

February 2019

ON&T

Ocean News & Technology

www.oceannews.com



ESSENTIAL INTELLIGENCE

Evolving Models For Submarine
Cable Development pg. 10

Ploughs For The Offshore
Renewables Markets pg. 28



DYNAMIC

CONFIDENCE UNDERWATER

Portable underwater systems delivered with exceptional service, support, and reliability.

212 East High Street, Pottstown, PA USA 19464

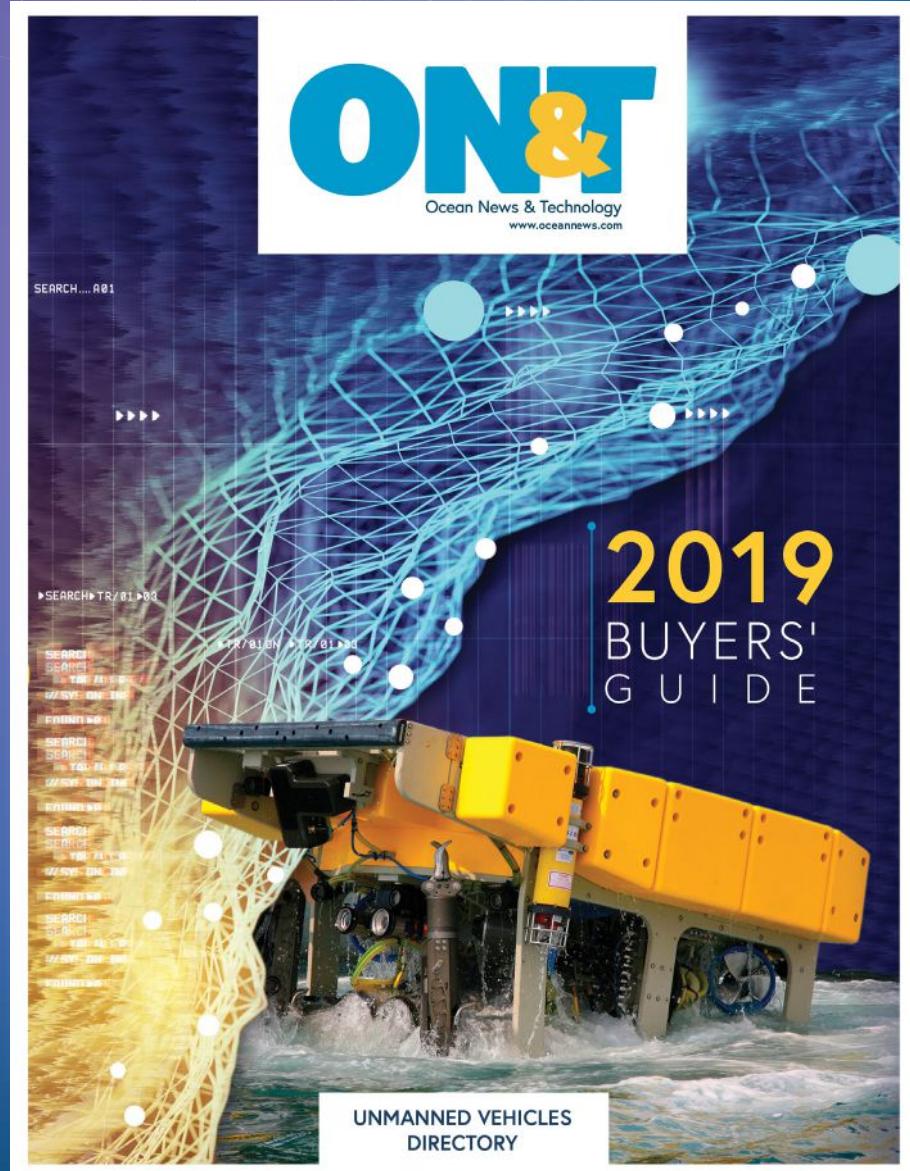
sales@videoray.com

+1 610 458 3000



videoray.com

NEW 2019 UV Buyers' Guide / Coming this summer!



The UV Buyers' Guide was our **MOST POPULAR** publication last year, and for good reason.

- It is essential. Whether you are listing a vehicle, or looking for one, this comprehensive catalog is a must-read for operators in the subsea industry.
- It is up-to-date. The information it includes comes straight from the providers and is backed by our four decades of experience building this type of publication.
- The Guide is sectioned into eight classifications based on the ROV Committee of the Marine Technology Society (MTS).
- For each vehicle, we've indicated the industry segment the vehicle fits within.
- The Guide is a living document. Not only does ON&T update it every year, but we include links to more detailed specifications.

Visit www.oceannews.com for more updates.



Model: MCM-015

MHU USV Winch

The next generation of cost effective autonomous handling systems from Okeanus

- Design and production capability for customized Winches and Launch and Recovery Systems (LARS).
- USV specific designs and customized autonomous solutions for military or commercial applications.
- Custom designed handling systems for towed or autonomous vehicles deployed from a USV.



OKEANUS SCIENCE & TECHNOLOGY, LLC

17455 NE 67th Court, Suite 120, Redmond, WA 98052 | +1-425-869-1834 | info@okeanus.com | www.okeanus.com

EMPOWERING



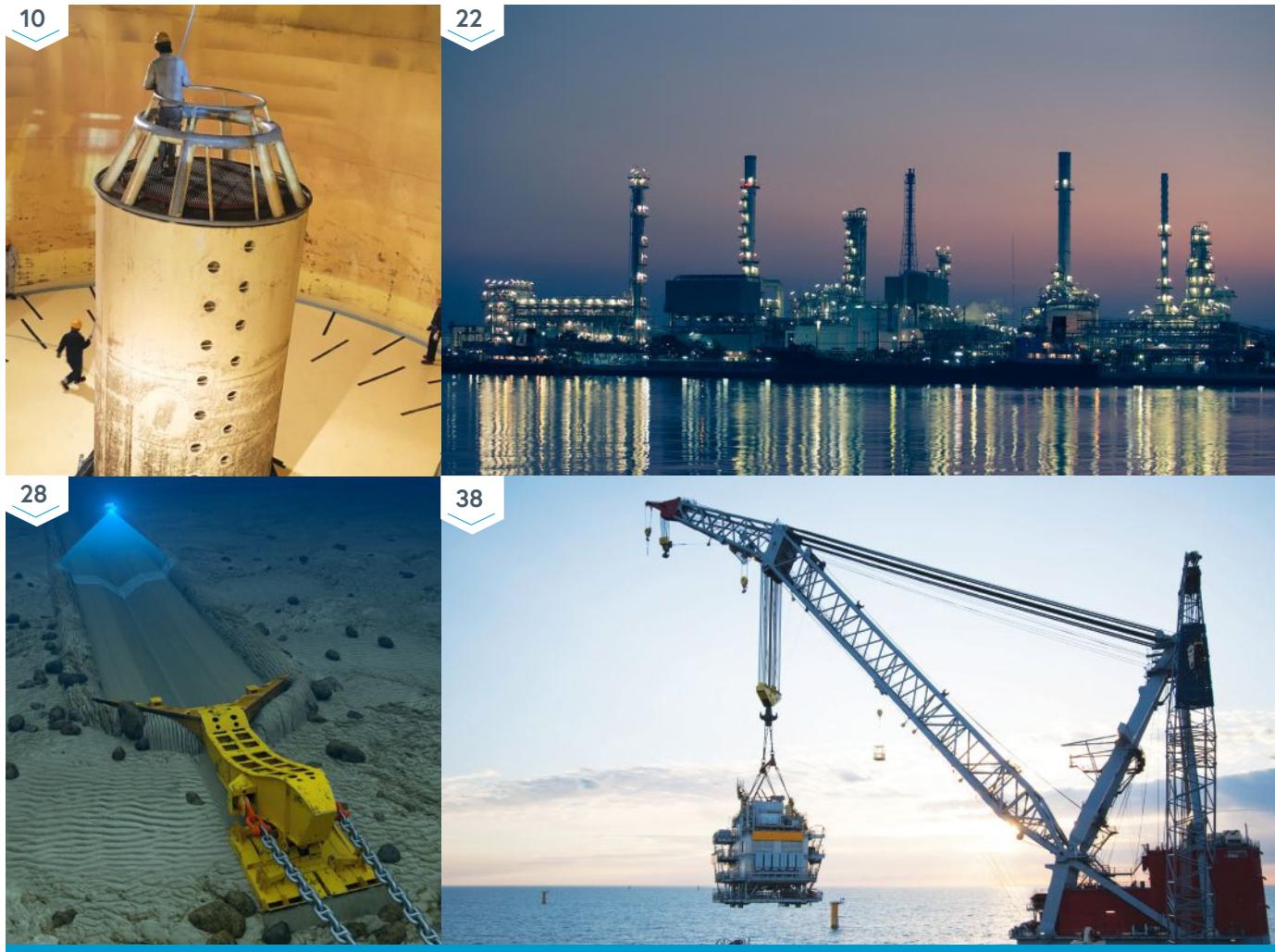
WORLD LEADER IN UNDERWATER e-ROBOTIC SYSTEMS



SAAB

SAAB SEAEYE

THE FUTURE IS ELECTRIC



FEATURES

- 10 Evolving Models for Submarine Cable Development**
- 22 Sanctions, Border Disputes, and a Failing Infrastructure:**
10 Things You Should Know About Venezuelan Oil
- 28 Ploughs for the Offshore Renewables Market**
- 38 Building a US Offshore Wind Cable Supply Chain**

DEPARTMENTS

- 14 OCEAN SCIENCE & TECHNOLOGY**
- 22 OFFSHORE ENERGY**
- 32 SUBSEA INTERVENTION & SURVEY**
- 40 COMMUNICATION & SUBSEA CABLES**
- 46 DEFENSE**

IN EVERY ISSUE

- 08 EDITORIAL**
- 20 PRODUCT FOCUS**
- 50 STATS & DATA**
- 54 EVENTS**
- 56 MILESTONES**
- 59 OCEAN INDUSTRY DIRECTORY**



ON THE COVER:

Offshore substations at London Array wind farm. The energy generated by the wind turbines is bundled and transported via high-voltage submarine cables to the coast. Photo courtesy of Siemens.



Sea the difference.

Managing the environmental impact of marine activities around the world.

EIA, EIS, ESHIA, EMP / Permitting Services / Oil Spill Response (MESSR, STEP) / Beach Restoration & Nourishment
Habitat Mitigation, Damage & Risk Assessments / Coral, Seagrass, Oyster & Mangrove Services / Habitat Surveys & Mapping
EBS & Drill Surveys / Physical Sampling (Sediment, Water, Biological) / Hydrographic & Geophysical Surveys
Metocean & Current Studies / Acoustic Monitoring & Modeling / Sound Mitigation (PSO, MMO, PAM)
Environmental Data Geospatial Services (EDGS) / Library & Document Services



Editor in Chief
GREG LEATHERMAN

UK Editor
KIRA COLEY

Contributor
JOHN MANOCK

Art Director
EMILLE RODRIGUEZ

Copy Editor
RON CAPITO

Newsletter Editor
INGER PETERSON

Conference Coordinator
WHITNEY SCHWERIN

Circulation
JESSICA LEWIS
Jlewis@tscpublishing.com

Advisory Board
DR. PHIL HART
Halifax, Canada

DREW MICHEL
Pierre Part, Louisiana

TOMY STAPLETON
Fall River, Massachusetts

Published by
Technology Systems Corporation
PATRICK C. LAGRANGE, CEO

ADVERTISING SALES
LISA CHILIK
Tel: 574-261-4215
Lchilik@tscpublishing.com

MIMI KING
Tel: +44 (0) 777 6017 564
mkng@tscpublishing.com

TO SUBSCRIBE
www.oceannews.com/subscribe

Ocean News & Technology ISSN# 1082-6106 is published 10 times a year in print and digital by Technology Systems Corporation, 7897 SW Jack James Dr., Suite A, Stuart, FL 34997, telephone 772-221-7720. Copyright ©2018 Technology Systems Corp. All rights to editorial content are reserved. No article, photograph, or illustration may be reproduced in whole or part without the written permission of the publisher. Unless otherwise stated in writing by the contributor, all images submitted to TSC may be used in other promotional materials belonging to TSC without permission. Subscriptions are free to qualified individuals or companies. For all others, call TSC for subscription information.

PRINTED IN THE USA | PRINTED WITH SOY INK



OPEN SYSTEMS ARCHITECTURE SUPPORTS NATIONAL DEFENSE STRATEGY

BY MARYBETH GILLIAM,
Chief Operating Officer, Greensea

The 2018 National Defense Strategy describes a plan to pursue urgent change at a significant scale in response to an increasingly asymmetrical threat environment, an increasingly chaotic global order, and an eroding American competitive advantage. A continuing impediment to this strategy is the prevalence of so-called "stovepipe" systems, which ought to be interoperable or modifiable, but aren't. Open Systems Architecture (OSA) is a set of business and technical practices that break open these stovepipes by building systems of modular, severable, reusable components with published interfaces for modification and improvement. This is exactly the sort of paradigm shift necessary to support the U.S. Navy's mission and key National Defense Strategy objectives, including:

1. Streamline rapid, iterative approaches: Built out of reusable, modular components, open architecture systems eliminate the need to reinvent the same technology multiple times, allowing for rapid advancement atop a proven, resilient foundation that incorporates lessons learned from many diverse applications.

2. Advance autonomous systems: Exponential improvement in field-relevant autonomy technology can only be achieved through collaboration among many different stakeholders; published interfaces and a common framework make this collaboration possible.

3. Deepen interoperability: Versatile, reusable components make the same technology rel-

evant to diverse users, laying the groundwork for interoperability through shared technology.

4. Drive budget discipline and affordability: Breaking down large systems into smaller, severable modules allows different vendors to provide different components, reducing acquisition cost by creating a competitive environment, and reducing lifetime cost by allowing incorporation of new technology without an expensive update to the entire system.

Greensea has firsthand experience with the benefits of an OSA approach for military customers.

OPENSEA, Greensea's open architecture software framework for marine robotics, is currently deployed on over 900 systems in the field, many of which are Greensea products used throughout the US and NATO defense communities. In addition to developing our own products, Greensea also provides OPENSEA as a platform for manufacturers, technology developers, and system integrators to build and field new capabilities. Through communication standards and a Software Development Kit (SDK), developers can include a broad group of stakeholders in technology development and testing on OPENSEA-enabled systems. Inclusion of many stakeholders ensures that new technology will be relevant to warfighters in the field, while the potential for rapid development means that advancement can be delivered at the speed of relevance.

Marine robotics are just one example among many; OSA is revolutionizing an ever-expanding range of applications. In response to the changing demands of today's threat environment, OSA is essential to the Navy's continued ability to win wars, deter aggression, and maintain freedom of the seas. Ms. Gilliam thanks Mikaela Osler, intern at Greensea, for her assistance with this article.

For more information, visit www.greensea.com.

NEWSLETTER

If you enjoy ON&T then you'll definitely be a fan of our weekly newsletter. Here you can access top stories, curated content and news from the industry.

SIGN UP AT:

bit.ly/ontnewsletter

CONNECT WITH US:

twitter.com/oceannews

facebook.com/OceanNewsandTechnology

linkedin.com/company/oceannews



Connecting What's Needed with What's Next™

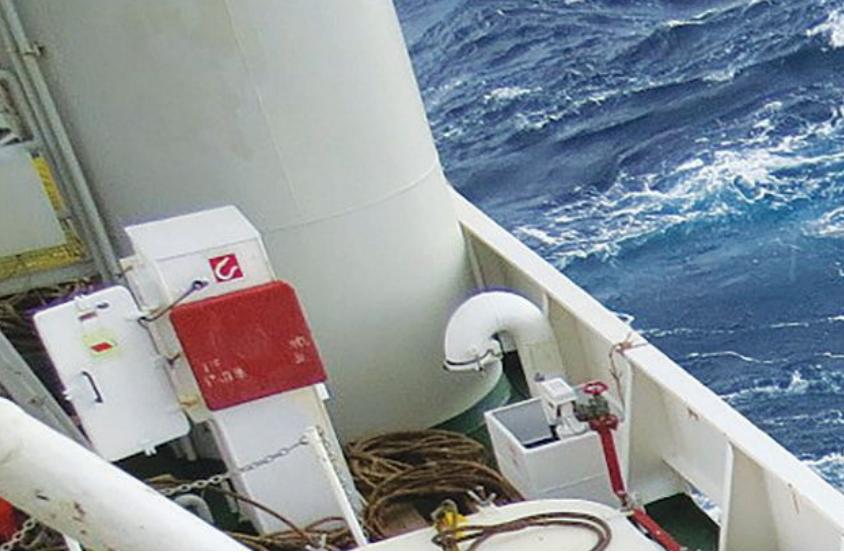
CLEAR FAST,
CUT DEEP,
ONE PASS
WITH SCAR5

Copyright © 2019 Oceaneering International, Inc. All rights reserved.

As your trusted partner, Oceaneering does things differently, creatively, and smarter. Our unmatched experience and innovative technologies and solutions enable us to adapt and evolve to meet ever-changing needs.

By working together, we will safely and reliably shape the future of the renewable energy industry.

■ Connect with what's next at oceaneering.com



| EDITORIAL FOCUS |



EVOLVING MODELS FOR SUBMARINE CABLE DEVELOPMENT

By Steve Lentz, Director Of Network Development,
Ocean Specialists, Inc.





The process by which submarine cable projects are conceived, planned, funded, developed and operated continues to evolve as a result of changes in the way the entire world communicates. Where international communications were once limited to financial, business, and governmental transactions, along with a few brief personal telephone calls, a new generation of bandwidth demand is being generated by the vibrant creation and consumption of media in the private and public sectors. Cable system operators have, today more than ever, many choices in how to structure the ownership and manage the development of those systems. Regardless of the approach, a successful project demands the expertise of those with both experience in the realm of submarine cables and the foresight to anticipate and take advantage of the ongoing evolution. Many system owners develop and retain the expertise needed in-house, while others turn to project consultants. Some may rely entirely on the supplier community, or some combination of resources. From traditional consortia to new business models and beyond, what are those structures and what expert resources are likely to be used?

Ownership consortia are recognized as the "traditional" manner in which submarine cable projects are developed. Now, 35 years after the start of deregulation and divestiture of state-owned telecom operators, there is still a place for consortia in many parts of the world. The West African Cable System (WACS), Europe-India Gateway (EIG), Asia Africa Europe-1 (AAE-1) and Southeast Asia-Middle East-Western Europe-5 (SEA-ME-WE-5) are among recent examples of consortium projects. The structure of consortium tends to make them a relatively time-consuming means to develop a cable, but the path to development is well understood and serves to reduce or eliminate the risk to each involved party. Project consultants are often used to ensure a common basis of commercial and technical understanding among the parties, or one or more of the parties may have the personnel, experience, and resources to provide this function.

Private development of submarine cable systems was used on some of the earliest fiber optic systems (PTAT-1 and NPC) and continues to this day in projects such as the transpacific SEA-US, South Atlantic Cable System (SACS), Australia-Singapore Cable (ASC), Seabras-1 (US-Brazil) and Hawaiki (Australia-New Zealand-US). The financial model for these projects can be challenging, as both debt and equity markets remain skeptical of submarine cable projects, most likely due to competition and ever-present downward pressure on bandwidth prices. Nevertheless, these projects can

» Buoy recovery operations for the Poseidon Cable System in the Mediterranean, ahead of a branching unit splice and deployment.

» Start of cable load for ATISA cable system into Subcom's MV Responder at Kitakyushu Japan.

▼ Factory Acceptance Test (FAT) for one of the ATISA Cable System's Branching Units (BUs) at the OCC/NEC cable factory in Kitakyushu Japan.



be viable where there is unmet demand or where a monopoly market can be identified. To develop a private system, the owner can develop their own in-house commercial and technical expertise or hire a project consultant. Where the owner intends to develop only one or two projects, the latter approach is often preferred as it avoids building up overhead that will serve no purpose when the projects are completed.

Partnerships and streamlined consortia (roughly speaking, those with only three or four

members) attempt to bridge the gap between consortia and private development. MONET, Moana, Trans Pacific Express (TPE), Unity and many other recent systems are examples of this approach. Generally focused on low cost and time to market, these projects allow each participant significant autonomy while sharing the cost of the wet plant. Many, or even most, of the participants in these projects have in-house technical expertise, but for new or non-traditional participants, the use of project consultants may be the best means to

ensure they can play on an equal footing with the large carriers or OTTs.

A more recent innovation in system development is targeted development, in which a single developer manages the project on behalf of one or more prospective owners. Unlike a partnership or consortium, the developer may not retain significant ownership in the system beyond commissioning. Presales are on a fiber pair (or greater) basis and are to large carriers or OTTs. This model frees the ultimate

owners from the day-to-day activities necessary to build a system, while preserving the speed and cost advantages of a streamlined consortium or partnership. Havfrue is the most notable example. To date, these projects have not required outside consultants, choosing rather to use in-house expertise, although that could, perhaps, change in the future.

Future projects seem destined to move even further towards a model in which one party is in control, but many parties have an equity stake. The

» The sea plow is launched to bury the cable system in order to further protect the armored cable from external aggression.



need for rapid delivery while minimizing cost suggests a role for both private developers and experienced consultants. One key to achieving these results will be the expeditious deployment of the necessary skills and expertise. Productive engagement with the suppliers through negotiated procurements (as opposed

to more drawn out tender processes), management of risks and uncertainties, particularly in regard to permissions and permitting, and effective project management all contribute towards this goal. This model also suggests a role for private equity, although it must be cautioned that major users of capacity

expect delivery at or close to cost. Providing added value through end-to-end integration, elimination of overheads, and other means of streamlining projects will be needed to win the business of OTTs and other large users. Again, this can best be achieved through the careful choice of both in-house and consulting expertise to develop

and deliver submarine cable projects.

For more information about Ocean Specialists, Inc. (OSI), visit WWW.OCEANSPECIALISTS.COM



» Floating the cable ashore at Yeroskipou, Cyprus, as part of the landing of the Poseidon cable system.

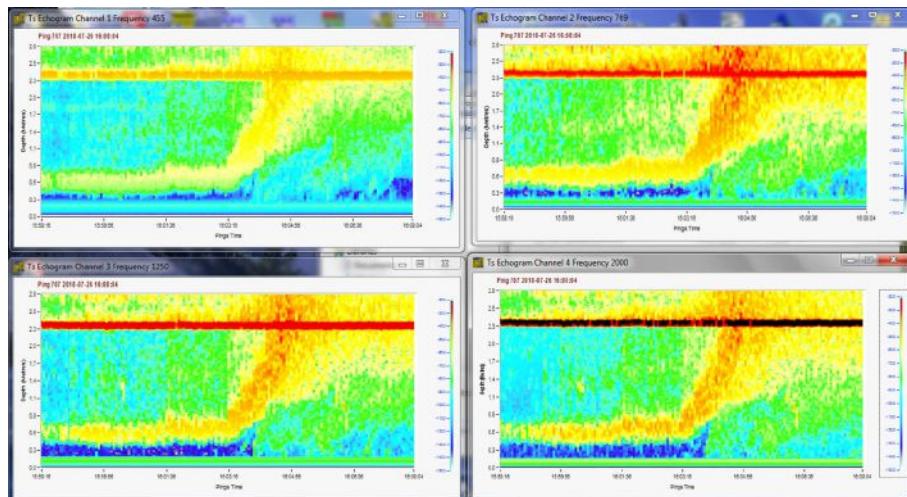


» Diver survey of the Tinian landing for the Marina-Guam Cable System.

ACOUSTIC DETECTION OF OIL IN THE WATER COLUMN USING AN ACOUSTIC ZOOPLANKTON FISH PROFILER



» Subsurface oil release over AZFP



» Acoustic backscatter data from all four frequencies (455, 769, 1250, 2000 kHz) during subsurface oil injections.

Laboratory experiments were carried out in July 2018 with ASL Environmental Sciences' multi-frequency Acoustic Zooplankton Fish Profiler (AZFP) at the Bureau of Safety and Environmental Enforcement's OHMSETT Oil Spill Response Research and Renewable Energy Facility outdoor saltwater wave tank (Figure 1). These experiments were conducted with the collaboration of the US Naval Research Laboratory (NRL) and the US Environmental Protection Agency (EPA), with funding provided by the US Bureau of Safety and Environmental Enforcement (BSEE). BSEE has managed the Ohmsett in Leonardo, New Jersey.

In these experiments the AZFP was mounted to the bottom of the test tank and oil was injected at depths above the instrument with a series of different release rates and pressures. Acoustic backscatter was recorded of the oil releases using four distinct frequencies (455, 769, 1250 and 2000 kHz). In addition to the oil, air bubbles were also introduced to provide additional suspended particles within the water column. These spill experiments were designed to simulate real world conditions to test the ability of the AZFP to characterize suspended particle size distributions. Figure 2 shows the backscatter of the four frequencies. By examining this backscatter data, and comparing it to the known release rates, analysis is expected to develop techniques to resolve acoustically oil concentration and oil drop-size distributions from AZFP data. Further details of this project were presented in a poster at the 41st Arctic and Marine Oil Spill Program (AMOP) conference held in Vancouver October 2–4, 2018.

CHINA'S UNDERWATER GLIDER SETS ENDURANCE RECORD

Haiyan, a Chinese underwater glider, set a new endurance record after working for 141 days and sailing 3,619.6 km in the South China Sea, said the developer.

Code-named Haiyan, which means storm petrel (a type of seabird) in Chinese, the long-distance glider completed the test in November 2018, surpassing its former record of continuously sailing 2,272.4 km over 119 days in the northern part of the South China Sea in the first half of the year, said the program team from the Tianjin University.

In April 2018, another type of the Haiyan series for deep diving set a world dive record by diving 8,213 meters in the Mariana Trench, the world's deepest known trench.

The unmanned gliders can survey marine conditions, such as temperature, salinity and currents, in large bodies of water over a long period of time.



» Image courtesy of Tianjin University.

The Pilot National Laboratory for Marine Science and Technology (Qingdao) has planned to develop a series of the Haiyan gliders working at different depths ranging from 200 meters to 10,000 meters underwater.

An advertisement for Sonardyne Subsea Technology. The background shows several offshore wind turbines in an ocean under a blue sky. In the foreground, there is a dark grey rectangular graphic containing the text "Total Positioning". To the right of this graphic, the Sonardyne logo is displayed, consisting of a stylized white wave icon above the word "Sonardyne" and the tagline "SOUND IN DEPTH". Below the logo, the words "SUBSEA TECHNOLOGY" are written. At the bottom of the advertisement, there are three pieces of red cylindrical subsea equipment standing upright. The text "Ranger 2. Underwater positioning for subsea cable and wind farm operations" is located at the bottom left, and a vertical column of text listing "POSITIONING", "NAVIGATION", "COMMUNICATION", "MONITORING", and "IMAGING" is on the bottom right.

Ranger 2. Underwater positioning for subsea cable and wind farm operations

Feasibility studies, UXO surveys, cable installation and asset maintenance. Whatever the operation, Ranger 2 reliably and accurately tracks your subsea equipment and sensor platforms. Vessel hardware and software is easy to install, configure and use, whether you're operating from a small survey vessel, dynamically positioned cable lay ship or USV. And thanks to our digital wideband signal technology, multiple targets can be simultaneously tracked in all water depths – from just a few metres to beyond 7,000 metres. Add value to your marine operations, search **Sonardyne Ranger 2**

POSITIONING
NAVIGATION
COMMUNICATION
MONITORING
IMAGING

ADVANCED NEW FIREFIGHTING SIMULATOR IMPROVES MARITIME SAFETY TRAINING



» New K-Sim Safety provides an efficient training solution for officers in advanced firefighting. The system includes an interactive 3D walk-through animation of the entire engine room and four upper decks.

Kongsberg Digital has unveiled an innovative new simulator solution for training officers and crew in advanced firefighting. Providing vital education for preparedness in accordance with the STCW Code requirements, K-Sim Safety offers high fidelity simulation covering all aspects of fire safety. K-Sim Safety contributes to reducing the impact of fire on board as well as planning strategies and tactics to control fire in various parts of the ship, enabling a safer and more effective response to incidents when they occur.

K-Sim Safety delivers practical exercises simulated in a realistic environment and meets the STCW regulation VI/3, section A-VI/3 table A-VI/3-1, where methods for demonstrating competence in firefighting, and search and rescue on board are described as: Control firefighting operation on board ships; Organize and train fire teams; and inspect and service fire detection and extinguishing systems and equipment.

K-Sim Safety is based on a detailed 3D representation of a 152,000 dwt double hull Suez Max crude oil carrier with 7

decks, which allows trainees to assess situations and determine the best response strategy, implement it and then observe the consequences of their decisions during a debriefing. Integration with K-Sim Engine and K-Sim Cargo simulators, as well as K-Sim Navigation also offers the possibility for crew resource training where actions on one simulator will directly affect others. This approach engenders more focus on clear communication between different roles on board.

As a full mission training system, K-Sim Safety includes two separate fire team muster stations with a detailed 3D virtual hotel & machinery space application, visualized in an interactive 3D walk-through animation of the entire engine room and four upper decks. It features high quality object and equipment models combined with powerful incidental visuals including fire & smoke, flooding, and missing persons to ensure a highly realistic scene.

During exercises, each fire team – consisting a team leader, an assistant and two smoke divers – can walk around selected areas of the ship using an Xbox

controller. Should the scenario call for smoke divers to split from the team, they can move to a separate area and continue the exercise using their own controllers and monitors. K-Sim Safety also includes the same state-of-the-art instructor, monitoring and assessment system used on KONGSBERG's K-Sim Engine and K-Sim Cargo simulators, providing deep control of exercises and extensive debriefing and advisory tools.

"Traditional fire safety training methods can be complex, costly and time consuming, placing pressure on both company and crew," said Leif Pentti Halvorsen, Vice President Products, Maritime Simulation. "By migrating training to a simulated environment using K-Sim Safety, ship officers and crew can experience an incident as if it happened in real-life, while maritime training providers can develop a more streamlined safety training strategy with a low investment and increased pedagogical value."

[WWW.KONGSBERG.COM/EN/
KONGSBERG-DIGITAL/](http://WWW.KONGSBERG.COM/EN/KONGSBERG-DIGITAL/)



ENSCO INTRODUCES CONTINUOUS TRIPPING TECHNOLOGY

Ensenco plc (NYSE: ESV) has announced its Continuous Tripping Technology™, a new proprietary solution that provides more efficient and safer pipe tripping and helps to lower customers' offshore project costs. The patented Continuous Tripping Technology, in concert with other key equipment, sensors and process controls, fully automates the movement of the drill string into or out of the well at a constant controlled speed. When deployed during offshore activities, Continuous Tripping Technology enables pipe-tripping speeds of up to 9,000 feet per hour – up to three times faster than tripping times achieved by current conventional stand-by-stand methods.

Continuous Tripping Technology can be retrofitted to both floaters and jackups, and is particularly well-suited for ultra-deepwater drillships and larger modern jackups. Ensenco recently completed the installation of Continuous Tripping Technology on ENSCO 123 and commissioning of this system is currently underway. Upon completion of the system's commissioning and the rig's acceptance testing, ENSCO 123 is expected to be delivered in March 2019.

President and CEO Carl Trowell said, "Continuous Tripping Technology is a step-change efficiency improvement that uses automation and innovative technology to address a repetitive, time-consuming process that is ubiquitous in offshore projects today. Tripping pipe is on the critical path for all drilling and workover activities and, as a result, meaningful time is spent performing this process over the life cycle of every offshore well. Continuous Tripping Technology significantly reduces the amount of time spent tripping pipe, and the faster tripping time that this technology offers is expected to lead to cost savings for customers regardless of water depth or well type."

In addition to increased efficiencies, Continuous Tripping Technology makes the pipe-tripping process safer by using automation to eliminate human error and personnel exposure associated with the conventional stand-by-stand method. Furthermore, the constant speed that Continuous Tripping Technology delivers has the added benefit of minimizing surge and swab pressure on the wellbore by eliminating intermittent stopping and starting as well as excessive peak speeds that typically occur when using current industry practices. To learn more about Continuous Tripping Technology, visit the Innovation & Technology page at WWW.ENSCOPLC.COM.



**UNDERWATER PORT SECURITY
ENVIRONMENTAL MONITORING
INFRASTRUCTURE INSPECTION**

**AUV - ROV - GIS
Services & Training**

**Efficient
Effective
Economical**



WWW.ORCAMARITIME.COM

+1-619-628-0068



MACARTNEY TO DEVELOP AN AUTOMATED TECHNICAL CONCEPT FOR A HGT

MacArtney has secured an order from Shanghai Electric Wind Power Group to develop an automated concept for a HGT – Hub Generator Tightening Tool - to improve mechanization and reduce human interaction in wind turbine maintenance.

Historically, humans have harnessed the power of the wind to sail their boats, grind their grain and more recently to generate electricity. Wind power has a long and ingenious history that is now being put to good use in our modern world. As we look to the future of our energy supply, offshore wind farms are becoming increasingly high tech and necessary in the pursuit of clean energy.

As more countries move towards renewable energy sources the need to streamline and mechanize the production and maintenance of wind turbines increases. MacArtney has supplied an automated technical concept to the Shanghai Electric Wind Power Group - a multinational power generation and electrical equipment manufacturing company. MacArtney has developed the concept for an automated tool for pre-tensioning and torquing the generator/hub bolts of a wind turbine. To be known as the HGT tool – Hub Generator Tightening tool.

The HGT tool consists of two parts – a Turner tool that creates the rotation of the

generator and an automatic bolt tool for torquing. Prior to torquing each bolt, the hub/generator is positioned using an optical sensor system that ensures the correct location under the nacelle. The tightening of the bolts is then carried out in two stages.

The first stage is to initiate the fully automated process of rotating the generator and pre-tightening the bolts. During stage two of the bolt torquing sequence; all bolts are correctly torqued and stamped with a 'Torque Approved' mark to provide a reference for manual inspection, thus illustrating the bolts are correctly tightened. The automated process of the HGT tool reduces human exposure and thereby improves safety with the additional benefit of reducing labour hours.

Throughout this process, data is continuously accessible and presented in real time by the HMI control system. The torque process is thoroughly monitored throughout and logged in the quality control report.

This turnkey solution supplied to the Shanghai Electric Wind Power Group continues to develop MacArtney's reputation as a full systems solution provider. With the ability to design, manufacture, install and service our products we are able to take MacArtney technical expertise from the drawing board to realization.

PRAGMA'S DOWNHOLE STEAM INJECTION VALVE TAKES NEXT STEP

Aberdeen-based oil and gas production technology business, Pragma Well Technology ('Pragma'), has been given the green light by Pharis Energy and OGTC to progress with the manufacture and prototype testing of their Downhole Steam Injection Valve ('DSIV') following a successful feasibility study.

Using advanced materials, detailed fluid design and innovative engineering features to maximize reliability for extreme downhole conditions, the surface controlled DSIV will be the first steam injection valve available on the market to meet UK safety regulations. The valve will be rated to withstand the extreme downhole conditions required for continuous high-pressure steam injection, and will operate at temperatures of up to 343 degrees Celsius.

Owing to Pragma's surface-controlled design, the DSIV technology will also be able to be used in other extreme high temperature developments around the world. These could include production or geothermal wells, providing the DSIV with considerable applications and advantages for a wider market. The production safety valve variant, the Extreme Temperature Safety Valve ('ETSV'), also incorporates ESP cable bypass capability which will allow the installation of downhole pumps.

The DSIV is a key enabling technology for the implementation of offshore steam-flood and Pharis will use the DSIV valves to protect well integrity, as the company progresses a steam assisted, phased development of the Pilot field, which lies in UKCS block 21/27a. This project will start with a steam-flood trial injecting up to 36,000 bcwe/day (barrels of cold water equivalent) of steam into the southern part of the Pilot field. The full-scale steam-flood is aiming for approximately 50% recovery (over 120 mmbbls), about three times as much oil as would be expected to be recovered using the standard cold water-flood techniques used in most North Sea heavy oil projects to date.

OCEAN BUSINESS 2019 TRAINING & DEMOS TO HIGHLIGHT AUTONOMOUS VEHICLES

Visitors to Ocean Business 2019 will see a record number of autonomous vehicles taking part in demonstrations, when the show returns to Southampton from 9-11 April 2019. Live demonstrations of cutting-edge ocean technology will take place back-to-back on-board vessels, in dockside waters, in the test tank and in classrooms; giving visitors a chance to see the latest products first hand in their real environment.

Demand for training and demo sessions is at an all-time high, and with a surge in bookings for autonomous vehicles, the dockside will become a marine technology hub in itself. The team has once again included parallel demonstration sessions in the dockside waters, to meet demand, and for the first time is including a new floating pontoon, specifically designed to accommodate the mobilization of autonomous vehicles. As well as this new dockside facility, there will be an extra classroom session to optimize learning.

Sessions have been booked up in record time by the 360+ exhibitors at Ocean Business this year, with a program that runs to 184 hours over the three days of the show. The training and demo program is one of the key reasons that Ocean Business is such a success.

The training and demo program at Ocean Business 2019 marks a year of exciting progress in autonomous vehicles with brand new technologies demonstrated both on the dockside and onboard vessels. These include dockside demos from: Kongsberg Maritime who will be showcasing their GeoPulse Sub-Bottom Profiler USV and dotOcean with their Cloud linked ASV swarm technology. Teledyne Marine are also hosting a number of sessions featuring the Teledyne RESON SeaBat T50-F and T-20 MotionScan multibeam sonars the Teledyne Gavia SeaRaptor 6000M rated AUV and the Teledyne RDI's new long range ADCP.

Other interesting classroom-based sessions to complement deep sea technology include: Ictineu who will be introducing pressure-tolerant and high energy li-po batteries; ecoSUB presenting software to simplify AUV mission planning; and SeeByte who will be demonstrating their human-machine interface technologies for unmanned vehicles. This is just a small sample of the sessions available - to download the full training and demonstration program, please visit: www.oceanbusiness.com.

All training and demonstration sessions are free to attend and visitors can simply book in on a first come first served basis at the show. Visitors can book their attendance in advance if they wish, by contacting the company hosting the session.

Ocean Business will take place from 9-11 April 2019 at the National Oceanography Centre, Southampton, UK. Free online registration at WWW.OCEANBUSINESS.COM.



**ocean
BUSINESS 19**
Southampton UK • 9-11 April

Ocean Engineering

subCtech
Subsea Technologies

pCO₂ Underway
■ Scientific ocean monitoring

Li-Ion Batteries
■ Highest capacity, reliability, safety
■ Your power source for subsea, AUV, ROV

Added Value
■ Customizing and personal support
■ Longest service & design lifetime
■ Simplest operation on board

clean seas
Turn the tide on plastic

ISO 9001
UN JAS Certified

info@subctech.com
www.gosubsea.com
SubCtech GmbH www.subctech.com

CO₂ optical Analyzer

OceanPack (FerryBox)

Subsea Batteries

Vehicle Batteries

Battery Systems

This advertisement for SubCtech highlights their subsea technologies, specifically focusing on ocean engineering. It features several subsea equipment components: a CO₂ optical analyzer, an OceanPack (FerryBox), subsea batteries, vehicle batteries, and battery systems. The ad also emphasizes their Li-Ion Batteries as a power source for subsea, AUV, and ROV applications, noting their highest capacity, reliability, and safety. The 'Added Value' section lists customizing, personal support, the longest service and design lifetime, and the simplest operation on board. The 'clean seas' logo is present, suggesting a focus on environmental issues. Quality assurance is highlighted with ISO 9001 certification and UN JAS certification. Contact information for SubCtech is provided at the bottom.

CHECK THE TECH!

Each issue, Ocean News & Technology highlights a few of the latest products from our friends in the ocean industry. Some are from big companies with storied histories, some come from new inventors with big ideas, but no matter the pedigree of these emerging technologies, they all share one thing in common:

This is where cutting-edge concepts become real-world tools.



ZBLAN: The Promise of Optical Fiber Production in Microgravity

One barrier in the subsea fiber optic cables market is the limiting nature of the technology. Silica revolutionized our ability to transmit data, but we are reaching the upper limits of its capabilities. High-performance is vital, not only to reduce cost and environmental impacts, but to meet the ever-increasing demand for data transmission capabilities across long-distances.

Because of this, any material that holds promise for increasing the range of transmission wavelengths, reducing signal attenuation

» The companies Made In Space and ThorLabs provided the Zblan fiber optics tested by NASA.

losses, and eliminating the need for subsea repeaters, attracts our attention.

In 2017, a cutting-edge company called Made in Space built a space-based optical fiber facility and formed it into a payload for NASA. The payload carried preforms of an exotic fluoride-based material called ZBLAN ($ZrF_4 \cdot BaF_2 \cdot LaF_3 \cdot NaF$) which was provided by ThorLabs. Research indicates that



ZBLAN has the potential for better optical qualities than the silica used in most fiber optic cable. It promises greatly superior signal transmission (high speed, low attenuation), and an extended bandwidth deep into the infrared, exceeding that of silica fibers. In fact, ZBLAN has been estimated to outperform silica by up to one hundred times when it comes to attenuation.

Via a rocket, the payload was sent to the International Space Station (ISS) where the manufacturing station was remotely operated from Earth in order to produce a promising high value-to-mass ZBLAN fiber. Why the ISS? They want to manufacture the stuff in microgravity.

Still, ZBLAN, which is terrestrially produced only in very small quantities, has proven impractical for many

commercial applications because gravitational effects (i.e., convection sedimentation) have a direct impact on the stability of manufactured materials. According to researchers at NASA Ames Research Center, gravity has a negative impact on the melting properties, crystallization temperatures, and viscosity of ZBLAN's elemental mix during the manufacturing process, but when ZBLAN fiber is pulled in microgravity it does not crystalize as much.

These microgravity experiments have provided preliminary answers about the role off-earth manufacturing could play in increasing the bandwidth capabilities of subsea fiber optic cables. A second flight resulted in short length of cable. The third flight of their fiber optic cable manufacturing machine launched on 5 December 2018. The ultimate goal: to spool out four kilometers of fiber from just four kilograms of raw material.

Researchers Iona Cozmuta and Daniel J Rasky of NASA Ames Research Center say that when it comes to ZBLAN, "Existing terrestrial markets (Internet, telecommunications, market transactions) and emerging space markets (on-orbit satellite servicing, space manufacturing, space resources, space communications, etc.) seem to converge."

Demonstration of the merits of manufacturing ZBLAN in microgravity sets the stage for large scale manufacture of

high-quality fiber optic fiber in orbit. As ZBLAN approaches the theoretical limits researchers think it will, this exotic fiber could become the industry standard for high end network cabling, long haul telecommunications, advanced medical equipment, and specialized high-powered lasers.



❶ [WWW.NASA.GOV/MISSION_PAGES/STATION/
RESEARCH/EXPERIMENTS/2421.HTML](http://WWW.NASA.GOV/MISSION_PAGES/STATION/RESEARCH/EXPERIMENTS/2421.HTML)

SWIFTplus

Profiling just got more powerful

Multi-parameter profiler measuring CTD, SVP, Turbidity, Salinity & Density

SWIFTplus has been designed, engineered and manufactured in the UK to exceed your profiling needs. From combining sensors for multiple profiles in a single drop, to seamless data transfer for instant use, and all within our signature titanium casing for durability. Technology and precision are combined in an easy to use compact, robust and portable handheld profiler.

t: +44 (0)1803 869292
e: sales@valeport.co.uk
w: www.valeport.eo.uk/swiftplus

VALEPORT

SANCTIONS, BORDER DISPUTES, AND A FAILING INFRASTRUCTURE: 10 THINGS YOU SHOULD KNOW ABOUT VENEZUELAN OIL



By Greg Leatherman
Managing Editor, ON&T



» Heavy crude from Venezuela is used to produce diesel and other high-margin products.

On 23 January 2019, the United States recognized Juan Guaidó as the new interim President of Venezuela. This aligned with statements from the U.S. Secretary of State Mike Pompeo that Nicolás Maduro is no longer the legitimate President of Venezuela. Two days later, the Trump Administration announced sanctions against that nation's state-owned oil and natural gas company (PdVSA).

In their official statement The U.S. Department of the Treasury said, "Today's designation of PdVSA will help prevent further diverting of Venezuela's assets by Maduro and preserve these assets for the people of Venezuela. The path to sanctions relief for PdVSA is through the expeditious transfer of control to the Interim President or a subsequent, democratically elected government."

Below are ten key points related to the production of oil in Venezuela:

1. The sanctions aim to isolate oil money away from Maduro: Under U.S. sanctions, companies can continue to import oil from

Venezuela to American refineries, but the funds generated must be held in blocked accounts that are not accessible to the Maduro regime.

2. PdVSA has been a vehicle for corruption. According to the Treasury Department a variety of schemes have been designed to embezzle billions of dollars from PdVSA for the personal gain of corrupt Venezuelan officials and businessmen, in amounts that reach into the billions of dollars.

3. The economic collapse is not new. Since the installment of a socialist government in 1999, up to four million Venezuelans have fled the nation. Maduro blames his nation's economic perils on sanctions and an international campaign to isolate the South American nation. His critics (such as Transparency International) say that Venezuela ranks as one of the most corrupt nations in the world.

4. Venezuela has not been able to meet crude oil commitments to existing customers. Crude output from this OPEC member nation is near its lowest levels

in 70 years amid an economic crisis and what critics have called mismanagement under Nicolás Maduro. According to S&P Global Platts, the PdVSA processed less than a third of its 1.6 million bpd of refining capacity during 2018. Venezuela's rig count, a loose barometer of future production, fell to 27 in December 2018 from 48 in January, according to Baker Hughes International Rig Counts.

5. The U.S. buys a substantial amount of Venezuelan Oil. According to Barclay's shipments to the U.S. account for about 75 percent of the cash Venezuela gets for crude shipments. Heavy crude from Venezuela is used to produce diesel and other high-margin products.

6. India and China could buy more. Under U.S. sanctions, if Maduro does not step down, Venezuelan oil would be cut off from Gulf Coast refineries, force PdVSA to send more crude to Asian countries such as India and China. As a result, prices of heavier U.S. crude grades rose in January.

7. Key infrastructure is aging. Until the mid-1980s, the Superior Oil Company had major investments in Venezuela. Experienced service companies from the U.S. installed and maintained infrastructure. Since Superior was acquired by Mobil in 1984, the condition of infrastructure has declined. This problem was exacerbated by problems with service and construction companies getting paid.

8. They have a major border dispute with Guyana. According to multiple reports, under Madura, Venezuela planned to remap its Caribbean oil and gas prospects in 2019. Included in the mapping survey are areas also claimed by Guyana, Grenada, and Saint Vincent. Guyana has U.S. backing for its ownership claim over the waters.

9. Maduro has harassed oil companies. For example, in December 2018, the Venezuelan navy intercepted two ships conducting seismic studies for Exxon as the oil major began preparations to develop giant deep-water reserves off the coast of Guyana. This led to one of the ships moving away from the border between Guyana and Venezuela, while the other left the region altogether.

10. And threatened more harassment. After intercepting the Exxon vessels, Maduro issued a decree stating that Venezuela's continental shelf is open for oil exploration, but he also included plans to assert "maximum legal security to the maritime spaces of Venezuela."

NEW YORK GOVERNOR AIMS TO QUADRUPLE OFFSHORE WIND, BUT PROHIBIT OFFSHORE DRILLING

New York Governor Andrew M. Cuomo set new renewable energy goals for his state—including quadrupling its offshore wind power production—in his 2019 State of the State address on 15 January 2019. The goals were also published as part of the state's official 2019 agenda.

"Let us set the goal: 100 percent clean power by 2040," the governor said in his speech.

According to the newly re-elected governor, the mandate is the most aggressive goal of its kind in the U.S. While it is similar to the goal set by California, the target date is five years sooner.

The foundation of New York's 100% goal is upping the state's Clean Energy Standard (CES) from 50% to 70% renewable energy by 2030. The agenda also includes investing \$200 million in New York port infrastructure, establishing a New York State Advisory Council on Offshore Wind Economic and Workforce Development, investing in an offshore wind training center, and initiating an effort to facilitate the development of an offshore wind transmission grid.

Liz Burdock, CEO & President for The Business Network for Offshore Wind, responded to the news by thanking Governor Cuomo for making offshore wind energy a critical piece of his mandate and for increasing the state's offshore wind target from 2,400 megawatts by 2030 to 9,000 MW by 2035.

"This is a massive increase and sends a clear message to the industry that New York is taking a leadership position in the U.S. offshore wind market," Burdock said. "We also thank the Governor for asking for \$200 million in port infrastructure, and investments in a training center and the development of an offshore transmission grid to make development more efficient and affordable for taxpayers and ratepayers. New York is off to a great start in 2019."

Cuomo said, "Offshore wind has potential – we know it – [and] the industry is moving that way. We want to locate the industry in this state . . ."

Part four of state's official 2019 agenda, "Launching the Green New Deal," says that New York's ramp-up of renewable energy will include:

- » Quadrupling New York's offshore wind target to 9,000 megawatts by 2035, up from 2,400 megawatts by 2030;
- » Doubling distributed solar deployment to 6,000 megawatts by 2025, up from 3,000 megawatts by 2023;
- » More than doubling new large-scale land-based wind and solar resources through the Clean Energy Standard;



- » Maximizing the contributions and potential of New York's existing renewable resources;
- » Deploying 3,000 megawatts of energy storage by 2030.

The official 2019 agenda also aims to prohibit offshore drilling off the coast of New York by:

- » Prohibiting leases for oil and gas exploration or production in New York waters, including Long Island, New York City, and the Hudson River;
- » Prohibiting infrastructure on State land associated with offshore oil and gas production in the North Atlantic;
- » Prohibiting transportation within the navigable waters of the state of crude oil produced from the federal waters, designated as the "North Atlantic Planning Area."

EXXONMOBIL TO PROCEED WITH NEW CRUDE UNIT AS PART OF BEAUMONT REFINERY EXPANSION

ExxonMobil has reached a final investment decision and started construction on a new unit at its Beaumont, Texas refinery that will increase crude refining capacity by more than 65 percent, or 250,000 barrels per day. The third crude unit within the facility's existing footprint will expand light crude oil refining. Startup of the new unit is anticipated by 2022. ExxonMobil previously announced plans to build and expand manufacturing facilities in the U.S. Gulf region as part of its Growing the Gulf initiative.

On 30 January, ExxonMobil also announced that it had earned \$20.8 Billion in 2018, including \$6 Billion in the fourth quarter. The full-year cash flow from operating activities was \$36 billion, the company's highest since 2014.

BID TO BUILD FIRST NJ OFFSHORE WIND FARM SUBMITTED BY ØRSTED



Ørsted submitted a bid to the New Jersey Board of Public Utilities (NJBPU) Dec. 28 to build its Ocean Wind project in response to the first offshore wind request for proposal under Gov. Phil Murphy's clean energy agenda, according to a release.

Ørsted owns and operates the Block Island Wind Farm, America's first offshore wind farm, and has a comprehensive geographic coverage with the largest development capacity, totaling more than 8 gigawatts in seven states. The company also launched the world's first offshore wind farm in 1991.

The proposed Ocean Wind project would be located 15 miles off Atlantic City, a significant distance away from the coastline and residential communities. Should Ocean Wind receive approval from the NJBPU, Ørsted will work with Public Service Enterprise Group's non-utility affiliates, which would provide energy management services and potential lease of land for use in project development. PSEG, which has a long history in New Jersey as well as a decade-long partnership with Ørsted, will have the option to become an equity investor in the project.

"Today is an important milestone in the state's desire to build out its renewable energy portfolio," stated Thomas Brostrøm, CEO of Ørsted US Offshore Wind and president of Ørsted North America.

"As the global leader in the development of offshore wind, we are confident in our ability to deliver a comprehensive, competitive project that will help Gov. Murphy achieve his goal of 3,500 megawatts of offshore wind by 2030, while boosting the economy and creating jobs," he continued.

"We are pleased to continue supporting Gov. Murphy's clean energy agenda," stated Ralph Izzo, PSEG's chairman, president and CEO. "New Jersey is fortunate to have excellent offshore wind resources. If approved Ocean Wind would provide substantial

environmental benefits, as well as generate significant economic activity in the state."

As presented in its proposal to the NJBPU, the Ocean Wind project will:

- » Deliver on Gov. Murphy's goal of a sustainable offshore wind supply chain with the first permanent offshore wind manufacturing jobs in America in addition to the creation of up to 1,000 annual construction jobs within the state, providing significant opportunities for high-quality, skilled labor jobs from the South Jersey building and construction trades.
- » Make significant investments in New Jersey's offshore wind fabrication, construction, and maintenance infrastructure — all of which will create long-term job potential and reduce the cost of future offshore wind farms in the region.
- » Provide more than half a million New Jersey homes with clean, reliable and stable-priced power.
- » Deliver a credible timeline as its the most mature project based on years of significant site investigation, permitting and interconnection work. This allows Ørsted to deliver on the economic, environmental and energy system benefits years before others can.
- » Establish the "Ocean Wind Pro-NJ" Grantor Trust (Pro-NJ Trust), which will support Minority Business Enterprises (MBE), Women Business Enterprises (WBE) and/or small businesses entering the offshore wind industry. The fund also will support investments in infrastructure resiliency projects throughout South Jersey.



» Flow Physics Facility director Joe Klewicki, professor of mechanical engineering at the University of New Hampshire, in front of the two 400-horsepower fans in 2010.

NEW HAMPSHIRE ASKS FEDS TO PARTNER ON OFFSHORE RENEWABLE ENERGY

In a 2 January 2019 letter to Walter Cruickshank, the acting director at the Bureau of Ocean Energy Management (BOEM), Governor Christopher T. Sununu formerly requested the establishment of an intergovernmental offshore renewable energy task force for the State of New Hampshire.

Similar task forces for other states have coordinated federal, state, and local efforts to determine the feasibility of offshore wind in federal waters and act as a preliminary step in a lengthy process.

A joint resolution filed by a group of New Hampshire state senators and representatives earlier in 2019 supported efforts to develop wind power off the state's coast and requested that Sununu contact BOEM about creating the offshore wind task force.

Small Coast, Big Potential

While the New Hampshire coastline is only eighteen miles long, a 2014 legislative study estimated the state's offshore wind resource potential at nearly 3,500 megawatts. That report also stated, that "... our neighbors to the north and the south are making serious efforts to develop the industry ... It therefore behoves New Hampshire to become more involved in this potentially significant area of economic growth, even with the limited coastline that we have."

Because the state does not have a large electric load, potential exists for the export of power generated by New Hampshire's offshore wind projects to neighboring states.

Dr. Martin Wosnik, Director for the University of New Hampshire's Center for Ocean Renewable Energy (CORE), said in a phone interview that the Portsmouth Naval Shipyard would be an excellent location to serve as staging area for offshore wind deployments.

CORE plays a leading role in New Hampshire's contribution to U.S. ocean renewables expertise and has worked closely with the University of Maine to develop floating foundations for offshore wind turbines. A prototype floating wind turbine design is currently being tested off the coast of Maine near Monhegan Island. If installed, the full-scale installation could produce as much as 43,000 MWh annually.

In 2010, the University of New Hampshire opened a 300 feet boundary-layer wind tunnel, which is used to help engineers and scientists better understand the dynamics of turbulent boundary layers, informing the aerodynamics of situations such as atmospheric wind over the ocean. CORE also manages testing sites for wave and tidal energy.

Source: <https://www.governor.nh.gov/news-media/press-2019/documents/20190107-boem-offshore.pdf>

MARATHON OIL UK LLC WINS APPEAL VICTORY IN ENGLISH COURT

International law firm Baker Botts, has achieved a litigation victory on behalf of Marathon Oil UK LLC in the English Court of Appeal. The case was one of the largest to come before the English courts in recent years in the energy sector.

Marathon had claimed against a number of its joint venture partners for reimbursement of tens of millions of pounds of pension related costs incurred in Marathon's role as the operator of certain hydrocarbon fields in the UK North Sea. In a Judgment handed down on January 17, 2019, the Court of Appeal unanimously upheld Mr. Justice Knowles CBE's earlier ruling in the High Court in Marathon's favor.

The unsuccessful parties, Spirit Energy Resources Limited (formerly Centrica Resources Limited), Taqa Bratani Limited and Taqa Bratani LNS Limited were ordered to make payment of Marathon's legal costs. The case is of relevance to joint venture arrangements in the energy sector where assets are often operated by one joint venturer, with that operator being reimbursed for its costs by the other joint venture parties.

In February 2018, Mr. Justice Knowles CBE, sitting as a Judge of the English High Court, issued a judgment requiring Marathon's partners under two operating agreements to reimburse it for pension-related costs incurred as the operator of certain hydrocarbon fields in the Brae Area of the UK North Sea. Justice Knowles found for Marathon on all points relating to liability and rejected the Defendants' counterclaims. He held that, under the relevant agreements, the Defendants were required to reimburse Marathon for their portion of the pension deficit recovery payments. The decision was appealed to the Court of Appeal by the Defendants. In its Judgment of 17 January 2019, the Court of Appeal unanimously upheld the lower court's decision.



STATE AND FEDERAL BILLS OPPOSING TRUMP OFFSHORE DRILLING PLAN INTRODUCED

On 8 January 2019, lawmakers from nine states (Connecticut, Georgia, Hawaii, Maine, Massachusetts, New Hampshire, New York, Oregon, and Rhode Island) introduced state-level bills aimed at blocking oil and gas drilling off their coasts.

These state-level bills do not have the authority to halt the Trump Administration from leasing oil and gas rights in federal waters on the Outer Continental Shelf but are instead aimed at halting development of the infrastructure required to transport fuel back to land. Some also include strict liability clauses for responsible parties in the case of an offshore oil spill.

Meanwhile, a group of House Democrats unveiled measures that would ban drilling in federal waters off much of the country. Representatives who introduced the bills include House Energy and Commerce Committee Chairman Frank Pallone (D-N.J.) and the chairman of the House select climate committee, Rep. Kathy Castor (D-Fla.). Others introducing bills in the package are Reps. Alan Lowenthal (D-Calif.), Joe Cunningham (D-S.C.), Salud Carbajal (D-Calif.), David Cicilline (D-R.I.), Jared Huffman (D-Calif.), A. Donald McEachin (D-Va.), and Elaine Luria (D-Va.).

The congressional bills include:

- H.R.205 would permanently extend the moratorium on leasing in certain areas of the Gulf of Mexico.
- H.R.279 would permanently prohibit oil and gas leasing off the coast of the State of California.
- H.R.286 would prohibit oil and gas preleasing, leasing, and related activities in certain areas of the Outer Continental Shelf off the coast of Florida.
- H.R.287 prohibit oil and gas leasing on the outer Continental Shelf off the coast of New England.
- H.R.291 would place a ten-year moratorium on oil and gas preleasing, leasing, and related activities on the Outer Continental Shelf in the North Atlantic, Mid-Atlantic, South Atlantic, and Straits of Florida planning areas and in the Eastern Gulf of Mexico.
- H.R.309 would prohibit drilling in the Arctic Ocean.
- H.R.310 would permanently prohibit offshore drilling on the outer

Continental Shelf off the coast of California, Oregon, and Washington.

- H.R.337 would amend the Outer Continental Shelf Lands Act to withdraw the outer Continental Shelf in the Mid-Atlantic planning area from disposition.
- H.R.341 would permanently prohibit the conduct of offshore drilling on the outer Continental Shelf in the Mid-Atlantic, South Atlantic, North Atlantic, Straits of Florida, and Eastern Gulf of Mexico planning areas.

Meanwhile, a Senate bill (S.13) introduced on 3 January 2019 by Republican Marco Rubio, would include the State of Florida in the Gulf of Mexico outer Continental Shelf revenue sharing program, but "extend the moratorium on oil and gas leasing in certain areas of the Gulf of Mexico" until 2027.

The Trump Administration has a draft proposal to open lease sales in 98% of the federal offshore from 2019 to 2024. The administration has said it wants to wrap up the plan by the end of 2019. For the most part, the Republican led Senate has supported the Administration's plan.

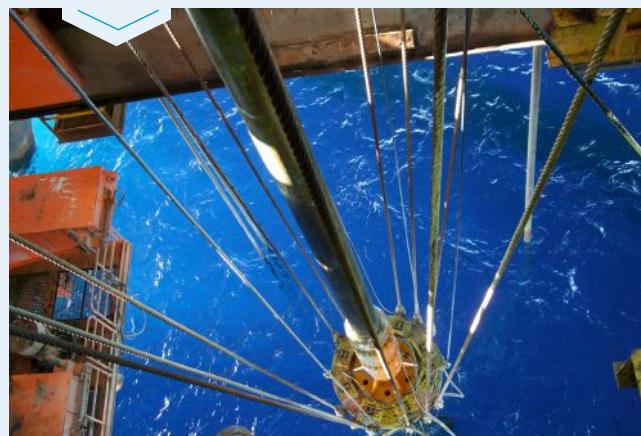
TOTAL ANNOUNCES A NEW SIGNIFICANT DISCOVERY IN THE NORTH SEA

Total has announced a new significant discovery in the North Sea offshore U.K., on the Glengorm prospect located in the Central Graben.

The well was drilled to a final depth of 5,056 meters and encountered 37 meters net gas and condensate pay in a high quality Upper Jurassic reservoir with excellent properties.

Recoverable resources are estimated close to 250 million barrels of oil equivalent. Further drilling and testing will be carried out to appraise resources and the productivity of the reservoir.

"Following the recent Glendronach discovery, West of Shetland in the U.K., Glengorm is another great success for Total in the North Sea, with results at the top end of expectations and a high condensate yield in addition to the gas," stated Kevin McLachlan, Senior Vice President Exploration at Total. "Our strong position in the region will enable us to leverage existing infrastructures nearby and optimize the development of this discovery. Glengorm is an achievement that demonstrates our capacity to create value in a mature environment thanks to our in-depth understanding of the basin."



The discovery is located on the P2215 license, which was previously part of the Maersk Oil portfolio, in water depth of about 80 meters, close to existing infrastructures operated by Total and offering tie-back possibilities, such as the Elgin-Franklin platform and the Culzean project, scheduled to start production this year. It also presents some upside potential with several other prospects already identified on the same block.

Total holds a 25% working interest in the Glengorm discovery, alongside CNOOC Petroleum Europe Limited, a wholly-owned subsidiary of CNOOC Limited (50%, operator) and Euroil, a wholly-owned subsidiary of Edison E&P SpA (25%).

WWW.TOTAL.COM



CORPUS CHRISTI CHANNEL DEEPENING EXPECTED TO INCREASE CRUDE EXPORTS FOR U.S.

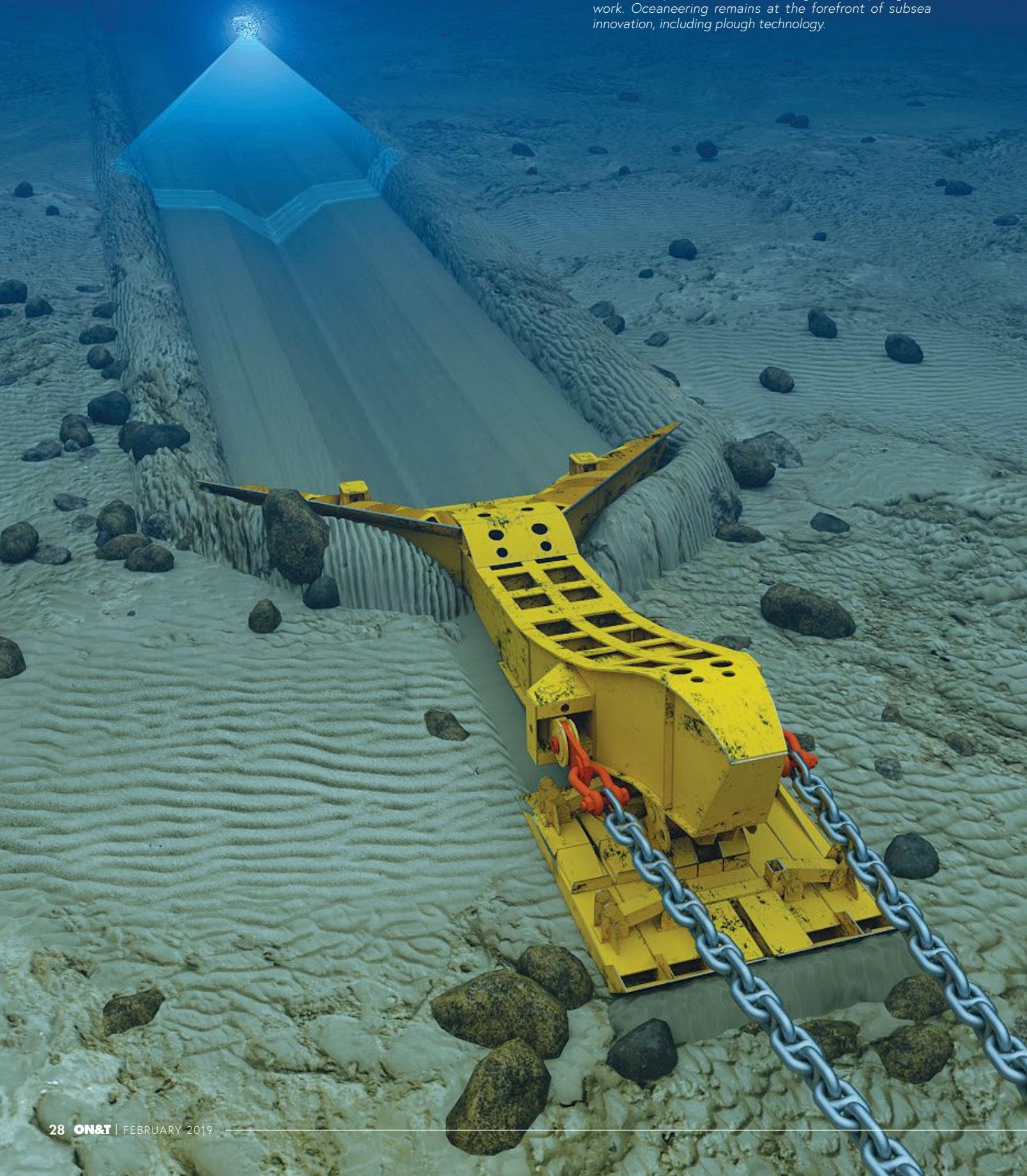
The Port of Corpus Christi is the largest crude export port in the United States and processes approximately 100 million tons each year. The Port's impact on the United States economy exceeds \$124 billion annually and planned work on this channel over the next five years is expected to bring significant boost to the United States, Texas and local economies.

Great Lakes Dredge & Dock Corporation ("Great Lakes") has announced the receipt of a \$93 million contract award for the Corpus Christi Ship Channel Improvement Project. Dredging to deepen the entrance channel will commence during the second quarter of 2019 with completion expected in early 2020. The overall ship channel deepening effort will be comprised of multiple phases, expected to be competitively bid and worked over the next five years. The total estimated contract value of these projects is approximately \$360 million.

This deepening project will be a major step toward the United States' objective of becoming a net exporter of its energy production. This project is sponsored by the U.S. Army Corps of Engineers, Galveston District, working in partnership with the Port of Corpus Christi to fund the work.

David Simonelli, President Dredging, commented, "Three additional contracts are planned to create much needed deep-water access to the Port. Great Lakes dredging operations will utilize hopper and cutter suction dredges to excavate over 6.6 million cubic yards of dense sands and clays to a depth of 58 ft."

» An example of an Oceaneering subsea plough at work. Oceaneering remains at the forefront of subsea innovation, including plough technology.



PLOUGHS FOR THE OFFSHORE RENEWABLES MARKET:

LEARN ABOUT OCEANEERING'S COMPREHENSIVE SUITE OF ROUTE CLEARANCE, PRE-CUT TRENCHING AND MECHANICAL BACKFILL PLOUGHS.

**By Simon Miller, Business Development Manager – Subsea Projects, Oceaneering
David McIntosh, Operations Manager – Subsea Projects Europe, Oceaneering**

BACKGROUND

Since its establishment in 1969, Oceaneering International has been at the forefront of subsea innovation and technological advancements, growing from a small regional diving company into a global provider of engineered products and services for use throughout an offshore field's life cycle. Through its advanced technologies group, Oceaneering serves the aerospace, defense and theme park industries.

For more than a decade, Oceaneering has successfully applied technologies it has developed for other sectors to the offshore renewables industry. We use our technical expertise to manufacture dynamic cables for complex wave and tidal projects and to perform independent inspections and weld assessments of topside substation modules during construction. Oceaneering conducts geophysical

and geotechnical surveys of cable routes and robotic crawler inspections of confined monopile spaces. The company also has an extensive track record of subsea construction support tasks, including foundation and jacket positioning support, cable touchdown and pull-in monitoring, anode hook-up and impressed current checks on structures.

In order to further its expansion into the renewables market, Oceaneering acquired Ecosse Subsea Systems in March 2018. Ecosse offered a comprehensive suite of route clearance, pre-cut trenching and mechanical backfill ploughs for export, inter-array, interconnector cable, pipelay boulder clearance and burial projects. Ploughs have been used on numerous

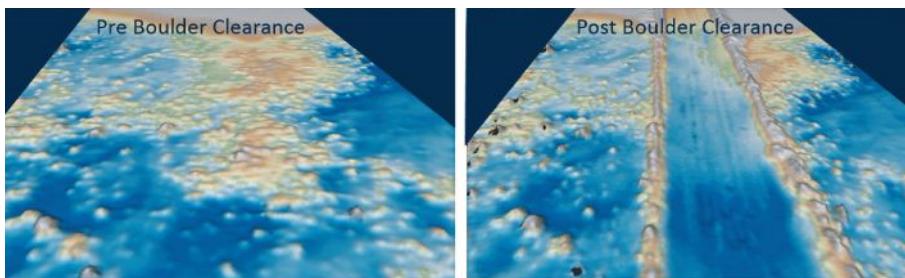
offshore wind projects and can also be used for wave and tidal projects that require cable burial.

POWERFUL PLOUGHS

Subsea ploughs have proven themselves to be as effective as their land-based counterparts. They fall within the existing family of industry standard seabed burial tools between jet-trenchers for low cohesive strength clay soils, non-cohesive granular soils, and mechanical chain cutters for very stiff clays and rock. In the right shallow seabed conditions, the simple plough makes for a very effective, low-cost and robust way to pre-cut trenches for cables and pipes. These cables and pipes can then be protected by the achieved

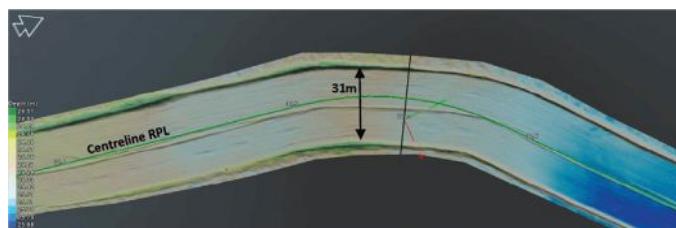
depth of lowering within the pre-cut trench and the trench left to naturally backfill over time. Alternatively, they can be mechanically backfilled post cable or pipe lay to reinstate the seabed to as near an as-found condition as possible immediately upon completion of the mechanical backfilling operation.

The Ecosse route clearance plough - now the Oceaneering route clearance plow - has become the market leader in dense boulder field clearance, and has over 5,000 km (cumulative) of project history and track record in some of the harshest subsea environments known to cable route developers. Pulled along the seabed using an anchor handling vessel, the robust boulder clearance system has easily displaced boulder walls of up to 2 m in height, amid seabed features such as megaripples and sandwaves.

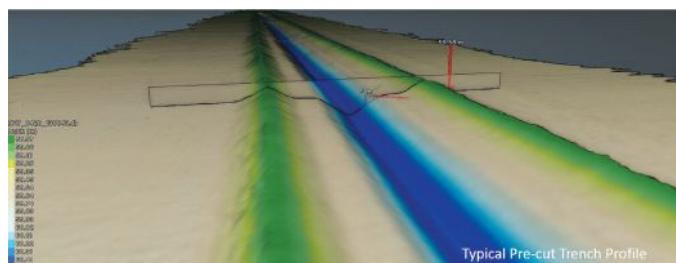


The overall concept of an efficient, robust and low-cost cable/pipeline route preparation solution has been used on many of the offshore wind farms in operation today—and can be applied to tidal and wave projects—clearing the way and reducing schedule risk for the cable lay vessel and for the client's chosen trenching solution.

With the boulder clearance plough, you have a simple and robust means to prepare a route for the accurate lay of pipe or cable within the swath of the clearance plough. The clearance swath is standard at 15m in a single pass but can be increased with multiple passes if a larger clearance swath is required. For example, on a recent Southern North Sea wind farm project, a 30+m corridor was specified by the customer and this was successfully achieved in five passes of the system. With the product not yet laid, there is no risk to the product, and any unexpected large boulders or other unforeseen seabed conditions encountered during the route clearance operation can be dealt with efficiently and off the project critical path before the product is laid.



The pre-cut trenching plough offers a simple and robust pre-cut trenching solution incorporating the latest subsea positioning technology from the beach out to deepwater, ensuring the trench is cut accurately to the planned route position list. To increase asset efficiency and productivity, the Ecosse pre-cut trenching solution has evolved from a multi-pass trenching solution into a single pass pre-cut trenching solution, incorporating an element of trench depth overcut to manage the potential risk of trench infill prior to product lay. The single pass pre-cut trenching plough is capable of cutting a trench up to 2m in depth in a single pass.

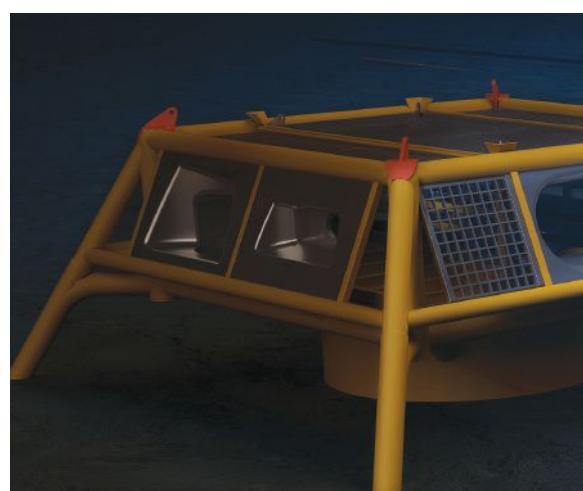


OPTIONS FOR MORE

Oceaneering is also offering clients the option to undertake boulder / route clearance works simultaneously while pre-cutting the trench. This novel and unique approach offers the client not only significant project cost savings, but also reduces the project risk associated with not achieving depth of lowering during post-lay trenching operations, where options to deal with unforeseen soil conditions are limited and expensive. Any unforeseen soil conditions impacting on target depth of lowering can be identified, managed and planned for before the product is laid.



» A subsea plough is washed down before relaunch. Subsea ploughs are utilized not only for offshore oil and gas and wind projects, but wave and tidal projects where cable burial is required.



» Oceaneering's Freedom AUV / ROV hybrid and other AUVs allow for simultaneous trenching and burial work alongside survey inspection, reducing offshore days and cost.



The pre-cut trenching plough also offers the cable contractor the opportunity to lay the cable under constant tension with increased lay speed, improving the quality and consistency of the product's position and reducing lay vessel costs by reducing the lay schedule duration. Trenching risks associated with post lay trenching and cable residual tension are completely removed.

When it comes to backfilling the trench after the product is laid, the backfill tool has been designed to ensure there is no mechanical or moving/articulated parts riding within the trench profile. With the soil berms from the pre-cut trenching activity being pushed back into the trench to provide cover for the product from the front of the mechanical backfill tool, any risk of product contact from the plough is removed. Offshore testing with the backfill plough being deliberately pulled off course demonstrates that, even with the plough set off track, at no time can the product be snagged or caught.

How do we use technology to keep us at the forefront of the market? And how do we make these ploughs even more effective by adding technology but without losing simplicity?

All our ploughing solutions from route clearance through to mechanical backfill now come with a robust plough subsea position feedback arrangement. This arrangement utilizes the latest in subsea positioning Inertial Navigation System technology and plough attitude visualization systems to allow the decision making on the bridge to be made with real-time accurate position and attitude data. This ensures highly accurate positioning of asset in relation to the

route position list and/or product.

The increasing distance of assets from shore and the growing interconnector markets that make energy transfer and sharing possible between countries, means that route clearance and pre-cut trenching/cable lay works can extend over hundreds of kilometers. Survey of routes, whether it be pre-lay, post-lay or post burial, consumes vessel time and adds cost to the project. This cost can be eliminated by the use of technology and simultaneous operations from the same vessel.

Introducing our suite of AUVs, along with our Freedom autonomous untethered AUV/ROV hybrid, allows for simultaneous operations to occur. Trenching and burial works performed simultaneously with survey inspection vastly reduces offshore days and therefore cost. We can start clearing a field or cutting a trench accurately with our ploughs whilst deploying our AUV assets to gather data in real time. That data can be transferred in large packets to onshore surveyors for interpretation and processing using our satellite bandwidth, further reducing costs by removing personnel from the offshore operations.

The result of the acquisition of Ecosse by Oceaneering is a new solution whose benefits include: vessel agnostic tooling; low-cost burial solutions that are environmentally friendly and reduce offshore vessel time, and proven, safe, robust, simple solutions that can utilize the most advanced positioning systems and AUV technology to further drive efficiency and accuracy, and reduce costs.

SO WHAT'S NEXT?

We are on a journey of continuous asset improvement in relation to not only improving plough operational efficiency, but pushing the boundaries of the latest subsea ROV / AUV vehicle technologies to ensure our trenching operations are customer centric, operationally efficient and at the right project cost base.

3D AT DEPTH EXPANDS UNDERWATER SURVEY SERVICES



» 3D Terrestrial scan for subsea placement and dimensional control.

3D at Depth, a leading expert in subsea laser LiDAR (SL) technology and 3D data visualization solutions, has announced the expansion of global office locations and the launch of a new portfolio of services designed to support cohesive workflow efficiencies for offshore oil field design through decommissioning.

The new line includes: terrestrial dimensional control to support subsea data collection workflows; subsea tooling design solutions; remote sensing, and real-time LiDAR data collection. These new services will compliment 3D at Depth's existing portfolio of solutions and deliver additional 3D insight to measure, map, analyze and manage more efficiently. Over the past few years, the Company's unique expertise in subsea laser LiDAR (SL) technology and 3D data collection and visualization has advanced underwater integrity programs by providing precise, repeatable, millimetric, 3D point clouds that allow clients to "Measure in 3D and Manage in 4D."

Neil Manning, 3D at Depth, Chief Operating Officer, said "The success of our work within the energy sector has enabled the company to double in size during 2018. As we continue to deliver on the goal of a 3D digitized oil field, we have added remote sensing for leak detection, vibration with displacement, and rotational mode effect monitoring from autonomous and remotely operated platforms. Subsea LiDAR technology is now being used on a regular basis for sensitive environmental areas due to our non-touch capability. The value realized from the type and format of the data we deliver continues to grow our client base. From underwater archeological heritage sites to potentially pollution wrecks, we can map, monitor and create environmental baseline audits for a wide range of stakeholders including government officials, corporations and nonprofits."

Last winter, 3D at Depth Inc. moved their U.S. headquarters to Longmont, Colorado. The larger, consolidated facility supports

expanded research and development; optical design; electronics and mechanical design, and a larger manufacturing and calibration department.

As the Company continues to expand operations and recruit talent, 3D at Depth established a UK entity, 3D at Depth Ltd. The Norwich location is the headquarters for their European, Middle East and Africa regional sales, services, and project support. Norwich also opened a dedicated data processing and offshore services center. The center provides an equipment and data processing hub located in a globally central time zone to enable better customer support with faster more efficient regional responsiveness.

WWW.3DATDEPTH.COM

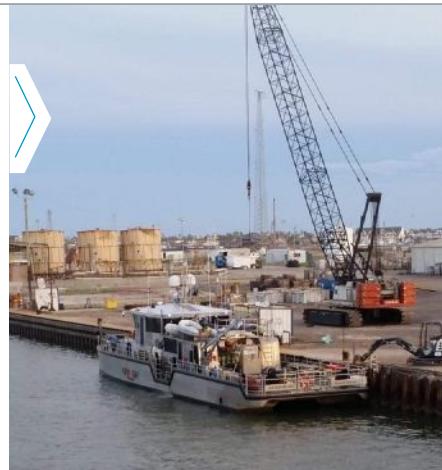
AQUEOS COMPLETES MAJOR DIVING SCOPE FOR SOUTH TEXAS-TUXPAN GAS PIPELINE

Aqueos Corporation has completed a major diving scope for the installation and commissioning of the South Texas-Tuxpan Gas Pipeline. The South Texas-Tuxpan Gas Pipeline is being constructed by a joint venture between TransCanada (60%) and Sempra Energy's Mexican unit IEnova (40%), also known as Infraestructura Marina del Golfo (IMG). The \$3.1 billion project is being sponsored by the Federal Electricity Commission (CFE) of Mexico. Carrying US natural gas to Mexico from west Texas, this 42" pipeline is ~800km in length and runs offshore from Brownsville, TX to a shore-end approach and pump station in Altamira, MX back offshore then making landfall in Tuxpan, MX. The pipeline will deliver natural gas to power the Mexican electrical power grid. The pipeline capacity is 2600 Million cubic feet per day.

On the US side, Aqueos has completed

a number of different scopes of work supporting the project. Working without interruption since December of 2017, Aqueos performed IMCA compliant surface and Nitrox diving operations from two Aqueos provided liftboats, a DP DSV and Aqueos' Special Purpose Liveboating And Survey Hull vessel, SPLASH™ in water depths from 5' to 90'. Over 900 successful dives were made supporting activities including pre-lay survey and obstruction removal, assisting pipe lay with the removal of over 1,000 Mono Buoyancy Units, tail pipe stabilization with the installation of 116 articulated concrete mattresses and 129 five-ton, bolt-on concrete pipe weights and pipeline burial support of 14 miles to 3' of cover.

Aqueos is currently providing diving support on the Mexican side of this project. To date, Aqueos has performed



DP surface-diving operations from two Aqueos provided DP DSV's, a major pipelay barge, and the Aqueos SPLASH™ in water depths from 15' to 180'. More than 600 successful dives have been completed thus far performing inspection, survey, valve operations, pipeline head installation & removal, installation and recovery of rock filter units and pipeline span rectification. The project is expected to be completed in Q1 2019.

i WWW.AQUEOSSUBSEA.COM

Save time and money locating subsea cables

with a JW Fishers CT-1 Cable Tracker.



- Locate and track cables
- Find faults and breaks
- Use on land & underwater
- Audio and Visual output
- Commercial construction
- Calculate burial depth
- Starting at \$15,995



JW Fishers Mfg., Inc

(800)822-4744

(508)822-7330

Email: info@jwfishers.com

www.jwfishers.com



ROV PILOT HELPS DISCOVER SUNKEN SHIP THAT HE SAILED ON IN THE 1990S

By Priyanka Runwal, MBARI

"Hey, come on guys, the American Heritage is sinking! We are going after it." These were the words Knute Brekke, chief pilot of one of MBARI's remotely operated vehicles (ROVs), heard in the middle of the night 23 years ago.

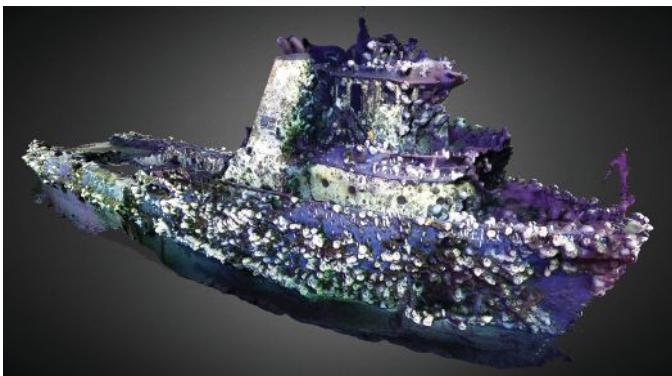
It was a night of mayhem. As soon as they heard the news, Brekke and his co-workers at American Pacific Marine, the diving and ROV company that owned the American Heritage, began to gather gear and cranes to salvage the sinking ship. But they never left port. It was too late. The ship had sunk.

"The propeller shaft separated and there was water coming through a six-to-eight-inch hole in the engine room. And down it went," said Brekke. Fortunately, before the ship sank, the Coast Guard managed to rescue everyone on board.

On May 4, 1995 the Los Angeles Times reported the incident and pinned the location of the sunken ship about 13 kilometers (eight miles) south of Malibu, in Santa Monica Bay.

Flash forward to 2008—MBARI researchers were using an underwater robot to map around Santa Monica Canyon and saw something unusual on the seafloor. In the end, however, the researchers decided it was just bad data. "They called it an anomaly," said Brekke.

In May 2018, MBARI researchers returned to Santa Monica Bay and surveyed the same spot as part of a larger seafloor mapping project. This time, the maps clearly revealed a 60-meter-long shipwreck lying on the seafloor almost 700 meters (2,300 feet) below the ocean surface.



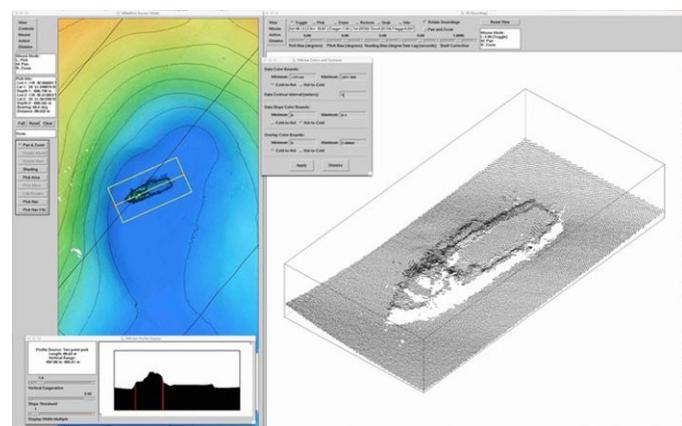
» Three-dimensional reconstruction of the wreck created using still images from MBARI's remotely operated vehicle Doc Ricketts. Image: Ben Erwin © 2018 MBARI.

Four months later, in September 2018, MBARI geologist Charles Paull led a research expedition using the research vessel Western Flyer and ROV Doc Ricketts to investigate faults and submarine canyons in this same area. But they were also on the lookout for the mysterious sunken ship.

Brekke was one of the pilots operating the ROV during this expedition. When he first looked at the seafloor maps of the area, Brekke was immediately drawn to the shipwreck. It looked like a typical oil-field supply boat that might have been servicing oil rigs between Los Angeles and Point Conception.

His curiosity piqued, Brekke found a nautical chart and drew a line along the route the sunken supply boat should have taken during its last passage. The line passed right over the position of the wreck shown on the sonar. "I may know what boat this is," Brekke exclaimed.

On the last day of Paull's cruise, the researchers were conducting an ROV dive barely 600 meters from the shipwreck site. Having a little extra time, they decided to dive on the wreck.



» Sonar images of the wreck created using data from MBARI's seafloor-mapping AUV during a survey of faults and submarine canyons offshore of Santa Monica Bay. Image: Dave Caress © 2018 MBARI.

Brekke was operating the ROV when its video cameras revealed a giant object covered in sponges. He and the other pilots flew the ROV around the wreck, from bow to stern, up and down, for three hours. Although poor visibility and loose ropes and cables prevented the ROV from getting too close to the wreck, the pilots eventually spotted the letters A, M, E, and R on the bow of the boat. "That's it. It says American Heritage," said Ben Erwin, Brekke's copilot. The company emblem on the smokestack confirmed that the ship belonged to American Pacific Marine.

"Wow. That's pretty cool," Brekke exclaimed.

Mesmerized by the shipwreck, Erwin decided to create a three-dimensional (3D) rendering of it. Over the next few months, he pieced together thousands of still images of the shipwreck that he had extracted from the ROV video. After weeks of heavy number crunching, Erwin posted the final product on the Sketchfab website. Now anyone can examine the wreck of the American Heritage on the seafloor in the deep waters of Santa Monica Bay.

OCEANEERING SECURES NEW NORTH SEA INSPECTION CONTRACT FROM PETROFAC

Oceaneering International, Inc. ("Oceaneering") has secured a three-year Provision of Inspection Enactment Services contract with Petrofac's Engineering and Production Services division in the Western Hemisphere ("Petrofac"), growing its asset integrity portfolio within the U.K. Continental Shelf (UKCS).

Oceaneering will retain its existing contract on one of Petrofac's Duty Holder assets, while expanding its service scope to include two additional North Sea facilities.

Oceaneering will provide inspection management, shutdown and project support for Petrofac, which manages these assets under its Duty Holder and service operator contracts. The contract includes two additional one-year options. The work will be carried out by Oceaneering's Asset Integrity team in Aberdeen.

Bill Boyle, Senior Vice President for Oceaneering's Asset Integrity Division said, "We are delighted to have won this contract and to extend our long-standing relationship with Petrofac, having supported the company for more than 14 years.

"The addition of inspection enactment services enables us to further align ourselves with Petrofac's commitment to providing value-added solutions that minimize risk, enhance integrity, reduce costs and unlock more value. We very much look forward to working with the team to enhance operability and continue the excellent safety and integrity standards across its Duty Holder portfolio."

Oceaneering's Asset Integrity division provides conventional and advanced non-destructive testing (NDT), specialist inspection solutions and integrity management capabilities, with a team of over 2,100 technically focused people, servicing clients from 24 global locations.



WWW.OCEANEERING.COM/ASSET-INTEGRITY/



BARRACUDA
A New Breed of ROV

*Designed to work in high current.
Small, Streamlined, Extremely Powerful and loaded
with Advanced Capabilities.*

- Shark Marine's "DiveLog" Control Software"
- Provides:
 - 3D Route Following.
 - Station Keeping.
 - Auto Depth / Altitude.
- Integrated Total Navigation System (TNS) Including GPS, DNS,(LBL also available).
- Able to run off of a wide range of power supplies.
- Easy to Deploy, High Thrust.

Shark Marine Technologies Inc. www.sharkmarine.com sales@sharkmarine.com Ph: (905) 687 6672

SUBSEA INNOVATION ACHIEVES DNV GL APPROVAL FOR PIPELINE REPAIR CLAMP



Subsea Innovation's Emergency Pipeline Repair Systems (EPRS) is used to prolong and protect operational life and production efficiency of subsea oil and gas pipelines.

Subsea Innovation Ltd, part of Tekmar Group plc, has been awarded DNV GL type approval for its SIClamp structural pipeline repair clamp technology. In doing so Subsea Innovation is the first manufacturer in the world to achieve this certification.

The new technology can act as a temporary or permanent structural repair clamp for carbon steel pipelines designed for water, oil or gas transport. Emergency Pipeline Repair Systems (EPRS) such as these are designed for immediate deployment should a subsea oil or gas pipeline become damaged or its integrity found to deficient due to corrosion or defect.

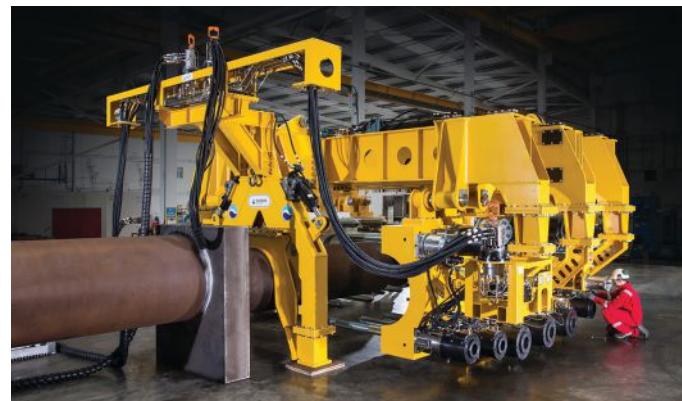
Designed for sizes between 8" and 44" and temperature ranges from -4 to +80°C, the SIClamps provide new capability in the global pipeline market, which is a great growth opportunity for the Darlington based company.

The technology was developed for operational offshore oil and gas platforms who have had their working life extended and pipelines are required to last longer. With the increase in working life, Emergency Pipeline Repair Systems support this by maximizing operational life and production efficiency and can be deployed at short notice.

Dave Thompson, Managing Director at Subsea Innovation, said, "The technology helps solve a major problem for oil and gas operators, tier 1 and tier 2 contractors to protect against leaks or structural integrity on the huge amount critical infrastructure which crisscross the globe."

Subsea Innovation have delivered nine such systems in the last two years which enabled the company to apply for the DNV GL type approval. Of these nine systems, five are fully Remotely Operated Vehicle (ROV) automated, utilizing Subsea Innovations in-house designed hydraulic reversible bolt tensioners, which allows for installation and operational in deep water down to 1350m. The company is currently developing systems for even deeper water, supporting global demand, with a prestigious client list including Subsea7, RasGas, Chevron and Impex.

Discover more at www.subsea.co.uk.



DOF SUBSEA AWARDED THREE NEW NORTH SEA CONTRACTS

The Atlantic region has recently been awarded three new contracts in the North Sea.

The first of these contracts will see DOF Subsea undertake a workscope in the Norwegian North Sea involving subsea construction support and pre-commissioning operations from the Geosund during December 2018.

In addition, the company has been awarded a contract for the initial phase of a decommissioning program in the central North Sea for a UK Operator. Under this contract DOF Subsea will provide construction support services for activities relating to the permanent disconnection and removal of an FPSO. The project scope will again be undertaken from the Geosund in Q2 2019.

The third contract award is from one of DOF Subsea's repeat Frame Agreement clients in the Norwegian CS, who have awarded DOF Subsea a subsea IMR and intervention scope. This work is scheduled to start in Q2, 2019.



Looking deeper
and seeing more.

Morgan & Eklund, Inc. specializes in collecting data in the coastal zone providing bathymetric surveying services for project monitoring, beach restoration, dredging and offshore borrow area investigations.



For more information, visit www.morganeklund.com or call (772) 388-5364

BUILDING A US OFFSHORE WIND CABLE SUPPLY CHAIN

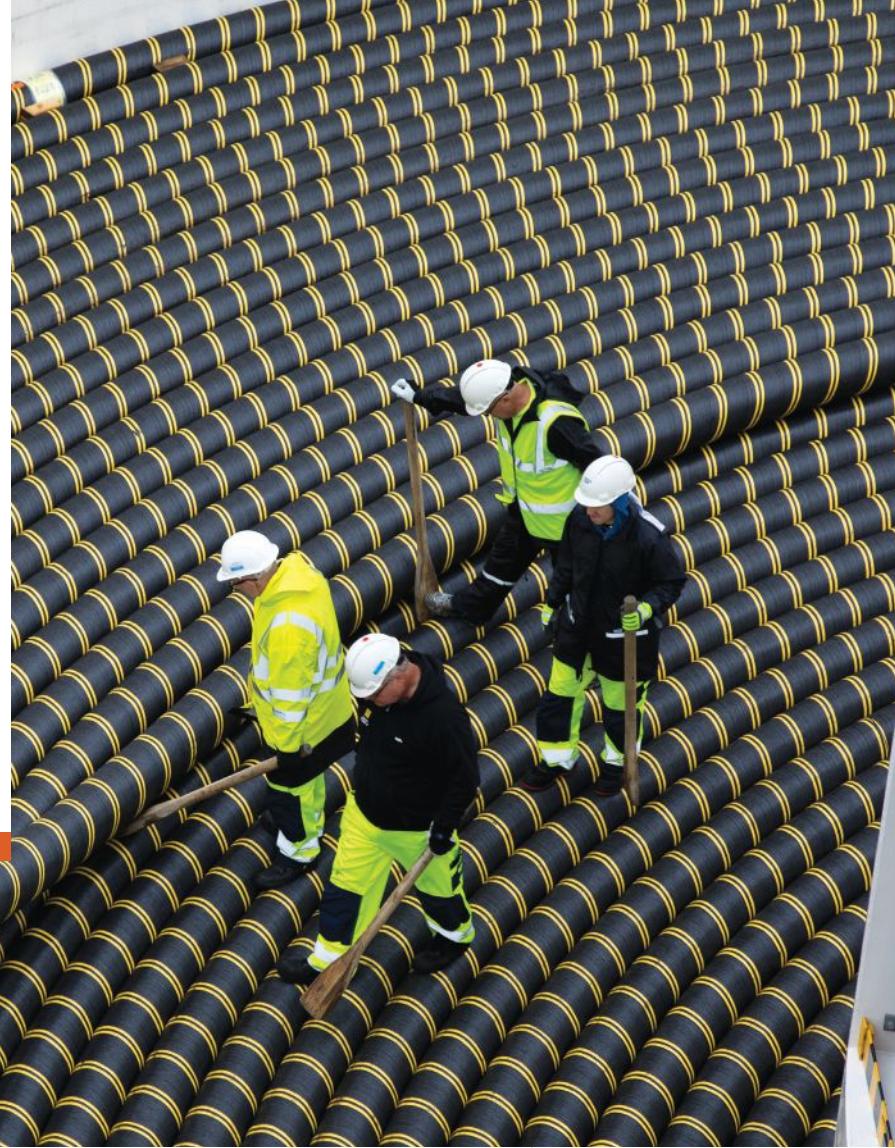
By John Manock, Editor, SubCableWorld

▲ High voltage offshore cable from NKT. Based in Denmark, NKT has manufacturing facilities in 6 European countries. Photo courtesy of NKT.

Zero. That's the total offshore wind cable manufacturing capacity of the United States. No offshore wind cable is, or ever has been, produced in the U.S. Neither are there any Jones Act-compliant purpose-built cable ships to install offshore wind cable in U.S. waters. Unlike submarine fiber optic cables, there is no industry organization dedicated to protecting those cables. There is virtually no U.S. supply chain for offshore wind cable.

Think about how unusual this situation is. The U.S. is the world's largest economy and has been the world's technological leader throughout the hi-tech era. And yet, for offshore wind, one of the world's fastest growing and most technically complex industries, there is only a limited U.S. supply chain for the industry as a whole and virtually none for the submarine cable component.

Think also about the power grid in the U.S. Traditionally, this is a terrestrial matter – the seemingly endless stretches of poles and pylons reaching across the country, delivering electricity from power plants to homes and





▲ Fugro's Saltire trenching and cable-lay vessel. Fugro N.V. is a Dutch multinational public company. Photo courtesy of Fugro.

businesses. Now, thanks to offshore wind, that power grid is about to move offshore. The terrestrial grid will be combined with cables across the bottom of the oceans to the new power plants – offshore wind farms. This already has taken place in many Northern European countries and now, finally, offshore wind in the U.S. is about to take off.

But the enthusiasm generated from recent offshore wind lease sales also highlights the vulnerabilities of this new offshore cable grid. Experience in Europe has shown how fragile the grid can be. Beginning in 2016, the costs of cable failures started to become apparent. In that year, GCube Underwriting Ltd. reported that cables were the number one cause of financial losses in the offshore wind industry, accounting for 77% of those losses.

As the U.S. offshore wind buildout gains momentum, there will be thousands of kilometers of offshore wind cable installed in the next decade, beginning off the North-eastern U.S., and later in other U.S. waters.

These cables will be sharing an increasingly busy ocean and will be at risk from a variety of external aggression threats, both accidental and, potentially, intentional. For the U.S., a new supply chain will have to be developed and it can be developed with cable protection playing a major role from the beginning.

With this backdrop, SubCableWorld, a sister publication to ON&T, has partnered with the Business Network for Offshore Wind, a non-profit organization working to develop the offshore wind supply chain in the U.S., to disseminate information specific to the U.S. offshore wind cable market. The new service will provide information that will help companies understand the U.S. market and move forward the development of the supply chain. We are pleased to be a part of this exciting new industry as it grows and develops.

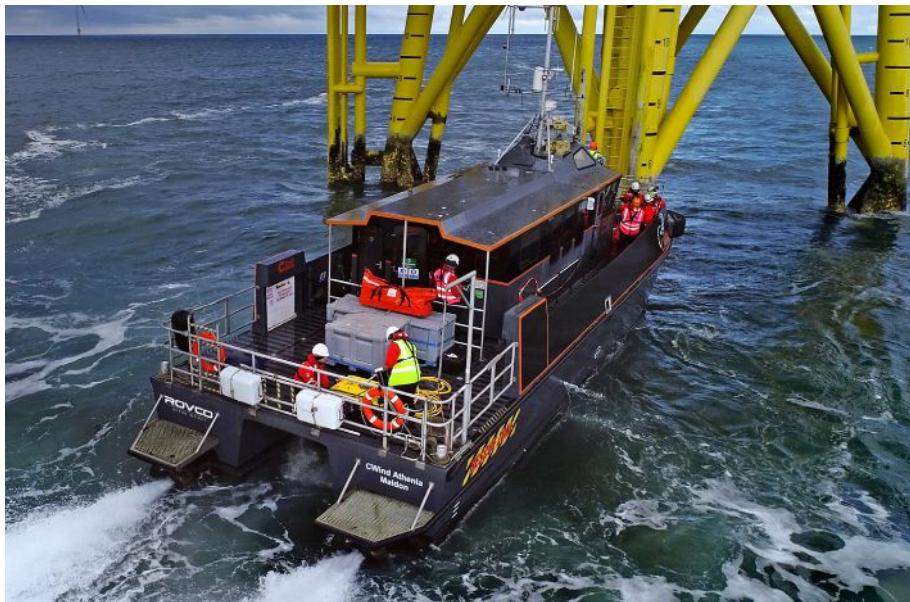
WWW.SUBCABLEWORLD.COM



▲ High voltage offshore cable production. Photo courtesy of NKT.

» A high-voltage transformer being handled by a crane during construction of an offshore wind farm in the UK.

ROVCO AND GLOBAL MARINE GROUP PARTNERS TO OFFER IRM SOLUTIONS



Subsea technology company, Rovco has formed an invested partnership with Global Marine Group (GMG) an innovative market leader in offshore engineering, to bring intelligent inspection, repair and maintenance (IRM) solutions to the global offshore market.

GMG, made up of three business units - Global Offshore, CWind and Global Marine - has secured a 13.8% share in the Bristol and Aberdeen based remotely operated vehicle (ROV) and hydrographic services business. The partnership will see both companies work together to deliver a range of efficient, high-quality subsea solutions to improve data acquisition.

Rovco's latest development, SubSLAM, which replaces visual video inspection with live 3D reconstruction technology, to obtain an accurate picture of subsea assets and environments, will be deployed from GMG's fleet of 21 specialized crew transfer

vessels. GMG's eight cable installation and maintenance vessels which are strategically located across the globe will also be able to support IRM projects.

SubSLAM enhances the accuracy and repeatability of subsea inspection, producing submillimetric data, and providing actionable information that reduces human error. Leveraging existing and active vessels, the partnership will also streamline multiple services and optimize current offshore operations to drive down costs and increase efficiencies. The mutually-beneficial partnership will enable both Rovco and GMG to serve a wider range of customers beyond their established industries.

Following the invested partnership, Mike Daniel, managing director of Global Offshore, part of the Global Marine Group joined Rovco's board of directors. He commented: "Our partnership with Rovco

enables us to continually evolve our client-centric subsea solutions. By utilizing a combination of innovation and engineering excellence, we can deliver a greater range of services to enhance our customers' operations, worldwide."

Brian Allen, founder and CEO of Rovco said: "This is a large step towards improving the efficiency of offshore IRM campaigns. We have industry leading data quality and the intelligence acquired will support pre-emptive asset maintenance and fault prediction, enabling customers to easily predict asset lifespan and corrosion or depletion rates. The partnership brings with it the creation of important synergies that will lead to the development of even more innovative solutions to benefit the offshore industry for years to come."

For further information please visit
www.rovco.co.

MARINE LAY FOR SUBSEA CABLE SYSTEM BETWEEN AUSTRALIA AND SOUTH EAST ASIA COMPLETED



» The INDIGO cable system on-schedule and on-track to be ready for service before mid-2019.

On 25 January 2019, AARNet, Google, Indosat Ooredoo, Singtel, SubPartners and Telstra announced a significant milestone in the implementation of the INDIGO subsea cable system with the completion, on schedule, of the final splicing of both the INDIGO West cable and Indigo Central cable.

This marks the completion of the marine installation of both the 4600km Singapore to Perth INDIGO West submarine cable and 4600km Perth to Sydney INDIGO Central submarine cable. Commissioning of the submarine cable system has begun, with the INDIGO cable system on-schedule and on-track to be ready for service before mid-2019.

This milestone follows the announcement in April 2017 that the consortium had entered into an agreement with Alcatel Submarine Networks (ASN) to build the INDIGO cable system connecting Singapore, Perth and Sydney, with two additional fiber pairs connecting Singapore and Jakarta via a branching unit.

The 9,200km INDIGO cable system will strengthen links between Australia and the fast-growing South East Asian markets, providing lower latency and enhanced reliability. Using today's coherent optical technology, the cable's two-fibre pairs will be able to support up to 36 terabits per second, the equivalent of simultaneously streaming millions of movies a second.

The INDIGO cable system will utilize new spectrum sharing technology so each consortium member will have the ability to independently take advantage of technology advancements for future upgrades and capacity increases on demand.

MONTSERRAT ISSUES RFP FOR CABLE PROJECT

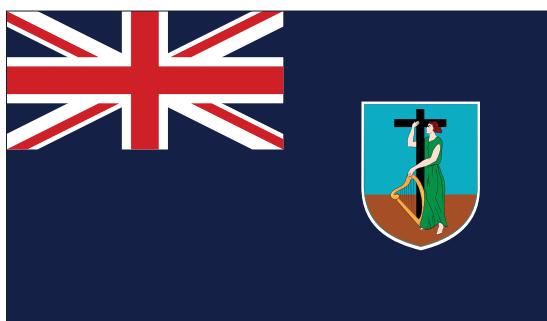
The Government of Montserrat has issued a request for proposals for the installation and operation of an undersea fiber optic cable; inviting all qualified companies, both locally and internationally, to participate.

The cable will be Montserrat's first international fiber optic connection since the mid-1990s, when the eruption of the Soufrière Hills Volcano led to the decommissioning of the island's only undersea cable connection.

Moving forward with the Montserrat Submarine Fibre Optic Cable Project ensures that Montserrat will no longer be disconnected from the global fiber network and that Montserratian consumers, businesses, and government users will benefit from affordable, reliable, high-quality telecommunications and Internet services. Further, the tremendous transmission capacity of fiber optic networks, currently in the terabits per second, guarantees that Montserrat's bandwidth requirements will be comfortably accommodated for at least the next 20 years.

"The Montserrat Submarine Fibre Optic Cable Project will put the island on an equal bandwidth footing with its neighbours throughout the region and allow Montserratians to take advantage of key digital initiatives such as telemedicine, distance education, and research networks," said Mr. Denzil West, the Director of Montserrat's Department of Information, Technology, and eGovernment Services (DITES). "This project represents a significant step in improving Montserrat's access and connectivity to the ultrafast international networks; and positions Montserrat to attract new and different types of businesses on island."

The Request for Proposals for the Installation, Operation, and Maintenance of the Montserrat Submarine Fibre Optic Cable Project is available for download via the MyTenders Portal at www.mytenders.co.uk as well as via the Government of Montserrat's website at www.gov.ms/tenders. Proposals are due by March 6, 2019 and following a period of negotiations with the chosen supplier, implementation of the cable system is expected to begin during the first half of 2019.



CODA OCTOPUS SUCCESSFULLY INTEGRATES ITS SONAR ON AN ASV



Coda Octopus has recently partnered with AVIC IET, an offshore wind contractor in China, to integrate the Echoscope4G® Surface real-time 3D sonar on a state-of-the-art Autonomous Surface Vehicle (ASV).

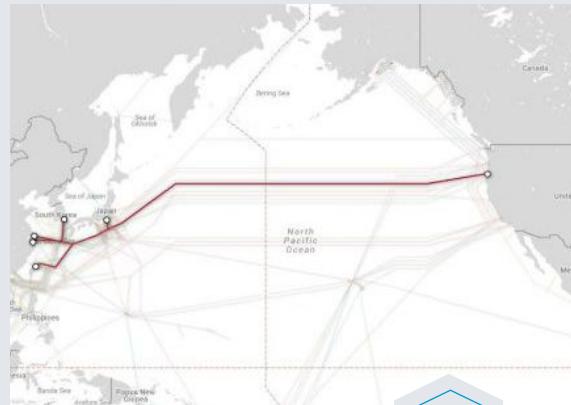
For the first time, AVIC IET will be able to autonomously control their vehicle and the Echoscope4G Surface with its integrated Pan and Tilt rotator (IPT), to survey subsea structures, monopiles, and cables on offshore wind farms.

Offshore wind energy is a rapidly expanding industry with China leading on investments in this market. BloombergNEF recently stated that in 2018 China invested around US\$11.4 billion in 13 offshore wind energy projects in China.

Coda Octopus' real-time 3D sonar solutions have revolutionized the offshore wind market around the world. The Echoscope® series is the key sensor for almost all ongoing offshore wind projects where it is used for the real-time visualization and tracking of a number of tasks including: cable pull-in operations, touch down point monitoring and performing the pre and post installation survey and remediation work.

Coda Octopus is committed to its customers' investment in renewable energies, as it continues to make offshore wind farm installations and inspections simpler, safer, and more efficient. Coming soon will be its new Echoscope4G® C500 Surface, which will be its lightest, smallest and most competitively priced real-time 3D volumetric sonars yet. The C500 Surface specifically targeted to the autonomous surface vehicle market.

These are part of Coda Octopus' continued investment into automating offshore operations which include the recently released Survey Engine® Automatic Object Detection Package (SEADP) that automatically identifies, measures, and records boulders on the seafloor, significantly streamlining initial geophysical site investigations and typically used on wind farm cable route and site surveys.



TELSTRA ADDS CAPACITY TO LARGEST SUBSEA CABLE NETWORK IN ASIA PACIFIC

Telstra has announced the addition of substantial capacity to its subsea cable infrastructure with its first large capacity purchase on the new-generation New Cross Pacific (NCP) cable, and a further investment in the Faster cable.

These investments strengthen Telstra's Japan to the US route and confirm Telstra's subsea cable network as the largest in the Asia Pacific.

In December, Telstra entered into agreed terms to purchase a 25 per cent stake in Southern Cross Cable Network (SCCN). Subject to approvals the agreement includes capacity on the existing Southern Cross network and new Southern Cross NEXT subsea cable - set to become the lowest latency path from Australia to the US. Telstra has also boosted its Asia to US operations over the last 12 months, with a half fiber pair investment in the Hong Kong Americas (HKA) cable and a 6Tb capacity purchase in the Pacific Light Cable Networks (PLCN) cable, both due to be completed in 2020.

These new-builds complement Telstra's major half fibre pair investment in the INDIGO cable system from South East Asia to Australia, which has reached a major milestone with the completion of the 4,600km Indigo West cable lay from Singapore to Perth just before Christmas. Today, Telstra's subsea cable network reaches more than 400,000km – enough to circle the world almost 10 times. Once completed, Telstra's investments in SCCN, HKA, PLCN and INDIGO, will grow Telstra's subsea cable network ownership by more than 25Tb.

For a third consecutive year, Telstra received the highest product scores for High Capacity Network and Low Latency Network in the Gartner Critical Capabilities 2018 report for Network Services, Asia Pacific.

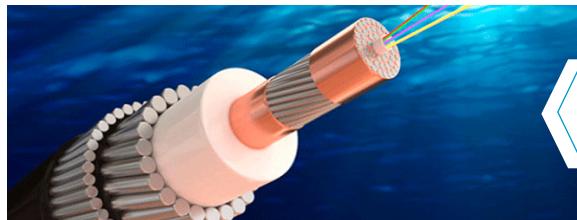
CHILE PREPS FOR RELEASE OF TRANSPACIFIC FEASIBILITY STUDY

Chilean telecom regulator SUBTEL is seeking information from the telecom industry that will be used to prepare bidding rules for an economic, technical and legal feasibility study for a transpacific cable.

SUBTEL said that is looking for voluntary submissions in order to obtain industry-relevant background information that will contribute to the preparation of bidding rules for the study.

Last June, Chilean President Sebastián Piñera announced that the country would build a cable across the Pacific. At the time, the project appeared to be a cooperative venture with China and all three of the proposed routes ultimately landed in China. But in this latest SUBTEL announcement, there was no mention of a specific routing to China – instead referring more generally to Asia.

The project, known as the "Puerta Digital Asia-South America," is a reflection of South America's growing economic power and shifting global trade routes. As we noted last year, the Trans Pacific Partnership (known as TPP 11 for the number of countries included in the agreement) recognizes this shift in trade routes, one of which is a southern route between South America, Australia and Asia.



In June 2017, Chile announced the results of the pre-feasibility study by Huawei, which identified three possible routes and potential landing points

These include:

- Valparaiso, Chile, to Juan Fernandez (Chile), Easter Island (Chile), Auckland (New Zealand) and Sydney (Australia) and Shanghai (China)
- Valparaiso, Chile, to Juan Fernandez (Chile), Easter Island (Chile), Tahiti (French Polynesia) and Shanghai (China)
- Punta Arenas, Chile, to Auckland (New Zealand) and Shanghai, (China).

As noted above, however, the latest announcement makes no reference to any landing points outside of Chile.



Ocean Sensor Systems

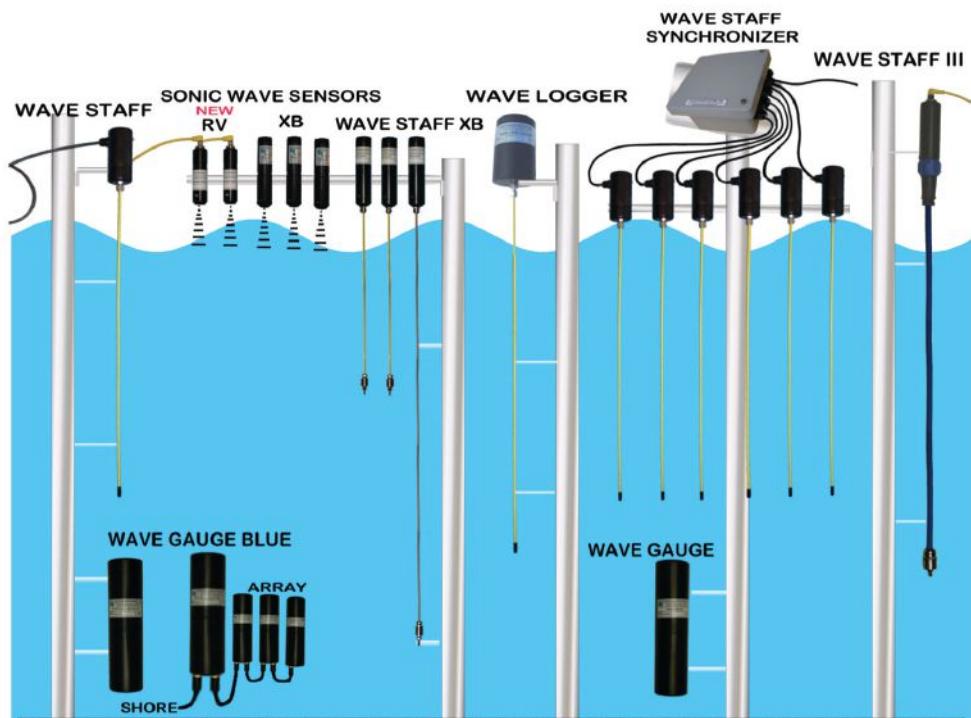
For Details Visit Us on the web or call 954-796-6583 USA
WWW.OCEANSENSORSYSTEMS.COM

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

MEASURE:
Waves
Tides
Levels

DATA VIA:
Cable
Logger
Wireless

WE SUPPLY:
Tech Support
Software
Accessories
Custom Work





REPORT: SHORTAGE OF SHIPS DELAYS GREENLAND CABLE REPAIR

There have been several submarine cable outages recently, including one that the results of which indicate a possible shortage of cable ships.

TELE Greenland, owner of a cable running up Greenland's west coast as well as an international cable to Iceland, suffered an outage on its cable between Nuuk and Qaqortoq on December 27. It also suffered a second outage on its cable further north, but it is the impact of the first cable that is worth noting.

In a statement released on January 22, TELE Greenland stated, "Initially, it was planned that the cable [between Nuuk and Qaqortoq] could be repaired within 3-5 weeks, but after contact with the suppliers, it has been found that the delivery time will be longer, since most cable ships are engaged in other tasks."

Also in the statement, TELE Greenland indicated that the cause of the outages may have been related to fishing activities. The statement said, "We would like to remind the trawlers that the cable is marked in the charts and that fishing vessels should be extremely careful when they are near the cable. This is a critical national infrastructure, where it is extremely difficult to repair damage," says technology and IT director, Jonas Hasselriis.

AUSTRALIA'S LABOR PARTY PLEDGES SUPPORT FOR JGA LANDING

Australia's Labor Party has promised to financially support the landing of the Japan-Guam-Australia Cable System (JGA) on Australia's Sunshine Coast.

The opposition party said that if it comes to power this year, it will invest A\$5 million in the project to install a 550-kilometer spur that will land in Maroochydore, according to ZDnet.

JGA consist of two systems:

- JGA North will land in Minami-Boso, Japan and Piti, Guam and
- JGA South will land in Sydney, Australia; Piti, Guam, as well as Maroochydore

NEC Submarine Networks Division is supplying the JGA project.

JDR WINS TAIWAN OFFSHORE WIND CABLE PROJECT

JDR Cable Systems (JDR), owned by the TFKable Group, has been selected by Jan De Nul to supply subsea power cables and accessories for the Taiwan Power Company Offshore Wind Farm Phase One.

The project is located off the coast of Fangyuan in Changhua County in Central Western Taiwan. It is being developed by Taipower with a consortium of Jan De Nul and Hitachi as the project's main contractor. Phase One will see the installation and commissioning of 21 5.2MW offshore wind turbines giving a total capacity of approximately 110MW.

Richard Turner, Chief Executive Officer at JDR, says, "We're thrilled to be selected to participate in a Taiwanese project for the second time. The region itself has exciting prospects with the growth of its offshore market and as Taiwan becomes an increasingly popular choice for investors and developers. We're delighted to be a part of the local success story and to bring not just our technology, but our experience to the developers and supply-chain in the region. And we don't just provide a product, we provide support and reliable service to our customers globally. So, this project really aligns with our growth strategy and localization in Taiwan, where our aim is to work alongside local partners to share knowledge, skills and expertise."

JDR will design and manufacture 65km of array and export cable to transmit power from the wind turbines to the shore. The 33kV cables will be manufactured at JDR's state-of-the-art facility in Hartlepool, UK, supported by its group facility in Bydgoszcz, Poland, before being shipped to Taiwan for installation by Jan De Nul. The project is targeted for completion in 2020.





THE ICPC 2019 PLENARY: CALL FOR PAPERS

Every year the International Cable Protection Committee (ICPC) Plenary attracts a global and industry-specific audience to consider the protection of submarine cables—the infrastructure of the Internet. Participation provides an excellent opportunity to engage with submarine cable owners, suppliers, installers, surveyors, academics and service providers regarding the planning, installation, operation, protection and maintenance of submarine cables.

The 2019 ICPC Plenary will take place in the Courtyard Liberty Station Hotel in San Diego, California USA from 14-16 May 2019. The ICPC asks interested presenters to submit abstracts for proposed presentations no later than 22 February 2019. The ICPC welcomes abstracts from ICPC Members and other interested parties.

ICPC's three-day conference offers participants the opportunities to enhance their industry knowledge for networking with colleagues and customers as well as meeting with exhibitors whom will be showcasing their products and services. Delegates will find an agenda full of pertinent presentations, round tables and interviews and the ICPC welcomes the opportunity for the industry to make the first step in reserving your place at the ICPC's annual event by submitting a presentation abstract in response to the Call for Papers.

The theme for the 2019 Plenary is 'Critical Infrastructure across the Oceans—protecting submarine cables and the marine environment.' The ICPC suggests the following presentation topics, but abstracts on additional relevant topics are also welcome:

- The future of submarine cable protection—news and developments
- International power cables—growth and challenges
- Expanding the cable network and protecting the world's oceans
- Innovative and challenging cable routes
- Technology for submarine cable security and resilience
- Operation and maintenance trends
- Law, policy and international cables
- Sharing the seabed with competing uses

For specific details, please click here: [Call for Papers](#). For any enquiries, please send an e-mail to the ICPC Secretariat via:
secretary@iscpc.org.

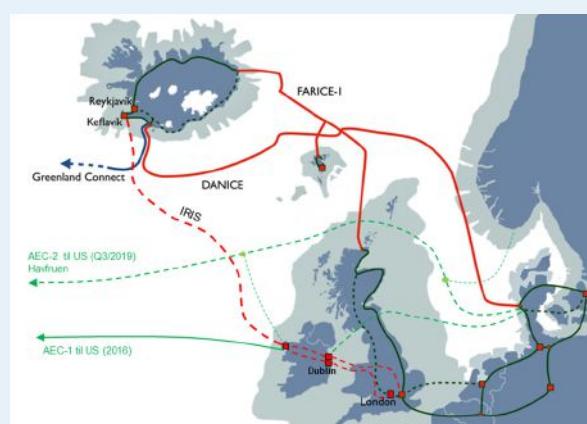
FARICE TO BUILD NEW CABLE TO LAND IN ICELAND

The Telecommunication Fund of Iceland and Farice ehf, the operator of two submarine cables to Iceland, have recently signed a DTS (Desk Top Study) work agreement.

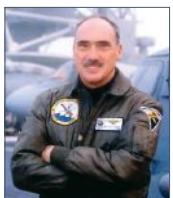
The DTS work involves selecting landing sites for a new submarine cable to Europe as well as project management for a seabed survey expected to take place in the year 2019. No further decisions have been taken at this stage for the actual cable build.

This agreement is an important milestone for the preparation of the next submarine cable to be connected to Iceland. Farice ehf operates the submarine cables FARICE-1 to UK and DANICE to Denmark. A third submarine cable Greenland-Connect connects Iceland to Canada and US. The future cable would be the fourth cable connecting Iceland and increases further the security and resiliency of Iceland's international telecommunications that are already of a high standard.

A landing site on Reykjanes Peninsula in Iceland is proposed and the route will be west of and non-crossing with regards to existing cables DANICE and FARICE-1. Landing site abroad is likely to be in UK or Ireland. The picture shows one possible route to Ireland with the new cable named IRIS.



SPECIAL OPERATIONS INDUSTRY CONFERENCE EXPLORES CUTTING-EDGE UNMANNED SURFACE VEHICLE TECHNOLOGY



By George Galdorisi

Director of Strategic Assessments and Technical Futures
at the U.S. Navy's Command and Control Center of Excellence
| www.georgegaldorisi.com |



» Members of industry and government converge in downtown Tampa, Fla., during the 2018 Special Operations Forces Industry Conference on May 22. SOFIC is the premier conference for the SOF community to interact with vendors and to collaborate on delivering new technology to warfighters. Photo credit: U.S. Air Force Master Sgt. Barry Loo.

Once every year, the United States Special Operations Command hosts SOFIC – the Special Operations Forces Industry Conference. The most recent event – held at the Tampa, Florida Convention Center – drew well over 10,000 visitors who came to hear senior leaders from the SOF community share their most compelling needs with industry.

The Special Operations Forces Industry Conference is the premier conference for the SOF community to interact with industry and to collaborate on the challenges, initiatives and way-ahead in delivering the most cutting-edge capabilities into the hands of SOF operators. While other military-industry conferences are important, it's easy to vote this event number one as a "can't miss" event.

Here's the "inside baseball" reason why: The SOF community invests an enormous amount of time, talent and energy in this event. All senior SOF community leaders speak and interact with attendees. All USSOCOM Program Executive Office program managers spend quality time with attendees. All senior SOF community leaders attend an industry panel with senior representatives of companies helping man, train and equip SOF warriors.

Because of the investment in time and talent the SOF community dedicates in putting together SOFIC, there is a strong expectation that industry partners large and small who want to do business with USSOCOM attend and interact during this once-a-year event. This expectation carries over throughout the year to the extent that industry representatives wanting to

network with SOF community leaders at other times during the year will routinely be challenged and asked, "Did you attend SOFIC?" Small wonder that over 350 companies exhibited at the most recent event and that attendance pushed past 11,000.



» The Honorable Ellen M. Lord, Under Secretary of Defense for Acquisition and Sustainment, dons a virtual reality headset during the 2018 Special Operations Forces Industry Conference. SOFIC is the premiere conference for the SOF community to interact with vendors and to collaborate on delivering new technology to warfighters. Photo credit: U.S. Air Force Master Sgt. Barry Loo.

One of the things that attracts attendees to SOFIC is the hands-on nature of the event – it includes vastly more than the typical "static" contractor exhibits. At this year's SOFIC, SOF operators had the opportunity to test drive innovative, cutting-edge technologies that could directly support SOF operators who are in the field and in the fight today.

Perhaps the best way to describe the value-added of SOFIC to the military and industry is to relate the experience of one small company that brought its innovative technology – fast, stealthy and modularized unmanned surface vehicles (USVs) – to the event. These USVs displayed and operated at SOFIC were from the MANTAS family of Tactical Autonomous Unmanned Surface Vessels.

Bruce Hanson, CEO of MARTAC (Maritime Tactical Systems Inc.) based in Satellite Beach, Florida, said this about why his company brought their MANTAS USV to SOFIC: "SOFIC is an important event for MARTAC because we recognize that our SOF operators are the ones taking the fight to America's enemies today."

The MANTAS USV was one of several systems demonstrated at SOFIC and is illustrative of the hands-on nature of the event. Why is hands-on important? It's because today's special operators are



» The MANTAS T-series USVs integrate open-architecture design. The hydrodynamic hull and sleek profile allow higher speeds, with superior maneuverability, while unmanned operation minimizes manpower requirements. Photo credit: Jack Rowley.

in the fight today across the globe and aren't especially interested in long-range development projects that will deliver technology in the "out-years." They need to test-drive gear and determine whether it is something that will help them in their next deployment.

SOF reps from all services were provided with a hands-on demonstration where they were able to test-drive a twelve-foot MANTAS USV and see the real-time surface picture the system provided. In this case, operators drove a twelve-foot MANTAS equipped with a SeaFLIR230 EO/IR Gyrostabilized High Resolution Camera. The system was operated in the bay fronted by the Tampa Convention Center, sending real-time visual imagery to the operators. These SOF professionals then made in-stream command and control decisions regarding where to redeploy the MANTAS USV for additional, or zoom-enhanced, imagery.

In another application, MARTAC demonstrated the ability of a twelve-foot MANTAS USV equipped with a Teledyne Reson T20 High Resolution Multi-Beam Echosounder to map channel boundaries, piers and other structures, as well as image underwater objects on the harbor bottom in the area near the Tampa Convention Center. The MANTAS USV transmitted these images in real-time where they were viewed on multiple devices, including a laptop, a tablet, and a smart phone.

MARTAC also demonstrated a prototype eight-foot MANTAS hybrid/stealth USV that operated at neutral buoyancy to demonstrate the ability of the craft to work in a semi-submersible mode with the upper deck at water level and only the antennas protruding above the water. SOF operators noted that the USV was virtually impossible to see as it made its way throughout Tampa Bay.

The value of these hands-on demonstrations is clear. As Jack Rowley, MARTAC Chief

Technology Officer and Senior Naval Architect/Ocean Engineer noted, "SOFIC is one of the most important military-industry events for MARTAC. The ability to have SOF operators 'test-drive' our MANTAS USVs provides us with invaluable feedback that helps us evolve continuous upgrades to our family of MANTAS Tactical Autonomous Unmanned Surface Vessels. Since our company's founding six years ago, one of our primary goals has been to continually drive creativity and to challenge the technological boundaries of unmanned surface systems."



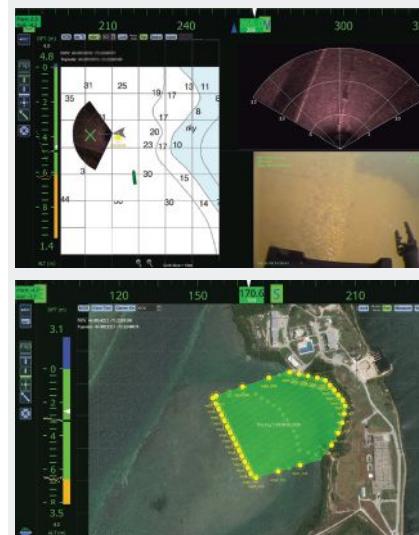
» Multinational Special Operations Forces aboard an MH-6 Little Bird helicopter and a Special Operations Craft – Riverine boat approach a simulated enemy position during a capabilities demonstration as part of the 2018 International Special Operations Forces week in downtown Tampa, Fla., May 22, 2018. Photo credit: U.S. Air Force Master Sgt. Barry Loo.

SOFIC will occur in Tampa again during May 20-23, 2019. For defense industry companies wanting to put their new technology in the hands of the operators who are in the fight today around the globe, SOFIC should be at the top of their list.

For more information, visit www.sofic.org.



OPEN ARCHITECTURE SOFTWARE FOR MARINE ROBOTICS



Introducing

EOD WORKSPACE

Click-and-go, drag-and-follow, and point-of-interest relative control allow EOD technicians to focus on threat neutralization.

greensea.com/eod
or call 802.434.6080

The appearance of U.S. Department of Defense (DOD) visual information does not imply or constitute DOD endorsement.

GENERAL DYNAMICS KNIFEFISH UUV AND TEXTRON UISS COMPLETE SHIPBOARD INTEGRATION TESTING

The US Navy's Littoral Combat Ship (LCS) Mission Module Program recently completed shipboard integration testing of two unmanned systems on board USS Independence (LCS 2).

The two systems — General Dynamics-developed Knifefish unmanned undersea vehicle (UUV) and Textron-developed Unmanned Influence Sweep System (UISS) — are part of the mine countermeasures mission package (MCM MP), which uses a system-of-systems approach to target specific portions of the water column and segments of the MCM detect-to-engage sequence.

During these integration events, both the Knifefish and UISS successfully verified the communications link between Independence and the unmanned systems as well as executed multiple launch and recovery evolutions from the ship.

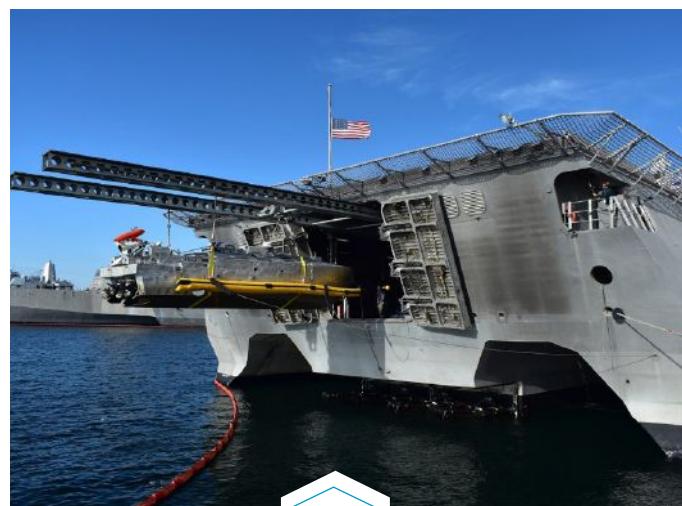
The US Navy says these test events mark a critical milestone for the LCS Mission Module Program, having now successfully tested each vehicle in the MCM MP (that is, an MH-60S helicopter, MQ-8B Fire Scout unmanned helicopter, UISS and Knifefish UUV) on board an Independence-variant LCS.

In addition to UISS and the Knifefish UUV completing integration tests, the program has certified all the aviation modules for the MCM MP for deployment on Independence-variant ships.

These airborne MCM systems provide combatant commanders the ability to rapidly deploy systems that can detect near-surface

mines as well as neutralize mines in the water and on the bottom without requiring sailors to sail into the minefield. Additionally, the Coastal Battlefield Reconnaissance and Analysis system, which is a vertical-take-off unmanned aerial vehicle payload, provides a much-needed beach zone mine-detection capability in support of the amphibious assault mission.

These tests are a subset of a comprehensive test program that encompasses shore-based system testing to characterize individual systems prior to completing final integration on an LCS. The LCS Mission Module program office will continue to incrementally deliver MCM MP systems to the fleet in advance of the formal MCM MP initial operational test and evaluation events beginning in 2021.



» LCS Mission Module Program tests the in-port launch and recovery of the Unmanned Surface Vehicle during integration testing of the Unmanned Influence Sweep System off littoral combat ship USS Independence (LCS 2) in San Diego. Photo credit: US Navy.

JFD TO DELIVER SUBMARINE RESCUE SYSTEM FOR KOREAN NAVY

UK-based underwater systems developer JFD has received a "multi-million pound" contract for the design and build of a deep search and rescue vehicle (DSRV) for the Republic of Korea Navy.

The contract for the delivery of a DSRV for the ROK Navy's new submarine rescue ship was awarded by South Korean shipbuilder Daewoo Shipbuilding and Marine Engineering (DSME).

The RoKN currently operates a multipurpose submarine rescue ship – the 103 m long, 4,300-tonne RoKS Cheonghaejin. Once in operation, the new ASR-II vessel will

replace the current Cheonghaejin, in operation since 1996.

The JFD-delivered DSRV will be launched and recovered from the submarine rescue vessel via a 'moonpool', through which the DSRV will be deployed to rescue the crews of distressed submarines at depths of up to 500m, and in waves as tall as four meters.

This method of launch and recovery minimizes the impact of weather and sea states on the ability to operate the DSRV, maximizing the chances of a successful submarine rescue operation, further safeguarding the lives of submariners.

Due to be delivered to the customer in 2021, the DSRV will undergo a comprehensive series of tests and trials including factory, harbor, and sea acceptance trials, before entering operational service.

"JFD first delivered a deep search and rescue system to the South Korean navy in 2009," James Fisher and Sons CEO Nick Henry, said, "The vehicle is a variation of the landmark third-generation vehicles recently delivered to the Indian Navy."

OKEANUS DELIVERS WINCH SYSTEM TO DEPARTMENT OF DEFENSE

Marine equipment and engineering service provider, Okeanus Science & Technology, LLC (Okeanus), has announced the delivery and supply to the United States Department of Defense with a DT3100EHLWR winch to expand and enhance their maritime efforts.

Darrell Troville, director of production at Okeanus said, "This was another great opportunity for Okeanus Science and Technology to showcase the capabilities and reliability of our products to the Department of Defense." Okeanus has long relationships with government and defense clients which has allowed them to play a significant role in the flexibility and enhancement of defense-related industries. "I know they will be extremely happy with the first-rate quality of the Okeanus

winch system and we look forward to the DOD joining our defense-related clients. Our high-quality products and customer service focus are why we have long term relationships with the major companies in the defense sector," Troville added.

The DT3100EHLWR is a 100-horsepower winch complete with level wind and remote control and heat exchanger. This winch holds 1000 meters of Amsteel ½" diameter synthetic line and has a line speed and pull bare drum rating of 16,550 lbs at 125 fpm. This powerful winch can be a huge asset to a maritime operation and its high quality provides a long life of service.



WWW.OKEANUS.COM

COUGAR PART OF DELIVERY TO ROYAL NEW ZEALAND NAVY

Norway-based Østensjø Rederi has chosen a Saab Seaeye Cougar XT underwater robotic vehicle as a deployable resource aboard their multi-purpose support vessel 'Edda Fonn'.

The company is contracted to deliver the 'Edda Fonn' to the New Zealand Ministry of Defence in 2019 with an integrated ROV and dive system amongst its upgrades. The ship will subsequently be used by the Royal New Zealand Navy.

To meet the Navy's exacting operational requirements, Østensjø Rederi expanded

and extended the technical specification for the complete system including the Cougar, the control room, and in particular, the Launch and Recovery System (LARS). The ability to safely launch the Cougar in sea states specified by the Royal New Zealand Navy was of paramount importance. This set a special focus on the LARS and its position inside the vessel, with the Cougar launched from a mezzanine deck inside the vessel's ROV hangar.

When evaluating the challenge, Østensjø Rederi concluded that the Cougar with a modified dipping and extending LARS with

snubber, heave compensation and electric winch motors, was the best solution.

Along with the LARS, the complete system includes a standard Cougar XT with minor modification to include three cameras and sonar system, together with its tether management system and three individual tool skids with manipulators, cutters and water jetting system. Also specified is a control room integrated into the vessel created to a design centred on operator ergonomic principles.

The 2000m rated Cougar XT's maneuverability comes from its six thrusters, each interfaced with a fast-acting control system and solid-state gyro for enhanced azimuth stability and control. The Cougar's compact 1.5 metre size footprint makes it easy to mobilise, yet it has the power to handle a wide range of heavy tooling.





COMMODITY MARKET TURMOIL IN LATE 2018 SETS TONE FOR 2019

BY G. ALLEN BROOKS | Author, *Musings From the Oil Patch* | www.energymusings.com

CRUDE OIL

Crude oil prices are up in January. In fact, through the middle of the month, they have climbed by \$6.70 per barrel for nearly a 15 percent increase since year-end. After falling over 40 percent from the beginning of October to the end of December 2018, any oil price increase is welcomed. Oil execs are feeling somewhat better as we start the new year, but the shock of last fall's collapse has not been forgotten. That experience, coming as it did during oil company budget-setting time, will impact 2019 industry spending, at least for the first half. Still, the capital spending surveys show the industry boosting outlays by high single-digits this year.

Why would companies want to boost output if it would arrive just when oil prices might be at risk of declining? Take these capital spending surveys with a large grain of salt. They were compiled as oil prices were falling, but before the full extent of the decline and its ramification on company profitability and cash flow was understood. Additionally, investor pressure on managements to "live within cash flow" has executives thinking seriously about how they can achieve that goal, while not crippling their company's growth.

We were asked about the conundrum facing industry executives by a private equity investor. Do you spend now to sustain production and possibly grow it, or do you live within cash flow and return excess funds to shareholders? Our response was that executives should embrace the demand, at least for the next few years, after which, if reserves and output have declined, a more compelling argument could be made to shareholders for a change in spending priorities in order to ensure the sustainability of the corporation. Oil company credibility with investors must be restored before managements can ramp up spending. If this philosophy is embraced, we likely would see less production growth, which would lift oil prices.

At the moment, the oil price increase is a reaction to the OPEC+ group's production cut, along with the surprising cut mandated for Alberta, Canada producers and the continuing output problems in Libya, Nigeria and Venezuela. The challenge for industry executives is to understand these are temporary moves. Once they end, if demand fails to increase and U.S. shale production rises as forecast, then the oil market could slip back into an oversupplied condition by the end of 2019, creating a potential rerun of 2018's fourth quarter debacle.

At the moment, less supply has elevated oil prices. However, global growth projections are being trimmed, but optimistic production growth forecasts are at risk following the oil price decline. The interaction of these forces will drive oil pricing this year.

NATURAL GAS

Natural gas price volatility continues. Gas prices are tethered to winter temperature forecasts. Given the low volume of natural gas in storage, every bout of cold temperatures brings a spike in gas futures prices. To understand why this is the case, one only needs to compare the relationship between weekly gas storage volumes relative to their 5-year average for this January versus the same two weeks in 2018. Last year, given the absence of cold weather, natural gas futures prices bounced in a range between the high \$2.90s to low \$3 per thousand cubic feet (Mcf). At that time, weekly storage held steady at about 88 percent of the 5-year average.

This winter, temperatures have not been materially colder than last year, although the recent Arctic Vortex that swept deep into the U.S. drove gas futures prices up by 50-cents/Mcf. Prior to that jump, gas prices had been hovering around \$3/Mcf, very similar to last winter's pricing. This year, weekly gas

storage reports have shown significantly greater volatility.

For the first week of January, storage equaled 85 percent of the 5-year average, but due to a warm subsequent week, the ratio increased to nearly 89 percent, even though there was a large withdrawal. The volatility in that ratio reflects the sensitivity of storage to year-over-year relative temperature differences. It will be interesting to see where weekly gas storage volumes sit compared to the 5-year average in early February once the projected January Arctic Vortexes have passed.

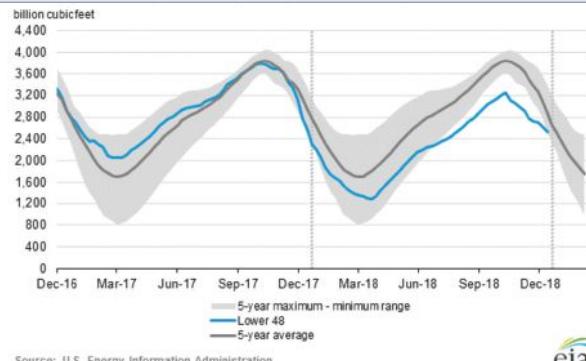
The forces that shaped the domestic natural gas market in the recent past remain in place. The Energy Information Administration reports that domestic natural gas production averaged 83.3 billion cubic feet per day and is projected to increase to 90.2 Bcf/d in 2019 and 92.2 Bcf/d in 2020. A projected 8.3 percent increase in gas output this year will likely impact on gas futures prices, unless heating and electricity demand, as well as gas exports grow. But it also assumes gas output continues rising as predicted, an assumption starting to be questioned.

Exports are the key driver for gas demand. The flow of gas to Mexico has surged since early

2018, as pipeline capacity expanded. More capacity is needed, so Texas Congressional representatives introduced legislation to expand the North American Development Bank's capacity to fund cross border pipelines. Since 2012, the flow of gas to Mexico has tripled, now at more than 6 Bcf/d, or 7 percent of total U.S. natural gas production. That growth comes as the U.S. ramps up liquefied natural gas exports. New terminals will enable

more cheap U.S. gas to enter the global market. Despite healthy export demand, coupled with more gas for electricity generation, cold temperatures are what will influence prices over the next 60 days. Baring an extended deep freeze, the domestic gas market will likely see prices settling around \$3.00/Mcf, but with plenty of daily volatility to keep the speculators happy.

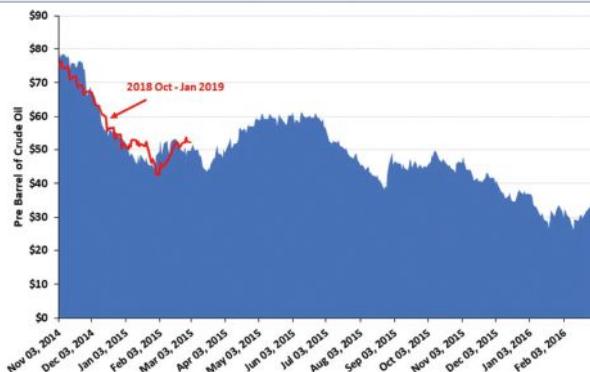
Working gas in underground storage compared with the 5-year maximum and minimum.



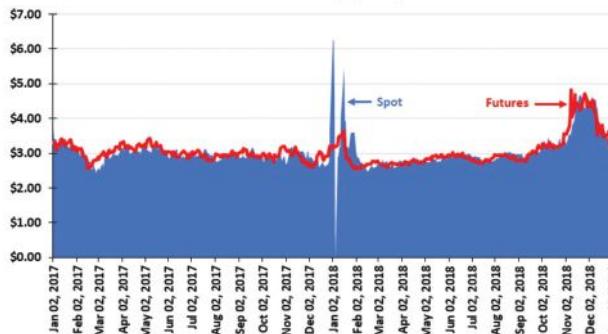
Source: U.S. Energy Information Administration



Is 2018 going to be a repeat of 2014-2016?



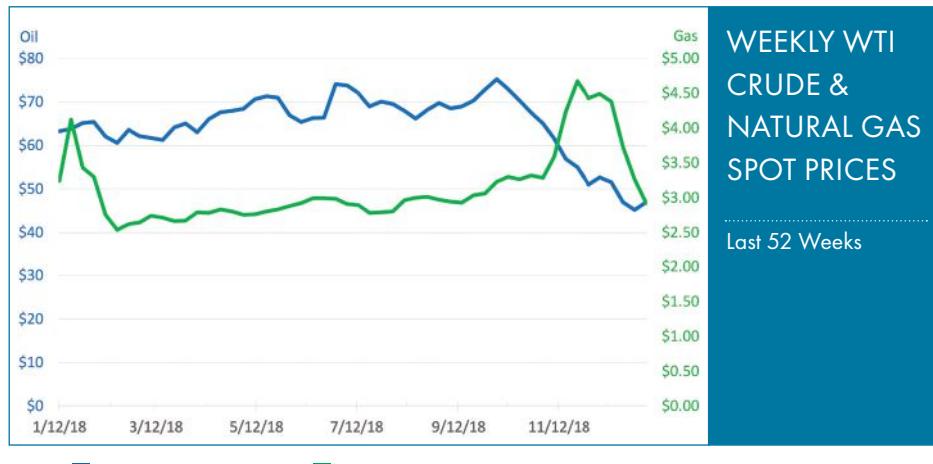
Futures and Spot Gas Prices Waiting for Next Winter Artic Blast (\$/Mcf)



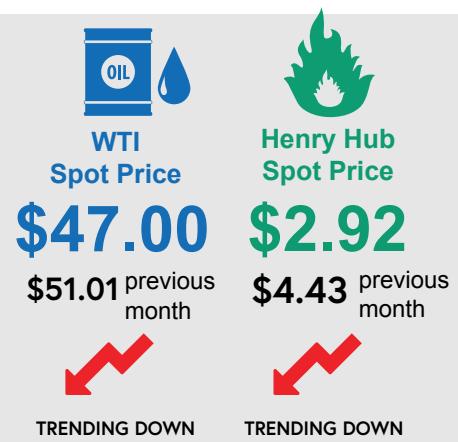
CRUDE & NATURAL GAS Spot Prices

PRICES IN US DOLLARS AS OF JANUARY 4, 2019

Oil prices continued to decline after surpassing the \$75.00 per barrel mark in October. On January 4, the EIA's WTI Spot Prices report put the price per barrel at \$47.00. According to CNBC, rising U.S. inventories and concern over global economic growth are the main causes for the price decline. In December, the Organization of the Petroleum Exporting Countries and other producers, known as OPEC+, agreed to production cuts that Reuters believed would calm market fears of oversupply.



For natural gas, Henry Hub Spot Prices were over the \$4.00 per million BTU mark for a five-week stretch from November through mid-December. By early January, however, prices had fallen dramatically to \$2.93 per million BTU. Unusually warm weather was considered a factor in this drop. At press time, futures were up and with colder weather in the US forecasted, prices are expected to rise again, according to CNBC.



KEY EQUITY Indexes

PRICES IN US DOLLARS AS OF JANUARY 4, 2019

THE DOW JONES INDUSTRIAL AVERAGE AND S&P 500 have fallen significantly in the past month

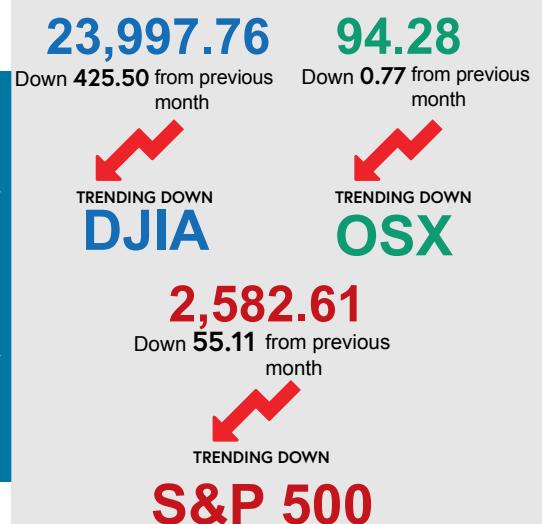
December saw continued turbulence in the equity markets. The second half of the month saw some of the largest daily gains and largest daily losses in history. Fears of trade wars and possibility of a future recession were repeatedly cited as the reasons for the turbulence. At the end of December, however, a strong jobs report brought some stability to the markets.

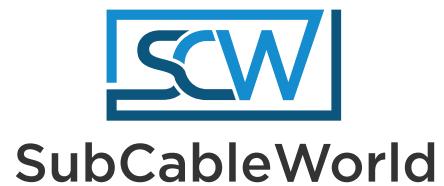
The Dow Jones index, which had peaked in record territory at nearly 27,000 points, had dropped to just above 22,000 points in mid-December. Since then, it has moved up gradually to just under the 24,000-point mark by January 14. The early January rally failed to get the market back up to where it had been a year earlier (26,071.72 on January 15, 2018), however.

S&P 500 index experienced similar turbulence. After flirting with the 3,000-point mark in September, the S&P fell to just above 2,400 points in mid-December. It also rose throughout the following two weeks; nearly reaching the 2,600-point mark on January 14.

PHXL Oil Services Index (OSX) continues to struggle. Since spiking at over 160 points at the beginning of last year, the OSX trended downward consistently in 2018, dropping below 80 points in mid-December. It did benefit from the rally that followed to nearly reach the 100-point mark by mid-January.

SELECTED EQUITY INDEXES





Analyzing the cable industry.



AMERICAS

Oi Americas

San Diego, CA » February 25-27
oceanologyinternationalamericas.com

Subsea Tieback

San Antonio, TX » March 5-7
www.subseatickbackforum.com

Int'l Deepwater Drilling

Rio de Janeiro, Brazil » March 19-20
www.iadc.org/event/2019-iadc-international-deepwater-drilling-conference-exhibition/

US Hydro

Biloxi, MS » March 19-21
www.thsoa.org/US-Hydro-2019

Decommissioning & Abandonment Summit

Houston, TX » March 26-27
www.decomworld.com/gom

SubOptic

New Orleans, LA » April 8-11
www.suboptic2019.com

Int'l Offshore Wind Partnering Forum

New York, NY » April 9-10
www.offshorewindus.org/2019ipf/

Mari-Tech

Ottawa, Canada » April 23-25
www.mari-techconference.ca

AUVSI XPONENTIAL

Chicago, IL » April 30 – May 2
www.xponential.org

OTC

Houston, TX » May 6-9
www.2019.otcnet.org/

Telecom Exchange

New York, NY » May 14-15
www.thetelecomexchange.com/nyc

H2O Conference

Halifax, Nova Scotia » June 6-7
www.h2oconference.ca

EUROPE

Ocean Business

Southampton, UK » April 9-11
www.oceanbusiness.com

DEVEX

Aberdeen, UK » May 7-8
www.devex-conference.org

UDT

Stockholmsmassan, Sweden
» May 13-15
www.udt-global.com

OMAE

Glasgow, UK » June 9-14
www.event.asme.org/OMAE

Deepsea Mining Summit

London, UK » April 29-30
www.deepsea-mining-summit.com

OCEANS '19 Europe

Marseille, FR » June 17-20
www.oceans19mtsieemarseille.org

Commercial UAV Expo Europe

Amsterdam, The Netherlands
» April 8-10
www.expouav.com/europe

AUSTRALASIA

Oil & Gas Tech Asia

Ho Chi Minh, Vietnam » March 5-7
www.oilgastechasia.com

Singapore AUV Challenge

Singapore » March 8-11
www.sauvc.org/

Australasian Oil & Gas

Perth, Australia » March 13-15
www.aogexpo.com.au/about

China Cable Connectivity

» March 25-27
Shanghai
www.ulandiwcschina.org

Telecoms World Asia

Bangkok, Thailand » March 25-27
www.terrapinn.com/conference/telecoms-world-asia/index.stm

Unmanned Systems Asia

Singapore » April 9-11
www.unmannedsystems-asia.com

Underwater Technology

Kaohsiung, Taiwan » April 16-19
<http://ut19.tori.org.tw>

ICCOE

Bangkok, Thailand » April 25-28
www.iccoe.org

MAST

Tokyo, Japan » June 17-19
www.mastconfex.com/asia2019

THIS SECTION IS SPONSORED BY:



EDITORIAL FOCUS	PRODUCTS & SERVICES FOCUS	SHOW DISTRIBUTION
JANUARY		
» Deepwater Inspection, Repair & Maintenance » ROV Tooling	Manipulator Arms & Tools; Pumps, Hoses and Hose Connectors; Cameras, Lights	Underwater Intervention » February 5-7 Subsea Expo » February 5-7 Oceanology Americas » February 25-27
FEBRUARY		
» Subsea Cables » Offshore Communication	Cable Installation Services and Equipment; Telecommunication Technologies	Int'l Wind Partnering Forum » April 9-10
MARCH		
» Mapping & Survey » Oceanology » MetOcean	Bathymetric Mapping/Charting; Data Acquisition & Processing	US Hydro » March 18-21 Ocean Business » April 9-11
APRIL		
» Offshore Technology » Maritime Security & Ocean Intelligence	Testing Facilities; Military Tech and Contractors	OTC » May 6-9 UDT » May 13-15
MAY		
» Surface Vehicles » Tracking & Positioning	Transponders / AIS; S/P Power Systems; Dredging	TBD
JUNE		
» Offshore Energy Exploration » Ocean Sound	Sonar Systems and Vessels; Imaging & GIS; Magnetometers	TBD
JULY		
» Unmanned Vehicles Buyers' Guide	ROV, AUV, USV, Glider, Towed Vehicles	TBD
AUGUST		
» Submersibles (AUV, ROV, UUV)	Cranes, Winches, LARS & Control Systems; Sensor, Profilers, Measurement; Thrusters; Umbilical, Tether, Cables, and Connectors	TBD
SEPTEMBER		
» Renewables » Offshore Energy Installation & Maintenance	Energy Storage Devices; Inspection Drones; Current Meters	Offshore Energy » October 8-9
OCTOBER		
» Ocean Science & Technology	Acoustic Modems; Acoustic Releases, Transponders, Command & Control Systems; Technical Schools, Training Programs	TBD
NOVEMBER		
» Oil Spill Prevention & Response » Ocean Archaeology & Salvage » Executive Profile	Buoyancy Materials; Pressure/Watertight Housing; Well Control Equipment	TBD
DECEMBER		
» Upper Deck Equipment Guide	LARS, Winches, Cranes, A-Frames, and Buoys	TBD





» Oceaneaut Victor Vescovo emerges from Triton's specially-designed two-person deep-sea research submersible.

EXPLORER REACHES THE DEEPEST POINT IN THE ATLANTIC OCEAN IN UNPRECEDENTED SOLO SUBMERSIBLE DIVE

On 19 December 2018, Explorer Victor Vescovo became the first human to dive on a solo mission to the deepest point in the Atlantic Ocean – the verified bottom of the Puerto Rico Trench at 8,376 meters in his Triton-built submersible, the Limiting Factor.

The trench was previously explored by the French submersible Archimede in 1964, but it did not reach the deepest point. The dive also makes the Limiting Factor the deepest diving operational submersible in the world, surpassing the previous operational record-holder, the Chinese submersible Jiaolong which has reportedly reached a maximum depth of 7,062 meters.

The feat was part of the Five Deeps Expedition. An exclusive interview with three of the key people contributing to the expedition appears in the Jan/Feb 2019 issue of our sister publication, ECO Magazine (page 22). To find out where they will dive next, what kind of equipment they use, and what they have discovered, visit www.ecomagazine.com.

OCEANEERING IN STRATEGIC AGREEMENT FOR ASSET INTEGRITY PROJECTS IN PAKISTAN

Oceaneering International GmbH has entered into a strategic collaboration agreement with F&M Private Ltd (F&M Inspections) to explore opportunities to collaborate on asset integrity projects within Pakistan. The aim is to provide customers with a modernized approach to delivering asset integrity services within Pakistan's oil and gas and industrial sectors, through a full life-of-field capability that supports both CAPEX and OPEX projects in the region. Oceaneering's Asset Integrity team comprises over 2,100 technically-focused people servicing clients at 24 global locations.

www.oceaneering.com



N-SEA ACHIEVES 1.5 MILLION MAN-HOURS LTI FREE

UK and Netherlands-based subsea provider N-Sea has reached 1.5 million man-hours lost time injury (LTI) free. In 2017, N-Sea launched their Golden Rules programme, embedding excellence in SHEQ (Safety, Health, Environment and Quality) across the business and has continued to see the benefits. N-Sea sets a high example for outstanding SHEQ performance and this is represented by this milestone.

www.n-sea.com



» Roddy James, N-Sea Chief Operating Officer

HAROLD ORLINSKY JOINS CTI, OPENS EAST COAST OFFICE

Chesapeake Technology, Inc. (CTI) has appointed Harold Orlinsky as General Manager. Harold brings 25 years of experience in the hydrographic field to lead Chesapeake, as they continue to build on SonarWiz their software for sidescan, sub bottom and multibeam applications. Under Harold's direction, CTI will provide additional software solutions to users as the company expands into new areas. In 2019, Harold will be travelling around the world to meet CTI clients, sales agents and sonar manufacturers.

XODUS APPOINTS CORPORATE DEVELOPMENT DIRECTOR

International energy consultancy Xodus Group has appointed Phil Cooper as its corporate development director to support the continued growth of the company. A hands-on engineer and business leader with more than 35 years' experience, Mr Cooper was most recently London general manager at Heerema Marine Contractors where he led a team of engineers engaged in heavy lift and subsea technical activities. Previously, he was the global technology director at INTECSEA and was responsible for defining and delivering its technology strategy. This new role will see Mr. Cooper strengthen the Xodus leadership team as the business enters a new phase of growth in the UK and beyond, in response to increasing global demand for expert technical services across the energy industry.

Mr. Cooper gained a B Tech (1st Class Hons.) in mechanical engineering at Loughborough University before working in several engineering consultancy roles. He gained a grounding of the offshore sector while leading a UK specialist FEA consultancy team at Lusas before helping to establish KW Ltd and developing advanced analysis capabilities for the oil and gas sector. Mr. Cooper is a Fellow of the Institution of Mechanical Engineers.

www.xodusgroup.com



SEA MACHINES ESTABLISHES GLOBAL DEALER PROGRAM

Sea Machines Robotics, a Boston-based developer of autonomous vessel control technology, has established a new dealer program to support the company's global sales across key commercial marine markets. The program includes strategic partners to sell, install and service the company's line of intelligent command and control systems for workboats. The SM Series products, SM300 and SM200, provide marine operators with task-driven, computer-guided vessel control, bringing advanced autonomy within reach for small- and large-scale operations. The dealer network includes the following initial builders and specialists:

- Navtronics (York, Maine, USA)
- Marine Group Boat Works (San Diego, California, USA)
- La Conner Maritime (La Conner, Washington, USA)
- Seacoast Marine Electronics (Halifax, Nova Scotia, Canada)
- Pinpoint Electronics (Plymouth, United Kingdom)
- Marble Automation BV (Netherlands)
- Technology Ventures (United Arab Emirates)
- CAN Traders & Services (Singapore)



Sea Machines SM product series can be installed aboard existing or new-build commercial vessels with return on investment typically seen within a year. The company is also developing advanced perception and navigation assistance technology for a range of vessel types, including container ships. In early 2019, the company will initiate testing of its perception and situational awareness technology aboard one of A.P. Moller-Maersk's new ice-class container ships. In December 2018, Sea Machines announced that it had raised another \$10 million in venture funding, marking one of the largest venture rounds for a marine- and maritime-focused technology company. For more information, visit sea-machines.com.

MCKAY MAKES WAVES IN NEW ZEALAND

McKay will be developing and implementing New Zealand's first plug-in fully electrical ferry which is due to be built in Wellington. Not only is this the first of its kind in New Zealand, but also the entire southern hemisphere. The project will consist of a modern, composite catamaran ferry using a McKay designed and installed power and energy management system, energy storage system and electric propulsion. Project delivery is expected in the 4th quarter of 2019. For more information, visit www.mckay.co.nz.

» Concept photo of New Zealand's first fully electric ferry.



» Hollie Moran,
Sales Manager EMEA Region

APPLIED ACOUSTICS APPOINTS SALES MANAGER

Applied Acoustic Engineering Ltd, designers and manufacturers of subsea positioning and marine seismic survey products, has welcomed

Hollie Moran to the company's sales team as the new Sales Manager for the EMEA region.

Hollie will focus on expanding the sales and supporting the company's distributors in Europe, the Middle East and Africa.

appliedacoustics.com

OCEAN BUSINESS 19

9-11 April 2019 Southampton UK

**REGISTER
FOR
*FREE**

The hands-on ocean technology exhibition and training forum



**Join 5,000+ visitors
from 60+ countries**

360+ international exhibitors will showcase the latest in the industry, with an extensive programme of 180+ hours of live demonstrations.

All FREE to attend!

Organised by
diversified
COMMUNICATIONS ■ UK

In Partnership with:



Hosted by:



* The exhibition, training & demonstrations, welcome drinks and wine trail are free to attend.
There is a fee to attend the Ocean Business dinner and Offshore Survey conference.

**International Exhibition • Conference
Demonstrations • Co-located Meetings
Seminars • Ocean Careers • Networking**

OCEAN INDUSTRY DIRECTORY

ON&

ACOUSTIC SYSTEMS

APPLIED ACOUSTIC ENGINEERING LTD

Marine House, Gapton Hall Road

Great Yarmouth, NR31 0NB, UK

Tel: +44 (0) 1493 440355

Fax: +44 (0) 1493 440720

E-mail: gavinwilloughby@appliedacoustics.com

Website: www.appliedacoustics.com

Contact: Gavin Willoughby



Manufacturer of fully integrated USBL acoustic tracking systems, both portable and vessel based, high quality multi-system compatible beacons for acoustic positioning and release, and seismic sub-bottom profiling systems for coastal, offshore or geohazard surveys. All products are supported by a network of overseas representatives providing a first class service on a global scale.

HIGH TECH, INC

21120 Johnson Road
Long Beach, MS 39560, United States

Tel: 228 868 6632

Email: high_techinc@bellsouth.net

Website: www.hightechincusa.com

Contact: Glenn Pollock



Experts in rugged marine sensor systems utilized in geophysical surveys, anti-submarine warfare, marine mammal monitoring and downhole applications. Products include data acquisition systems, hydrophones, array cables, pressure vessels and peripherals related to marine systems.

OCEAN SONICS LTD.

11 Lornevale Road

Great Village, NS, B0M 1L0

Tel: +1 902 655 3000

E-mail: info@oceansonics.com

Website: www.oceansonics.com



Ocean Sonics designs and manufactures icListen, the world's first smart digital hydrophone. Compact and easy to use, its small size makes it the perfect tool for sound data collection. Listen in real-time and improve decision making, or use as an acoustic recorder for long term deployments. The best data is collected by the best tools. icListens internal processing saves time. Digital sound is streamed live.

Ocean Sonics is dedicated to your success. We provide services in deployment, system design and integration, and data processing.

Listen Now. The Ocean Sonics Way. .

RTSYS

25 rue Michel Marion

56850 Caudan, France

Tel: +33 297 898 580

E-mail: info@rtsys.eu

Website: www.rtsys.eu



RTSYS designs and manufactures Real-Time Acoustic Systems (Underwater Recorders and Buoys), Sonar Systems (analog sonar retrofit, portable sonars for divers) and Autonomous Underwater Vehicles.

Our Synchronized Multichannel Acquisition Core System (SDA) can handle various Acoustic Transducers and Hydrophones from 3Hz to more than 1MHz and allows a broad range of applications such as noise impact studies, sediment characterization, or cetacean research.

RTSYS products are used all over the world by Navies, Scientific Research Institutes and Offshore Fields Engineers. Flexibility, passion and innovation guide our daily decisions.

TELEDYNE RESON

Fabriksvangen 13

3550 Slangerup, Denmark

Tel: +45 4738 0022

E-mail: reson@teledyne.com

Website: www.teledynemarine.com/reson/

Contact: Shannon Searing



TELEDYNE RESON
Everywhereyoulook™

Teledyne RESON together with Teledyne BlueView and Teledyne Odom provides a range of high quality underwater acoustic hardware and software solutions for underwater imaging within Teledyne Marine. These solutions are delivered through recognized brands such as SeaBat, BlueView, Odom, HydroSweep and ParaSound Multibeam Echosounder and Teledyne PDS software suite.

Teledyne Marine is a group of leading-edge subsea technology companies that are part of Teledyne Technologies Incorporated. Through acquisitions and collaboration over the past ten years, Teledyne Marine has evolved into an industry powerhouse, bringing Imaging, Instruments, Interconnect, Seismic, and Vehicle technology together to provide total solutions to our customers.

ADCP/DVL

NORTEK AS

Vangskroken 2

1351 Rud, Norway

Tel: +47 67 17 45 00

E-mail: inquiry@nortek.no

Website: www.nortekgroup.com



Nortek excels in the development and manufacture of acoustic Doppler instrumentation. Doppler Velocity Logs (DVLs) are used for subsea navigation. Acoustic Doppler Current Profilers (ADCPs) are used to understand physical processes in the ocean, rivers, lakes and laboratories. We pride ourselves on being innovative in product development and production processes. Nortek provides solutions to engineers and scientists by offering real-time data collection and support from our responsive technical team.

TELEDYNE RD INSTRUMENTS

14020 Stowe Drive

Poway, CA 92064

Tel: +1 855 842 2600

E-mail: rdlsales@teledyne.com

Website: www.rdinstruments.com

Contact: Paul Devine



TELEDYNE
RD INSTRUMENTS
Everywhereyoulook™

Teledyne RD Instruments, Inc., located in Poway, CA USA, specializes in the design and manufacture of underwater acoustic Doppler products and oceanographic sensors for a wide array of commercial, academic, and defense applications.

Originally founded in 1982, RD Instruments developed the industry's first Acoustic Doppler Current Profiler (ADCP). Through the years, this innovation has spawned a full line of ADCPs for current profiling in environments ranging from the shallowest stream to the deepest ocean. Expanding on this technology, the company also offers their industry-leading Doppler Velocity Logs (DVLs) for precision underwater navigation onboard manned and unmanned submersibles.

BUOYS

METOCEAN TELEMATICS

21 Thornhill Drive Dartmouth,

Nova Scotia B3B 1R9 Canada

Tel: +1 902 468 2505

Fax: +1 902 468 4442

E-mail: emily@metocean.com

Website: www.metocean.com

Contact: Emily MacPherson



MetOcean Telematics designs and manufactures drifting buoys, environmental platforms, and the world renowned NOVATECH locator beacon product line. In addition to providing complete end-to-end telematics services, and one of the few manufacturers in the world to achieve ISO 9001 certification. MetOcean Telematics' drifting buoy family consists of environmental and weather monitoring, oil spill response, and search and rescue drifters: NOVA profiling float, Iridium SVP (iSVP), iSPHERE, Argosphere, SLDMB, and iSLDMB.

BUOYANCY PRODUCTS

DEEPWATER BUOYANCY, INC.

394 Hill Street
Biddeford, ME 04005
Tel: +1 207 502 1400
Fax: +1 207 221 5718
E-mail: sales@deepwb.com
Website: www.DeepWaterBuoyancy.com
Contact: Dan Cote, Sales Manager



DeepWater Buoyancy Inc. is the world's largest producer of subsea buoyancy products for the oceanographic community and has a vast product line of buoyancy solutions for offshore oil & gas, energy and technology companies. This product portfolio has been built over the course of 35 years serving these industries. Though products are offered for shallow water applications, the company specializes in deepwater, providing solutions to depths of 6000 meters and beyond.

NAUTILUS MARINE SERVICE GMBH

Alter Postweg 24
Buxtehude, 21614, Germany
+49 (0) 41618 66250
info@nautilus-gmbh.com
Website: www.vitrox.com
Contact name: Steffen Pausch



Nautilus Marine Service provides the finest VITROVEX® glass housings that are capable of operating in the most extreme regions of the Earth. VITROVEX® glass enclosures offer the dual advantage of buoyancy and pressure proof housings - a perfect combination for small and autonomous underwater instrumentation packages.

Simple, reliable and affordable.

SUBSALVE USA

P.O. Box 2030
North Kingstown, RI 02852
Phone: 401-884-8801
Fax: 401-884-8868
E-mail: richard@subsalve.com
Website: www.subsalve.com
Contact: Richard Fryburg



Since 1977 Subsalve USA has been America's #1 manufacturer of standard and custom flotation devices and we are the innovators in buoyancy and engineered inflatables. Our products include: Professional, Commercial, Standard, Shallow Water, Enclosed Flotation Bags, Cable & Pipeline Floats, Water Load Test Bags, Rapid Recovery & Mark V/ORCA EOD Systems.

CAMERAS / LIGHTS / LASERS

ARTIC RAYS LLC

382 Chicopee Row
Groton, MA 01450
Tel: +1 567 343 2370
E-mail: lee@articrays.com
Website: www.articrays.com
Contact: Lee Fray



Arctic Rays LLC is a specialist in the design and manufacture of deep sea lighting and imaging products specifically for use on AUVs, but also prove ideal for manned vehicles and all other underwater, surface vehicles or platforms. Our designs feature the smallest possible size and lowest power consumption available.

CATHX OCEAN

Unit D3, M7 Business Park,
Newhall, Naas,
Kildare W91F780
Ireland
Ireland: + 353 (0) 45 252 786 / UK: +44 (0) 1224 432 180 / USA: +1 (832) 808-3403
E-mail: apastor@cathxocean.com
Website: www.cathxocean.com
Contact: Alberto Lopez Pastor
Cathx Ocean design and manufacture advanced subsea imaging and precision measurement systems for subsea operations.



Designed to meet stringent technical, operational and integration requirements associated with various subsea applications and vehicle types, Cathx Ocean's systems offer precision, reliability and peace of mind. Products include advanced still imaging, colour laser point cloud and video systems, designed to deliver precision subsea data in a way that allows automation for subsea vehicle operations.

The range includes the Hunter system (AUV Imaging and Laser), the Scout system (Observation Class ROV Imaging and Laser Profiling), the Pathfinder system (Work Class ROV Imaging and Laser Profiling) and the Prowler I & II systems (Towed Vehicle Imaging Range and Scale Measurement).

DEEPSEA POWER & LIGHT

4033 Ruffin Rd.
San Diego, CA 92123
Phone: 858-576-1261
Fax: 858-576-0219
Email: sales@deepsea.com
Website: www.deepsea.com



For over 30 years, DeepSea Power & Light has provided high-quality and innovative products to the oceanographic community. The company's expertise and product line has grown to include underwater video systems, lighting solutions, pressure relief valves, and lasers.

Design criteria for products include ease of service, reliability, high performance, and cost effectiveness. Products are rigorously tested in both the initial design process and manufacturing stage to perform in the harsh marine environment—from wet/dry surface applications to full ocean depth deployments. DeepSea Power & Light offers a versatile product line while developing new designs to continue exceeding market expectations.

SIDUS SOLUTIONS, LLC

7352 Trade Street
San Diego, CA 92121
Phone: 619-275-5533
Email: info@sidas-solutions.com
Website: www.sidas-solutions.com



SIDUS Solutions LLC, 'SIDUS' is a worldwide company that designs, manufactures and installs systems in the most extreme of environments. SIDUS products include Cameras, Pan & Tilts, Lights and Lasers for use in hazardous areas and for SUBSEA, serving the, energy, scientific, military, nuclear, and shipping industries. Engineering experience makes us the perfect choice for application specific surveillance systems to provide end to end safety and security. SIDUS provides complete integration, design, documentation, and commissioning for all systems. From sea-floor observation platforms, to surveillance systems on drilling rigs, or sonar deployment systems - SIDUS is a field proven solution.

CABLES

CORTLAND COMPANY

10333 Richmond Ave
Suite #1000
Houston TX 77042-4128
Tel: +1 (832) 833-8000
Fax: +1 (832) 833-8002
E-mail: cortland@cortlandcompany.com
Website: www.cortlandcompany.com
Contact: Marco Cano



Cortland has more than 30 years of manufacturing experience supplying custom-designed electro-optical-mechanical cables. We provide solutions that meet the challenges posed by harsh environments, hydrostatic pressures, and high mechanical stresses.

We manufacture custom EOM cables assemblies for various subsea applications which include CTDs, hydrophones, magnetometer, tow cables, ocean bottom, ROV cables, and other custom application. Our global presence and industry-leading design engineers, manufacturing facilities, and management teams, work together to implement integrated solutions with unsurpassed reliability that support the needs of customers worldwide. Visit us online at cortlandcompany.com

FALMAT CABLE
 1873 Diamond Street
 San Marcos, CA 92078
 Toll Free: 800 848 4257
 Tel: +1 760 471 5400
 Fax: +1 760 471 4970
 E-mail: sales@falmat.com
 Website: www.falmat.com
 Contact: Shawn Amirehsani



For over 50 years, Falmat Cable has been a key supplier and a solution provider to many global OEMs and end users supporting a wide range of marine applications. We design and manufacture high performance cables for use in harsh and demanding environments. Our rugged Xtreme cables are known and preferred worldwide for superior reliability and durability in commercial and military projects. We offer XtremeMarine cables with precision coaxial components for use with SD/HD video requirements, wet rated submersible pump cables, miniature fiber optic cables, a comprehensive range of highly engineered ROV Tethers plus our well recognized Xtreme Ethernet cables. Falmat is a Certified ISO9001/AS9100 organization. Visit our web site: www.falmat.com.

SOUTH BAY CABLE CORP
 54125 Maranatha Drive
 P.O. Box 67
 Idyllwild, CA 92549
 Phone: (951) 659-2183
 Fax: (951) 659-3958
 E-mail: Sales@southbaycable.com
 Website: www.southbaycable.com
 Contact: Gary Brown, Sales Manager



Since 1957, South Bay Cable Corp has designed and manufactured specialized electrical, electro-mechanical and electro-optical-mechanical cables for use in demanding marine environments. Cables are designed to meet customer requirements and include tether and umbilical cables for ROVs, tow cables, video inspection, faired cables and a host of other customer specific applications.

CONNECTORS

BIRNS, INC.
 1720 Fiske Place
 Oxnard CA 93033-1863 USA
 Int'l: +1 805 487 5393
 Fax: +1 805 487 0427
 USA: +1 888 BIRNS 88 (+1 888 247 6788)
 E-mail: service@birns.com
 Website: www.birns.com
 Contact: Eric Birns



BIRNS has served the subsea industry since 1954, and is an ISO 9001:2015 certified global leader in the design and manufacturing of high performance connectors, cable assemblies and lighting systems. With a NAVSEA PRO-020 certified molding facility, it offers sophisticated connector lines, including 6km-rated electrical, electromechanical, coaxial, electro-coax, optical, electro-optical and electro-opto-mechanical hybrids. BIRNS provides the industry's highest volume of cost-effective hydrostatic and helium pressure testing, and has a wide range of ABS Product Design Assessment (PDA) certified fiber optic and electrical penetrators. BIRNS' LED and tungsten-halogen marine, chamber, security and commercial diving lights are trusted in the world's most extreme environments.

BIRNS AQUAMATE LLC
 Waltham St.
 Pawtucket, RI 02860 USA
 Tel: +1 (401) 723 4242
 Fax: +1 (401) 753 6342
 E-mail: sales@birnsaquamate.com
 Website: www.birnsaquamate.com
 Contact: Eli Bar-Hai



Birns Aquamate design and manufacture underwater electrical connectors, cable assemblies, and cable terminations. The company produces a wide range of standard industry products such as the 5500 Series, SC, MC, LP, FAWL/FAWM, NANO, TC, Rubber Molded, etc. Birns Aquamate is the only manufacturer to guarantee compatibility with other uw connectors. Birns Aquamate also specializes in fast turn-around for custom design of special connector solutions. All connectors are manufactured under DNV ISO 9001:2000 certification. Dealers in Canada, Brazil, UK, Belgium, Holland, Norway, Germany, South Africa, Holland, Italy, and China.

SEACON
 1700 Gillespie Way
 El Cajon, CA 92020 USA
 Tel: +1 619 562 7071
 Fax: +1 619 562 9706
 E-mail: elcajonsales@te.com
 Website: www.seaconworldwide.com



For the widest range of connectivity and sensor solutions designed for subsea applications, TE Connectivity (TE)'s portfolio includes over 2,500 underwater electrical and fiber optic connectors, and complete connectivity systems to give you a wide range of advanced connectivity options. The portfolio includes not only SEACON products, but DEUTSCH connectors, Rochester engineered cables, and TE sensors – giving you one-stop access to rugged, reliable solutions.

TELEDYNE MARINE
 1026 N. Williamson Blvd.
 Daytona Beach, FL 32114
 Tel: 386-236-0880
 E-mail: TeledyneMIS@teledyne.com
 Website: www.teledynemarine.com



Teledyne Marine Interconnect Solutions integrates the resources of ODI, DGO, Impulse, and Cable Solutions into a single organization that supplies innovative, high-performance solutions for harsh environment interconnect. Solutions for these harsh environments include wet-mate, splash-mate and dry-mate connectors, pressure boundary penetrators, cable assemblies, cable terminations, and custom-engineered encapsulation and molding. TMIS contains a broad portfolio of field-proven, time-tested electrical, optical, and hybrid interconnect capabilities optimized for applications where performance and reliability are imperative. Products are available as stand-alone items, or as complex solutions that integrate technologies into advanced, value-added systems.

DESIGN & ENGINEERING

HYDRO LEDUC NA, INC.
 19416 Park Row, Ste. 170
 Houston, TX 77084
 Tel: 281-679-9654
 E-mail: bogden@hydroleduc.com
 Website: www.hydroleduc.com



Hydro Leduc is a specialist in the design and manufacture of hydraulic piston pumps, hydraulic motors, hydro pneumatic accumulators, and customized hydraulic components satisfying customer needs with reliable products from a reliable source. As the leader in micro hydraulics, it is feasible to obtain several tons of force from a minimal power source within a restricted space envelope. The techniques of micro hydraulics allow simple solutions to problems that are often beyond the limits of traditional mechanical options. Hydro Leduc's expertise is at your service in varied applications such as oil service tools, oceanographic instrumentation, aeronautics, and any extreme working condition of temperature, pressure, medium, and environment.

EQUIPMENT RENTAL

OKEANUS SCIENCE & TECHNOLOGY, LLC
 2261 Denley Road
 Houma, LA 70363
 Tel: 985-346-4666
 Fax: 985-346-8444
 E-mail: Bleblanc@okeanus.com
 Website: www.okeanus.com
 Contact: Benton LeBlanc



Okeanus is the premier rental provider for oceanographic and marine scientific research equipment utilized in nearshore and offshore projects around the world. Focused on providing industry-leading customer service, Okeanus offers advanced, high-quality technology coupled with knowledgeable and experienced staff that can deliver dedicated support regardless of a project's location.

SeaCatalog Vendor

FIBER OPTIC PRODUCTS/SERVICES

OCEAN SPECIALISTS, INC.

8502 SW Kansas Ave
Stuart, FL 34997
Tel: +1 772 219 3000
Fax: +1 772 219 3010
Email: contact@oceanspecialists.com
Website: www.oceanspecialists.com



Ocean Specialists, Inc. (OSI) is a system development and advisory firm for undersea cable projects and technology with global capabilities. OSI works with clients during all project phases of subsea network development, from planning and design to procurement and implementation. Our customers, primarily representing Oil and Gas, Telecommunications and Ocean Observing, recognize the value of fiber optic networks to their field and services solutions, and look to OSI to deliver the skills and experience that developing these networks require.

GYRO COMPASSES

KONGSBERG SEATEX AS

Pirserteret
N-7462 Trondheim, Norway
Tel: +47 73 54 55 00
Fax: +47 73 51 50 20
E-mail: km.seatex.sales@kongsberg.com
Website: www.km.kongsberg.com/seatex
Contact: Finn Otto Sanne at finn.otto.sanne@kongsberg.com



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

LIQUID STORAGE

AERO TEC LABORATORIES, INC. (ATL)

45 Spear Road Industrial Park,
Ramsey, NJ 07446 USA
Tel: +1 201 825 1400
Fax: +1 201 825 1962
E-mail: atl@atlinc.com
Website: www.atlinc.com
Contact: David Dack



ATL specializes in the design/manufacture of custom bladder-type fluid containment systems, including tanks, inflatables, pillows and bellows for surface and subsea. ATL's flexible fluid containers boast unparalleled chemical tolerance, abrasion resistance, and remarkable durability - used with methanol, diesel fuel, gases, ethylene glycol, hydraulic fluids and chemical cleaning cocktails. Expedited deliveries are also available.

MARINE ENVIRONMENTAL CONSULTING SERVICES

CSA OCEAN SCIENCES INC.

8502 SW Kansas Avenue
Stuart, FL 34997
Tel: +1 772 219 3000
Fax: +1 772 219 3010
E-mail: gstevens@conshelf.com
Website: www.csaocean.com
Contact: Gordon Stevens



CSA Ocean Sciences Inc. (CSA) is a marine environmental consulting firm specializing in multidisciplinary projects concerning potential environmental impacts of activities throughout the world. With extensive experience in environmental sciences and technical field operations, CSA is staffed and equipped to offer a complete range of services for projects in offshore, nearshore, estuarine, wetland, and freshwater environments.

MARINE VENTURES INTERNATIONAL, INC. (MVI)

8524 SW Kansas Avenue
Stuart, FL 34997
Tel: +1 772 419 9627
Fax: +1 772 419 9628
E-mail: bpudney@marineventures.com
Website: www.marineventures.com
Contact: Bruce Pudney



Marine Ventures International, Inc. (MVI) provides high quality, marine environmental and technical experts to conduct coastal and offshore field operations worldwide. We leverage our wealth of talent and resources to bring you a customized team of independent contractors, subject matter experts and specialized equipment to get the job done. Our professionals work in a variety of sectors from submarine cable projects and engineering services to protected species observation and environmental consulting.

MOTION SENSING EQUIPMENT

KONGSBERG SEATEX AS

Pirserteret
N-7462 Trondheim, Norway
Tel: +47 73 54 55 00
Fax: +47 73 51 50 20
E-mail: km.seatex.sales@kongsberg.com
Website: www.km.kongsberg.com/seatex
Contact: Finn Otto Sanne at finn.otto.sanne@kongsberg.com



KONGSBERG

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

NAVIGATION & POSITIONING SYSTEMS

ADVANCED NAVIGATION

Level 8, 37 Pitt Street, Sydney 2000
New South Wales, Australia
Tel: +61 2 9099 3800
E-mail: sales@advancednavigation.com.au
Website: go.advancednavigation.com/ONT



ADVANCED
NAVIGATION

Advanced Navigation is a privately owned Australian company that specialises in the development and manufacturing of navigation technologies and robotics. The company has a focus on generating products of the highest quality standard, both in terms of hardware and software. Advanced Navigation has specialised expertise across a broad range of fields including sensors, GNSS, inertial navigation, RF technologies, acoustics, robotics, AI and algorithms. Advanced Navigation is an ISO 9001 certified company and maintains a strict quality control system across the two research facilities and three manufacturing facilities that they operate in Australia. Advanced Navigation is a carbon neutral company, offsetting all emissions due to energy use through the planting of trees.

EVOLOGICS GMBH

Ackerstrasse 76
1335 Berlin, Germany
Tel: +49 (0) 30 4679 862-0
Fax: +49 (0) 30 4679 862-01
E-mail: sales@evologics.de
Website: www.evologics.de



EvoLogics provides the world's most advanced spread-spectrum underwater communication systems (S2C) with multi-channel data management, networking capability, built-in tracking and positioning functions with USBL. Data loggers, acoustic wake-up module and releasers optionally included. Deployments in offshore platforms (FPSO, ABS), environmental monitoring, defense systems, ROV and AUV operations and more. Applications include simple positioning and sensor information to transmission of underwater photos.

KONGSBERG SEATEX AS

Pirserteret
N-7462 Trondheim, Norway
Tel: +47 73 54 55 00
Fax: +47 73 51 50 20
E-mail: km.seatex.sales@kongsberg.com
Website: www.km.kongsberg.com/seatex
Contact: Finn Otto Sanne at finn.otto.sanne@kongsberg.com



KONGSBERG

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

RJE INTERNATIONAL, INC.

15375 Barranca Parkway, Ste I-112
Irvine, CA 92617
Tel: +1 949 727 9399
E-mail: sales@rjeint.com
Website: www.rjeint.com
Bruce O'Bannon



RJE International offers product design, development, evaluation and marketing for military divers, offshore and marine scientific communities, search and rescue teams, and more. RJE has become the industry leader in diver navigation and acoustic relocation. Our team has an extensive background in developing, manufacturing, and supplying underwater acoustic marking and relocation systems, diver navigation platforms, and other subsea equipment.

NETWORK & DATA COMS

KONGSBERG SEATEX AS

Pirserteret

N-7462 Trondheim, Norway

Tel: +47 73 54 55 00

Fax: +47 73 51 50 20

E-mail: km.seatex.sales@kongsberg.com

Website: www.km.kongsberg.com/seatex

Contact: Finn Otto Sanne at finn.otto.sanne@kongsberg.com



KONGSBERG

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

OCEANOGRAPHIC INSTRUMENTS / SERVICES

ASL ENVIRONMENTAL SCIENCES, INC.

Victoria, BC, Canada

Tel: +1-250-656-0177

E-mail: asl@aslenv.com

www.aslenv.com



- Metcean Equipment Leasing:** Acoustic Doppler Current Profiler ADCPs (including StreamPro & RiverRay), Ice Profilers, AZFP, acoustic releases, wave/tide gauges, pingers, satellite beacons, CTD+DO+Tu profilers, DO & turbidity loggers, weather station, cages, flotation, bottom frames.
- Oceanographic Products:** Acoustic Zooplankton Fish Profiler (AZFP), Ice Profiling Sonar (IPS5) & shallow water Ice Profiler (SWIP), Imagenex scanning sonar logger (IRIS), instrument cages, bottom frames. Custom acoustic products and system integration.
- Consulting:** Field work, data collection, analyses, numerical modelling, acoustics, remote sensing, oceanographic mooring design and system integration.
- Manufacturer's Representative:** Teledyne RD Instruments, Deep Water Buoyancy, WERA Northern Radar.

NKE INSTRUMENTATION

rue Gutenberg

56700 Hennebont, France

Tel: +33 2 97 36 41 31

Fax: +33 2 97 36 10 12

E-mail: info.instrumentation@nke.fr

Website: www.nke-instrumentation.com



- Fresh and marine waters multiparameter probes: CTD, dissolved oxygen, turbidity, chlorophyll, Phycocyanin, Phycoerythrin, CDOM, detection of hydrocarbons, pH, Redox
- Dedicated monitoring data loggers and equipment for: sediment transport, underwater systems behavior, marine corrosion, pCO₂ sensor (stand alone or on drifting buoy), density, absolute salinity.
- Intelligent network: environmental parameters (meteorologic and oceanographic), Ecosystems Approach to Fisheries (EAF–Voluntary fishing vessels), Webdata application.
- Prover and Arvor profiling subsurface floats (ARGO project): CTD, dissolved oxygen, BGC, deep, Argos and Iridium transmission.
- Drifting surface buoys with temperature and GPS receiver for Surface velocity project.

RBR

95 Hines Road

Ottawa, ON K2K 2M5

Tel: +1 613 599 8900

E-mail: info@rbr-global.com

Website: https://rbr-global.com/



RBR creates instruments to measure the blue planet. From the ocean abyss to the polar ice caps, our sensors track water parameters – temperature, depth, salinity, dissolved gases, pH, and many others. With design and manufacturing centrally located in Ottawa, Canada, our team works in a fast-paced, dynamic atmosphere to serve customers all over the globe.

ROMOR OCEAN SOLUTIONS

41 Martha Avenue

Mount Uniacke, NS Canada

B0N 1Z0

Tel. +1 (902) 466-7000

Fax. +1 (902) 466-4880

E-mail: Sales@romor.ca

Website: www.romor.ca

Contact: Darrin Verge, President & CEO



ROMOR Ocean Solutions provides instrumentation solutions for the geophysical, oceanographic, defense, security, oil & gas, and renewable energy industries. By partnering with world renowned manufacturers, ROMOR is able to offer technical knowledge, value added services, logistics expertise, and the most reliable instrumentation on the market.

SEA-BIRD SCIENTIFIC

13431 NE 20th St.

Bellevue, WA 98005

Tel: +1 425 643 9866

Fax: +1 425 643 9954

E-mail: info@sea-birdscientific.com

Website: www.sea-birdscientific.com



Contact: Calvin Lwin, Sales

Sea-Bird Scientific provides best-of-class sensors and systems for oceanographic research and environmental water quality monitoring of physical and biogeochemical properties. Sea-Bird Scientific is the leader in accurate, stable ocean instruments for measuring conductivity (salinity), temperature, pressure, oxygen, pH, chlorophyll, CDOM, turbidity, beam attenuation, irradiance, radiance, PAR, nitrate, and phosphate. Our CTD profilers, water samplers, moored CT recorders, wave/tide recorders, DO sensors, and optical sensors are used by research institutes, ocean observing programs, government agencies, and navies globally.

STAR-ODDI

Skeidarars 12, 210

Gardabaer, Iceland

Tel: +354 533 6060

Fax: +354 533 6069

E-mail: baldur@star-oddi.com

Website: www.star-oddi.com

Contact: Baldur Sigurgeirsson



A manufacturer of miniature data loggers with sensors as temperature, depth/pressure, salinity, tilt/acceleration, compass direction/magnetometer, light levels, acoustic receiving/transmitting. The loggers are used for various researches, including oceanography, fishing gear studies, equipment behavioral monitoring and fish tagging.

SMART TELEMETRY

OCEANWISE LTD

Dovedale House, 16 Butts Road

Alton, Hants, GU341NB, UK

Tel : +44 (0)1420 768262

Fax : +44 (0) 872 115 0560

Email : sales@oceanwise.eu

Website: www.oceanwise.eu



Monitoring and measuring environmental data is not enough! You need to manage it so you get the right data in the right place at the right time. Our Port-Log.net Environmental Data Sharing and Publishing service gets the most out of your investment in data monitoring.

- Easy and inexpensive viewing and sharing of real-time data

- Secure and straightforward archiving and storage of all types of marine data

- Data accuracy, integrity and reliability

Enjoy the confidence of working with marine data experts!

SONAR SYSTEMS

ECHOLOGGER

303 Venture Center,
76 Hanggongdaehak-Ro, Deokyang-Gu,
Goyang-Si, Gyeonggi-Do, 10540, Korea
Tel: +82-2-3158-3178
Email: info@echologger.com
Website: www.echologger.com
Contact: Doowon Choi

Echologger represents the best quality sonar products in the market. We are a leading developer/manufacturer of high-end ultracompact echosounders and high resolution scanning sonar that are equipped with state-of-the-art features and essential functionalities to match customers' needs in affordable price.

Founded in 2009 and a company located in South Korea, and with a brand name Echologger, EoFE Ultrasonics Ltd. is a knowledge-based company that continuously designs, develops and manufactures high technology sonar devices and solutions to meet the changing needs of the customers. Having been in the industry for years, the company understands how the industry operates and what works best for the benefit of our valued customers.

EDGETECH

4 Little Brook Rd.
West Wareham, MA 02576
Tel: +1-508-291-0057
E-mail: info@edgetech.com
Website: www.edgetech.com
Contact: Amy LaRose

EdgeTech designs, manufactures and sells industry-leading side scan sonars, sub-bottom profilers, bathymetry systems and combined sonar systems. Additionally, the company produces world class underwater actuated and transponding solutions including deep sea acoustic releases, shallow water and long life acoustic releases, transponders, reliable USBL acoustic tracking and positioning systems, and custom-engineered acoustic products.

**KLEIN MARINE SYSTEMS, INC.**

11 Klein Drive
Salem, NH 03079
Tel: +1 603 893 6131
International: 603 893 6131
E-mail: sales@kleinmarinesystems.com
Website: www.kleinmarinesystems.com



Celebrating over 50 years in the marine technology industry, Klein Marine Systems continues to be a world leading sensor technology manufacturer of high-resolution side scan sonar equipment and radar-based security and surveillance systems. Klein Marine Systems has developed a worldwide reputation of excellence in the industry by providing quality products and excellent customer service. Klein sonar systems are deployed by government agencies, navies, port authorities, surveyors, oil companies and universities worldwide. Visit our web site at www.KleinMarineSystems.com and discover how Klein is Making the Oceans Transparent!

MARINE SONIC TECHNOLOGY

120 Newsome Dr. Suite H, PO Box 1309
Yorktown VA 23692-1309
Toll Free: +1 800 447 4804
E-mail: Regan.Lipinski@na-atlas.com
Website: www.marinesonic.com



MARINE SONIC TECHNOLOGY
A brand of ATLAS NORTH AMERICA

Marine Sonic Technology builds high quality, high resolution side scan sonar systems. Located in Yorktown, Virginia, Marine Sonic has been in business for more than 25 years. Our towed systems are rugged, easy to deploy and simple to operate. We also offer highly efficient AUV/ROV embedded systems, which occupy minimal space and low power consumption.

SOUND VELOCITY PROBES/CTDS

SAIV A/S

Nygardsviken 1, 5165
Laksevag, Norway
Tel: +47 56 11 30 66,
Fax: +47 56 11 30 69
E-mail: info@saivas.com
Website: www.saivas.no
Contact: Gunnar Sagstad

SAIV A/S
Environmental Sensors & Systems

- STD/CTD, Sound Velocity probes/recorder with optional multi-parameter facilities; Turbidity, Fluorescence, Oxygen etc. The new CTD/STD model SD208 with wireless communication and high accuracy: 0.002 mS/cm, 0.002 °C.
- Precision pressure / depth (0.01% accuracy) and temperature sensors/recorders. Applications: hydrographic profilings, installation on ROVs and towed systems, etc. Robust and compact designs are combined with accuracy and "plug and play" compatibility. Output format for sonar equipment, e.g. EM1002, EM3000, SSP, HiPAP and Reson 8125.

SUBSEA FABRICATION

NEW INDUSTRIES

6032 Railroad Avenue
Morgan City, LA 70380
Tel: +1 985 385 6789
E-mail: bill.new@newindustries.com
Website: www.newindustries.com
Contact: Bill New

NEW INDUSTRIES

New Industries provides quality fabrication services to the offshore oil & gas and marine industries focusing on large diameter pressure vessels, suction piles, DNV buildings and deepwater subsea production equipment such as jumpers, PLETs, PLEMs and manifolds.

SUBSEA TECHNOLOGY

**KONGSBERG MARITIME AS – SUBSEA DIVISION
(DIVISION OF KONGSBERG GROUP)**

Strandpromenaden 50
NO-3183 Horten
Norway
Tel: +47 33 03 41 00
Website: www.km.kongsberg.com



KONGSBERG

Kongsberg Maritime is a marine technology company providing innovative solutions for all marine industry sectors including merchant, offshore, subsea, naval and fisheries. The company delivers systems that cover diverse maritime applications. Within subsea, Kongsberg Maritime's sonars, Sub-bottom profilers, multibeam and single beam echo sounders, cameras, positioning and underwater communication & monitoring systems, instruments, software and Marine Robotics are used in survey and inspection operations worldwide. Working closely with customers to develop technology that pushes the limits in subsea applications, Kongsberg Maritime is also dedicated to developing innovative environmental monitoring solutions such as the K-Lander system in addition to cutting-edge Marine Robotic platforms such as the futuristic Eelume vehicle.

UNMANNED MARITIME VEHICLES

**GENERAL DYNAMICS MISSION SYSTEMS'
BLUEFIN ROBOTICS PRODUCTS**

553 South Street
Quincy, MA 02169
Tel: +1 617 715 7000
E-mail: adam.mara@gd-ms.com
Website: gdmissionsystems.com/
underwater-vehicles/bluefin-robotics
Contact: Adam Mara

GENERAL DYNAMICS
Mission Systems

General Dynamics Mission Systems' Bluefin Robotics products provide undersea capabilities for defense, scientific and maritime customers worldwide. Bluefin Robotics products offer a range of systems and configurations that can operate in the open ocean and in constrained waterways. Our core autonomous product line includes Bluefin SandShark, Bluefin-9, Bluefin-12, and Bluefin-21, Hovering Autonomous Underwater Vehicle (HAUV), and Subsea Power technologies.

The Bluefin Robotics AUV family shares a free-flooded, modular, and open architecture backbone that has enabled the integration of 70+ sensors. We have developed and delivered AUVs worldwide to research institutes and industry and have provided AUVs to the United States' and International Navies.

**INTERNATIONAL SUBMARINE
ENGINEERING LTD. (ISE)**

1734 Broadway Street,
Port Coquitlam, BC, V3C 2M8
Tel: 1-604-942-5223
E-mail: info@ise.bc.ca
Website: <https://ise.bc.ca/>

International Submarine Engineering Ltd. (ISE) is a world leader in the design and integration of autonomous and remotely operated robotic vehicles and terrestrial robotics. Over our 40+ years in business, we have accumulated a great deal of expertise in the design, manufacture, and maintenance of:

- Autonomous Underwater Vehicles (AUVs)
- Remotely Operated Vehicles (ROVs) for subsea operation
- Human Occupied (HO) submersibles
- Customized systems for the offshore oil industry
- Customized systems for the Military-Naval sector
- Hydraulic, pneumatic, and electric robotic manipulators
- Teleoperated and autonomous robotic systems
- Robotic systems for nuclear Industry applications
- Communications and real-time control system

**L3 OCEANSERVER, INC.**

275 Martine Street
Fall River, MA 02723 USA
Tel: +1 508 678 0550
Fax: +1 508 678 0552
E-mail: sales@ocean-server.com
Website: www.iver-auv.com
Contact: Jim Kirk

L3 OceanServer, Inc. is one of the leading manufacturers of unmanned underwater vehicles (UUVs) with over 300 units delivered to customers around the world.

The Iver UUV is an affordable, simple to operate commercial system for military, survey, water quality, and research applications.

**OUTLAND TECHNOLOGY**

38190 Commercial Ct.
Slidell, LA 70458 USA
Tel: 985-847-1104
Fax: 985-847-1106
E-mail: jeff@outlandtech.com
Website: www.outlandtech.com
Contact: Jeff Mayfield

Offering the most rugged equipment and unsurpassed customer service, Outland Technology has been the world's leading manufacturer of underwater video, lighting and ROV equipment for over 30 years. We recognize that no two jobs are the same and specialize in products that are customizable for your specific applications.

**TELEDYNE OCEANSCIENCE**

14020 Stowe Drive
Poway, CA 92064
Tel: +1 858-842-2600
E-mail: oceanscience.sales@teledyne.com
Website: www.teledynemarine.com/oceanscience
Contact: Jamie Carrig



Teledyne Oceanscience manufactures unmanned deployment platforms for echosounders and environmental monitoring instrumentation. Our major products are remotely-controlled Q-Boats and tethered instrumentation deployment Riverboats for echosounders and ADCPs, remotely-controlled Z-Boats for hydrographic surveys in shallow or hard to access areas, the Underway CTD that provide affordable and compact profiling from a moving vessel, and the popular Sea Spider and Barnacle seafloor platforms.

TELEDYNE SEABOTIX

14020 Stowe Drive
Poway, CA 92064
Tel: +1 619 450 4000
Fax: +1 619 450 4001
E-mail: inquiries@teledyne.com
Website: www.teledynemarine.com
Contact: Jamie Carrig



Teledyne SeaBotix is a world leading manufacturer of capable underwater MiniROVs that perform a multitude of tasks including maritime security, search and recovery, hull and pipeline inspection, hazardous environment intervention, aquaculture, sensor deployment and oceanographic research. The Little Benthic Vehicle systems have become the benchmark in compact ROVs around the world and ROV equipment for over 30 years. We recognize that no two jobs are the same and specialize in products that are customizable for your specific applications.

VIDEORAY

212 East High Street
Pottstown, PA 19464
Tel: +1 610 458 3000
Fax: +1 610 458 3010
E-mail: sales@videoray.com
Website: www.videoray.com
Contact: Chris Gibson



With more than 3,700 ROVs in service around the world, VideoRay is the global leader in Observation ROV technology. VideoRay's underwater robot systems are extremely versatile, portable, affordable, and reliable solution for underwater operations including surveys, offshore inspections, search & recovery, homeland & port security, science & research, aquaculture, and many other underwater applications. The latest Mission Specialist systems provide solutions for particularly difficult underwater challenges. VideoRay is available on the General Services Administration (GSA) Schedule.

WINCHES, HANDLING, & CONTROL SYSTEMS**MARKEY MACHINERY COMPANY**

7266 8th Ave. South
Seattle, WA 98108 USA
Tel: +1 800 637 3430
Fax: +1 206 623 9839
E-mail: info@markeymachinery.com
Website: www.markeymachinery.com



Preferred by the U.S. fleet, Markey's advanced oceanographic winch systems provide ultimate dependability, reliability and precise performance when and where you want it. Operating within critical windows of opportunity you can count on our custom winches, capstans, windlasses and auxiliary machinery for the successful execution and completion of your research.

OKEANUS SCIENCE & TECHNOLOGY LLC

17455 NE 67th Court, Suite 120
Redmond, WA 98052
Tel: +1 (425) 869-1834
Fax: +1 (425) 869-5554
E-mail: info@oceanus.com
Website: www.oceanus.com
Contact: Ted Brockett



Exclusive Provider of SOSI Brand Products



SOSI and DT Marine brand winches, handling systems, and engineered solutions are now available exclusively from Okeanus Science & Technology. Proven, reliable, and cost-effective standard and custom designed winches range from small all-electric instrumentation winches to high horsepower all-electric or hydraulic umbilical and multi-purpose oceanographic systems. SOSI brand winches can be packaged and supplied with skids, A-frames, over-boarding sheaves, HPUs, and other auxiliary equipment. Okeanus has offices in Houston, TX, Redmond, WA and Houma, LA. Call, email or visit www.oceanus.com for more information.

CSA Ocean Science Inc.	07	Orca Maritime	17
www.csaoccean.com		www.orcamaritime.com	
Evologics GmbH	67	Okeanus Science & Technology....	04
www.evologics.de		www.okeanus.com	
Greensea	47	Saab Seaeye.....	05
www.greensea.com		www.seaeye.com	
J.W. Fishers Manufacturing, Inc.	33	Shark Marine Technologies, Inc.....	35
www.jwfishers.com		www.sharkmarine.com	
Morgan & Eklund	37	Sonardyne	15
www.morganeklund.com		www.sonardyne.com	
Ocean Business 19	58	SubCableWorld	53
www.oceanbusiness.com		www.subcableworld.com	
Ocean News & Technology	03	SubCtech GmbH...	19
www.oceannews.com/uv-buyers-guide		www.subCtech.com	
Oceaneering	09	Valeport.....	21
www.oceaneering.com		www.valeport.eo.uk/swiftplus.com	
Ocean Sensor Systems	43	Video Ray.....	02
www.oceansensorsystems.com		www.videoray.com	
Ocean Specialists, Inc.	68		
www.oceanspecialists.com			



SMART SUBSEA SOLUTIONS

S2C TECHNOLOGY: COMMUNICATION AND TRACKING COMBINED

- time, space and cost-saving solutions
- low power consumption for autonomous operations
- advanced data delivery algorithms, addressing and networking, remotely configurable settings
- extendable platform with multiple configuration options: power-saving Wake Up module, acoustic releaser, additional sensors, custom solutions, OEM versions available

USBL POSITIONING SYSTEMS

simultaneous positioning and communication - no need to switch between positioning mode and modem mode

- flexible SiNAPS positioning software
- reliable data transmissions
- range: up to 8000 m
- accuracy: up to 0.04 degrees

UNDERWATER ACOUSTIC MODEMS

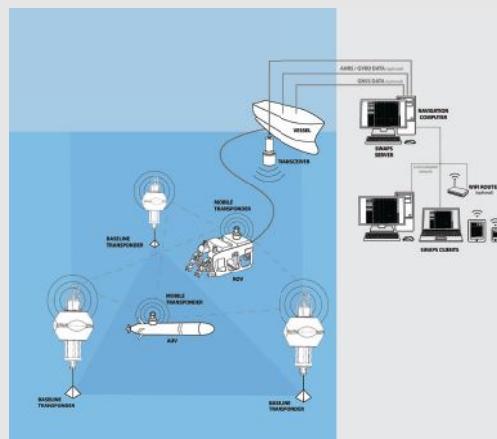
reliable data transmissions even in adverse conditions, customizable R-series modems, light and compact M-series "mini" modems, **new S2CM-HS high-speed modem**, special editions for developers, S2C communication and positioning emulator - remote access or standalone device

- range: up to 8000 m
- depth: up to 6000 m
- data rate: up to 62.5 kbps

LBL POSITIONING SYSTEMS

highly accurate, precise and stable performance, simultaneous positioning and data transmissions

- flexible SiNAPS positioning software
- reliable data transmissions
- range: up to 8000 m
- accuracy: better than 0.01 m





DEVELOPING HIGH-QUALITY FIBER OPTIC NETWORK SOLUTIONS



OSI is a project development company that provides end-to-end network development expertise to deliver undersea fiber optic cable networks. We specialize in all aspects of planning, engineering, implementation and operation.

TELECOM



Developing fiber optic networks.

OIL & GAS



Connecting onshore and offshore assets.

OCEAN OBSERVING



Protecting the ocean environment.

