to a workable solution," Chug says.

Chug has received multiple request for the ViraBox and has committed to donating two units to a Houston hospital. TVO is building an additional 10 units that will be donated to hospitals in Houston, Detroit, Colorado Springs, Co, and Topeka, Ka.

Dr. Chug and TVO hope this innovative solution can be mass produced to benefit healthcare workers and patients across the country and even potentially overseas.



» ViraBox. Image Credit: Trendsetter Engineering.

Meanwhile, TVO is working to develop ways to simplify and expedite production using 3D printing for long-lead-time and high-cost components and evaluating further design modifications that will allow the ViraBox to be used for procedures that require more than one person working on the patient at the same time. [www.trendsetterengineering.com](http://www.trendsetterengineering.com)

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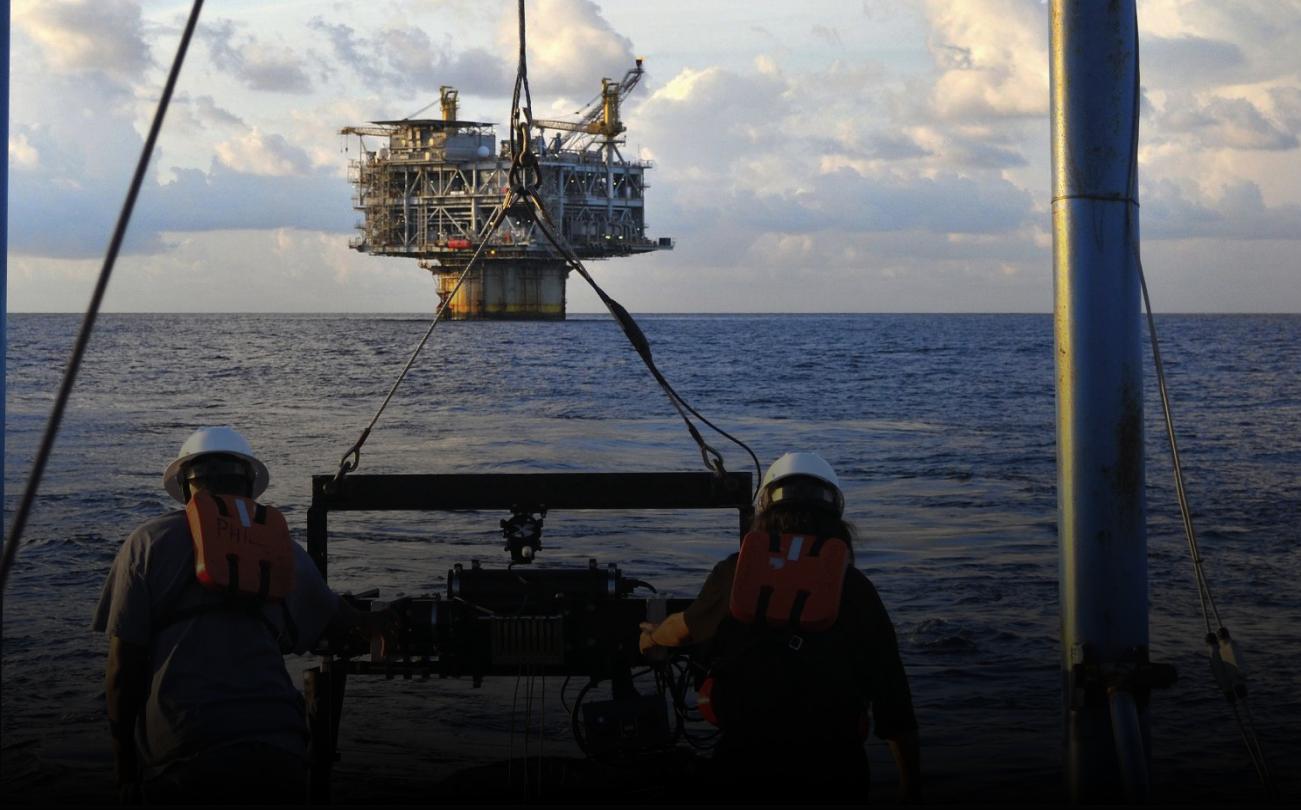
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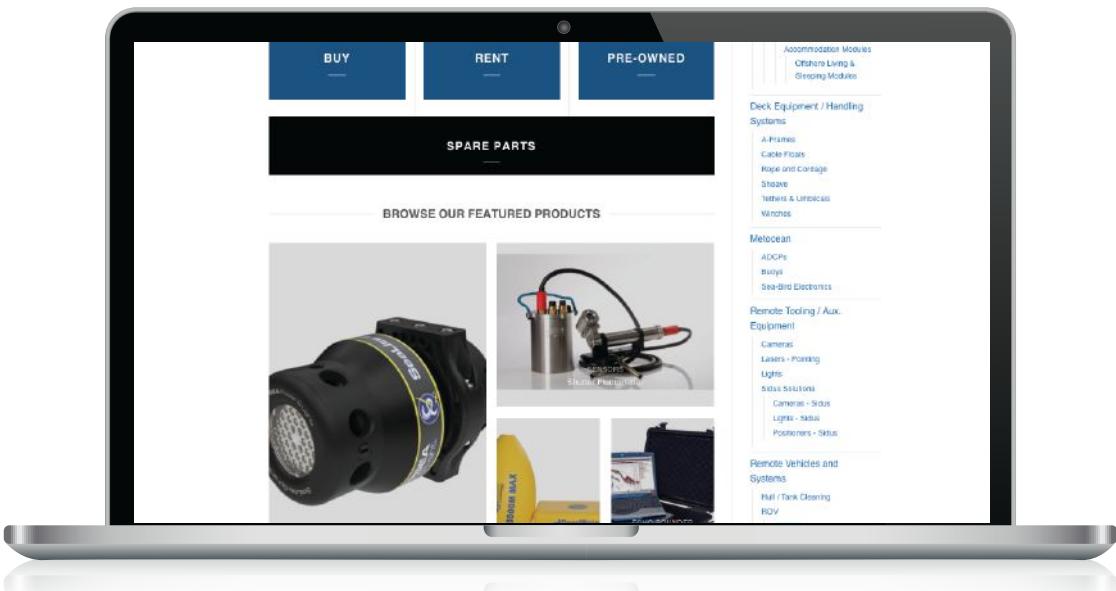
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