

# Ocean News

News for the Ocean Industry

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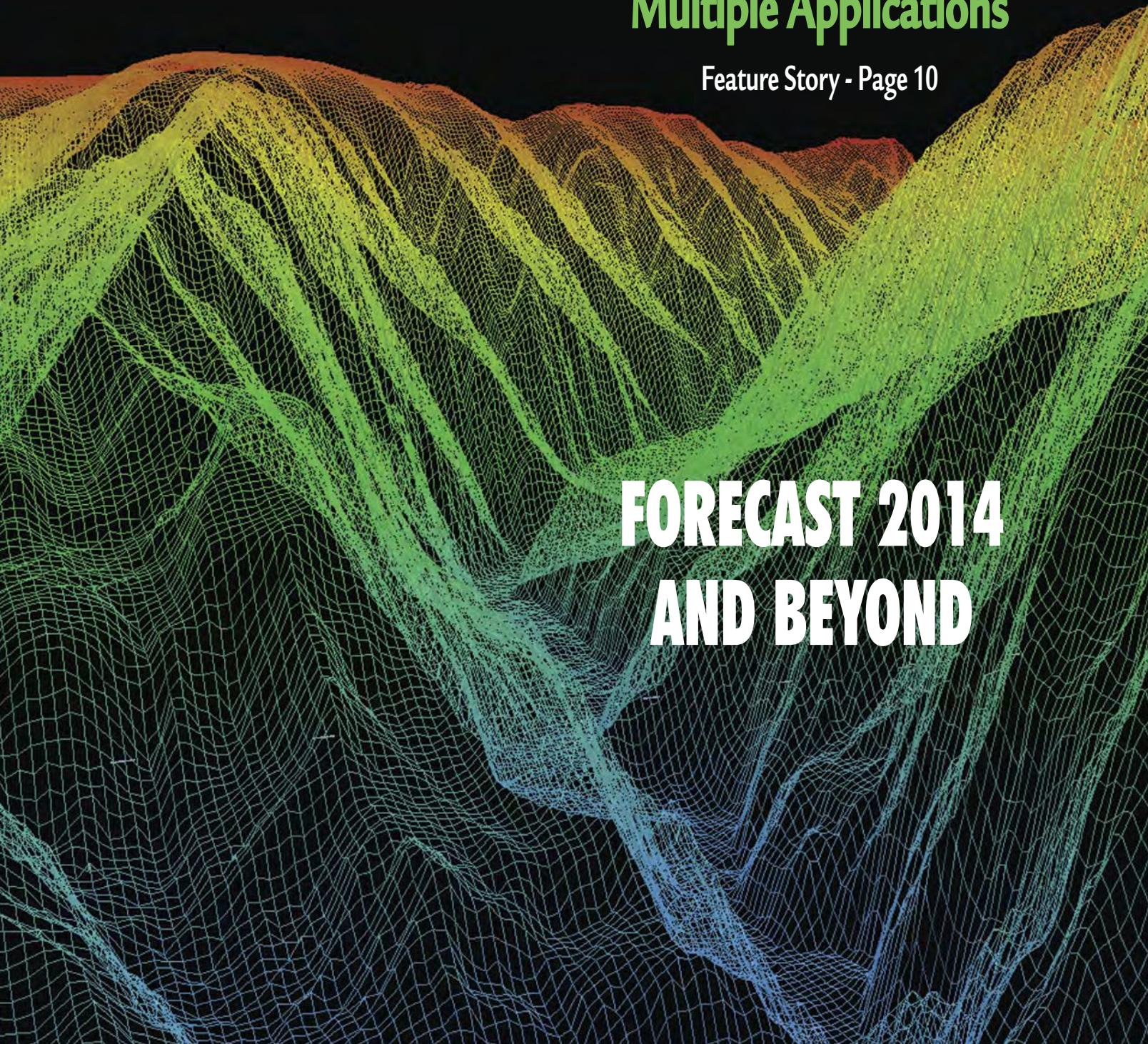
January 2014

& Technology

## M3 Sonar: Multiple Modes for Multiple Applications

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AND BEYOND**





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**3,000+** Owners & Operators

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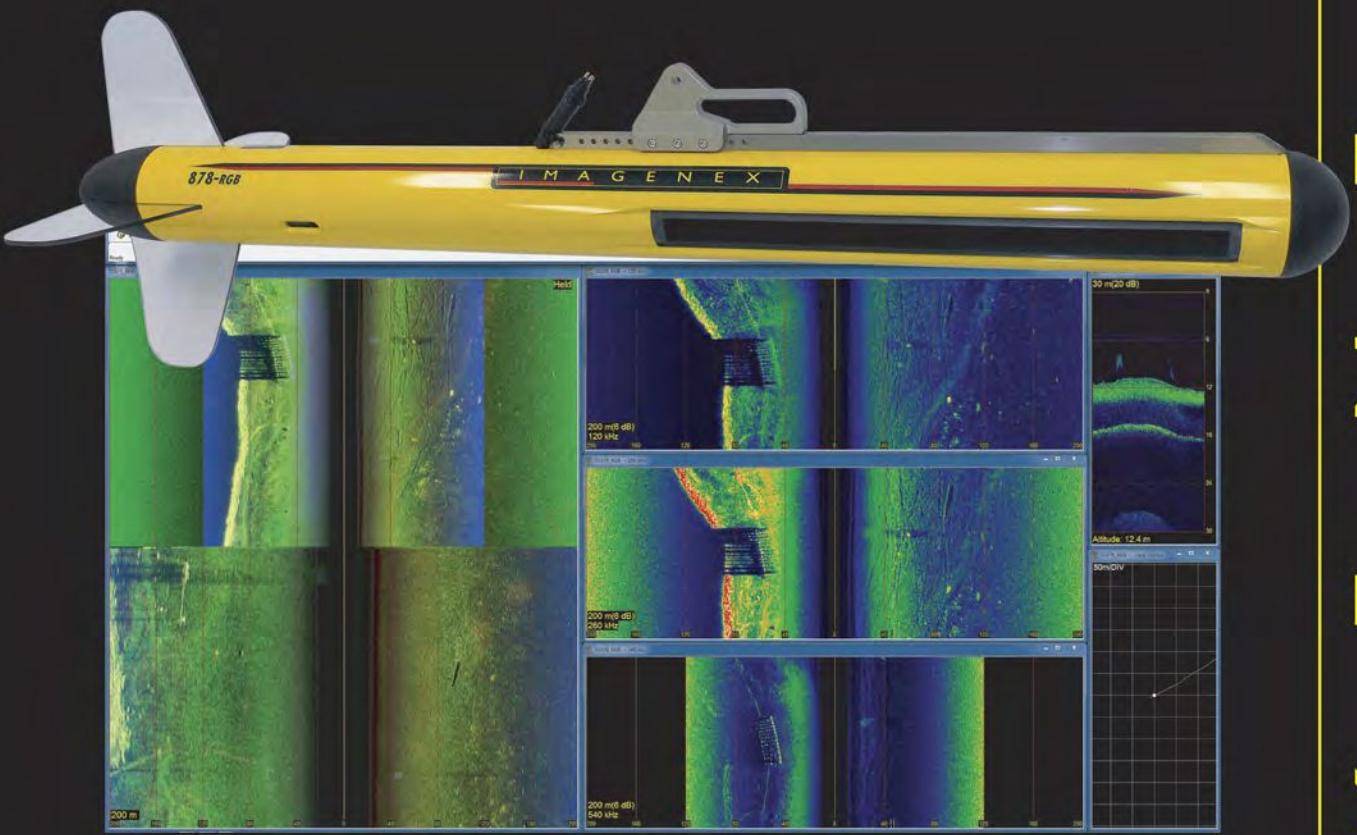
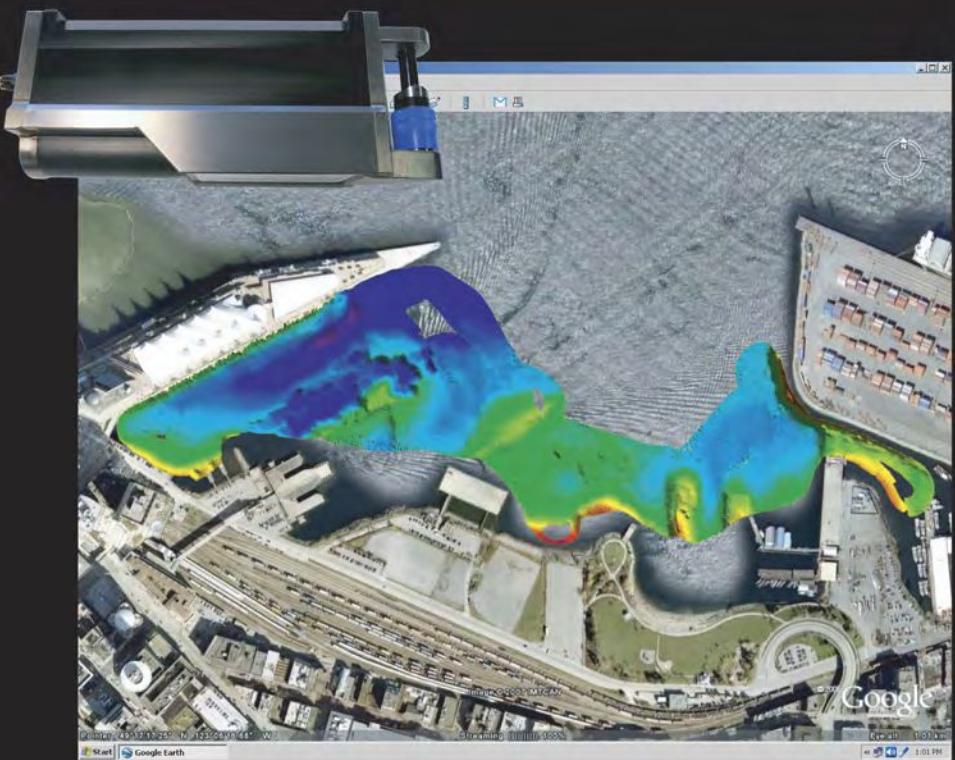
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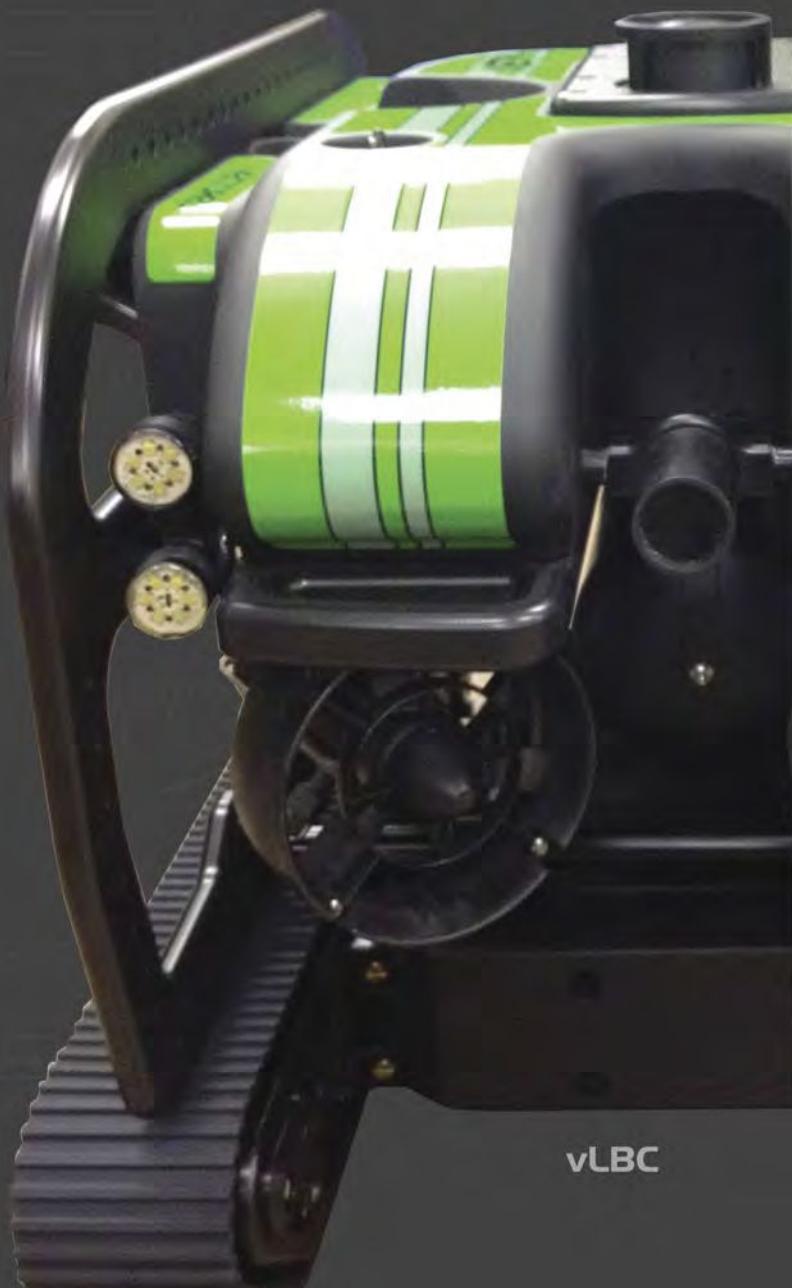
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Fledermaus 3D View of the Norfolk Canyon, Atlantic Ocean, U.S. made from data courtesy of NOAA NGDC on the Nancy Foster - NF-11-04 NC Cruise using a Simrad EM1002 multi-beam system.



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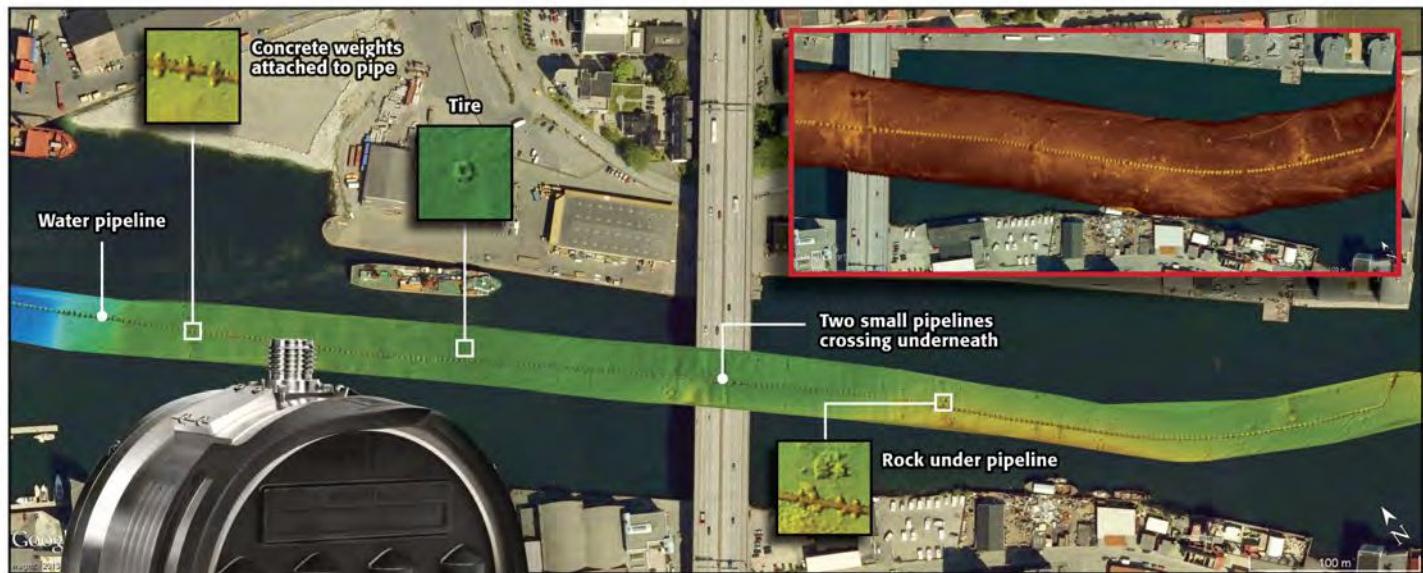
- Buoys & Monitoring Instrumentation
- Environmental Monitoring/Testing Services



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## M3 MULTIMODE SONAR



M3 Sonar pipeline survey (profiling data and image mosaic)



Image of  
a sunken  
boat

### M3 Sonar

- Multi-purpose sonar with imaging and profiling capabilities
- Real-time imaging data
- Image mosaics for surveying
- Real-time bathymetric data
- Integration with third-party software for real-time data acquisition and post-processing

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# EDITORIAL

By: Keith VanGraafeiland



## The coastal & marine GeoSpatial revolution is coming

I recently attended the second meeting of the Ocean GIS Forum convened by ESRI (Environmental Systems Research Institute) in Redlands, California. ESRI, the world's market leader in Geographic Information Systems (GIS) software, invited an elite group of ocean scientists, GIS analysts, and developers from around the world to meet for the express purpose of planning a collective strategy for the future of ocean mapping. The high level and extraordinary convergence of science, technology, and innovation were truly astounding.

GIS technologies have rapidly become core infrastructure for critical ocean and marine challenges, such as monitoring and managing global ship traffic, delineating marine protected areas, classifying/cataloging coastal resources, and developing spatial data systems that provide a common operating picture for government or organizational stakeholders engaged in marine hazards planning and mitigation.

To provide a bit of context, advanced GIS technologies have been used for ocean analysis for decades by NASA, NOAA, and other well-funded governmental agencies. However, only within the past 5 to 10 years has private sector GIS innovation exploded as these technologies and the computing power required to support them become readily available. Several key reports produced in the past several years by private firms (BCG, Daratech, and Oxera-Google) and government agencies (United Nations and U.S. Department of Labor) have independently concluded that extraordinary growth is occurring in the market for GeoSpatial services and applications. It's clear that there is a growing recognition among governments and the private sector that an understanding of location and place is a vital component of effective decision making and that the use of GeoSpatial data and technology becomes more necessary with every passing year. Researchers at Penn State University go so far as to assert that we are irrevocably engaged in a "GeoSpatial Revolution!"

I couldn't agree more and suggest that this particular revolution is fueled primarily by convergence of interests and integration of systems/technology. GeoSpatial industry growth has been fueled by many factors, including the sector's importance to national econom-

ic and security interests as well as major industries, such as energy exploration, shipping, natural resources, and infrastructure management. It has been the combined weight of these interests in spatial information that has provided the critical mass necessary to make location-based technologies commonplace in society. Furthermore, spatial data and location-based services and applications are being integrated into nearly every consumer electronic device. Our web browsers, cell phones, automobiles, televisions, and even watches are now keeping track of our location! And, better yet, these devices are beginning to track one another, thereby creating a true "sensor web."

There's little standing in the way of our creative application of these leading-edge GeoSpatial technologies to problems associated with conservation, energy exploration, and virtually any other discipline where location is important. Returning for a moment to the Ocean GIS Forum, I was impressed that the attendees were drawn from a broad and diverse group of experts from academics (Duke University Marine Lab, University of New Hampshire Center for Coastal and Ocean Mapping), government (West Coast Governor's Alliance on Ocean Health, Yangtze Waterway Bureau), and the private sector (Quality Position Services – Fledermaus, CSA Ocean Sciences, Inc.). By tapping the diversity of groups like these, we'll be able bridge the gap between traditional data products like spreadsheets, databases, and static reports and dynamic, location-aware data like full-motion video, unmanned aerial/aquatic vehicles (drones), and earth observing systems (LiDAR, satellite, SONAR). Connecting these disparate data types and technology is certain to provide a new dimension—the spatial dimension—to our problem solving and business development toolkit.

Despite the fact that my daily interactions are primarily with scientists and technologists, I'll concede that it's been the real estate industry that's had the right idea all along. It really is about "location, location, location," and there's a GeoSpatial boom underway. I can't wait to see what (and where!) tomorrow brings.

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# M3 Sonar: Multiple Modes for Multiple Applications

By: Sarah Pilkington, Kongsberg Mesotech Ltd.

Underwater surveys, obstacle detection, and harbor security inspections are only a few of the applications challenged by high currents, lack of visibility, and other subsea hazards. For over 40 years, Kongsberg Mesotech acoustic systems have been successfully used worldwide to augment diver inspections and underwater visualization operations.

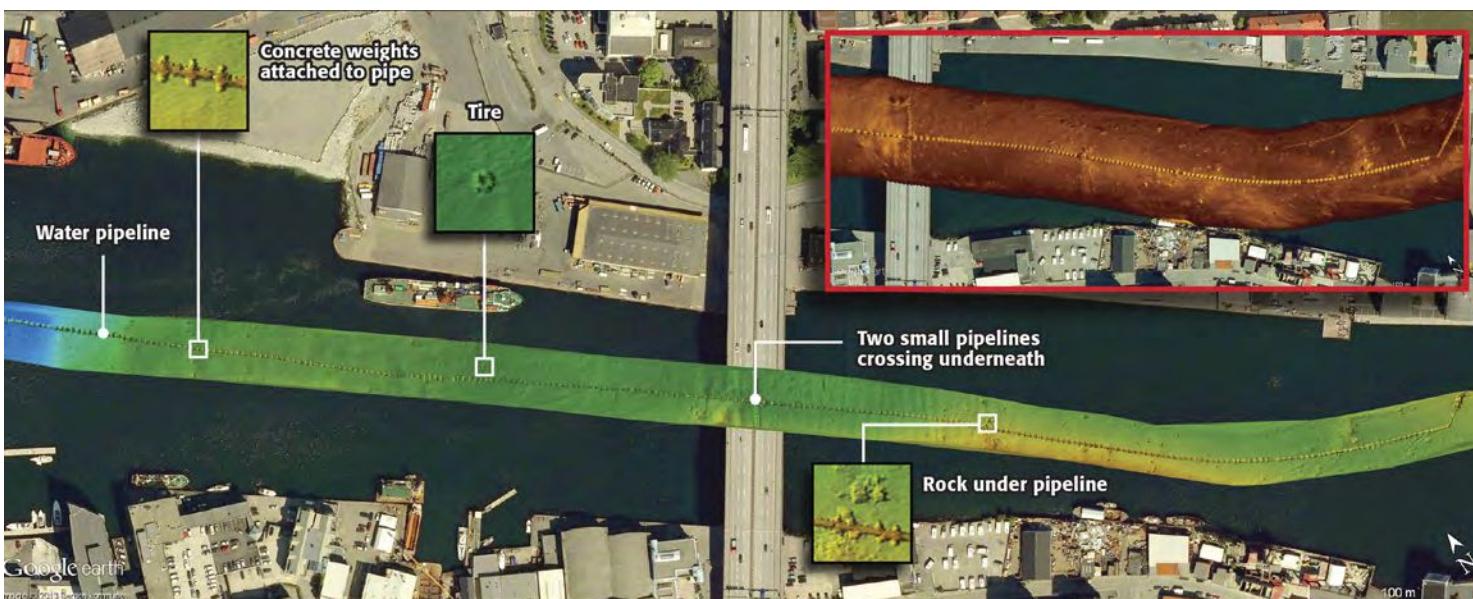
The use of multibeam technology enables faster operations than traditional scanning sonar and provides a large coverage area for data acquisition and a real-time data display. Kongsberg Mesotech's M3 Sonar can be used for both imaging and profiling applications. The M3 Sonar delivers high-resolution and easy-to-interpret images by combining the rapid refresh rate of conventional multibeam sonar with image quality comparable to scanning sonar and is suitable for a variety of deployment platforms, including remotely operated vehicles (ROVs), pole mounted on a vessel, or mounted on a tripod.

Exclusive to the M3 Sonar is the multimode capability that, in addition to standard imaging and profiling, features a unique enhanced image quality (eIQ) mode designed to provide image quality comparable to high-resolution scanning sonars. With four pre-defined operating modes, the M3 Sonar delivers application capability not found in any other system.

## Operating Modes

1. Imaging: long-range navigation with a fast update rate
2. Enhanced Image Quality (eIQ): greatest image quality from a short range with a slightly slower update rate
3. ROV Navigation: automatically selects eIQ or imaging based on range
4. Profiling: optimized split beam profiling for bathymetric surveys

*"We are thrilled at the feedback received from customers after seeing the M3 Sonar's imaging and split beam profiling data", said Colin Smith, Multibeam Product Manager. "Having the multimode capability in one unit gives the M3 Sonar a distinct advantage over other multibeams."*



M3 Sonar pipeline survey (profiling data and image mosaic)



**M3 Sonar Head**



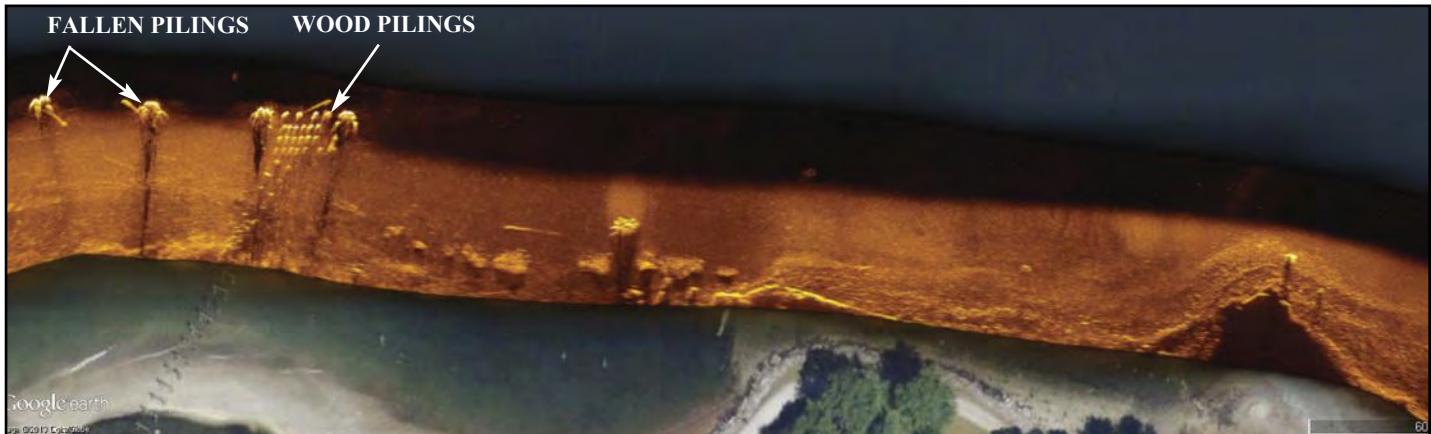
*Image of 26' sunken sailboat*

#### **M3 Sonar software features:**

- Real-time 3D point cloud
- Automated GeoTIFF export for image mosaics
- Dual head synchronization abilities

#### **M3 Sonar Applications**

- ROV Navigation and obstacle avoidance
- Marine engineering
- Site inspection and visualization
- Environmental monitoring
- Pipeline survey
- Berth clearance



*M3 Sonar mosaic image of a shoreline*

M3 Sonar can be integrated with third-party software for real-time profile data acquisition and post-processing.

#### **Faster Operations**

M3 Sonar operations are faster than manual diver searches and conventional scanning sonar surveys, resulting in reduced risk and lower costs. An initial search can be completed prior to dive team mobilization, with targets and potential hazards identified before the first diver enters the water. Dive time and associated risks are substantially reduced using the M3 Sonar.

#### **Flexible Applications**

The multimode capability of the M3 Sonar allows the operator to quickly switch from one operating mode to another. After locating a target using forward imaging, the operator can switch to profiling for 3D point cloud generation.

The M3 Sonar System is Kongsberg Mesotech's latest development in acoustic systems, and the company continues to make technological advances and is expanding its product lines through extensive research and development.

To view M3 Sonar data videos and learn more, please visit [www.km.kongsberg.com/M3Galleries](http://www.km.kongsberg.com/M3Galleries).

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- Broadband Acoustic Spread Spectrum Technology
- Highly Accurate, Robust and Cost Effective

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- Depth: up to 7,000 m
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- Targets: up to 16



- The Best Selling Acoustic Modems In The World
- Broadband Acoustic Spread Spectrum Technology
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- Range: up to 10,000 m
- Bit Error Rate:  $< 10^{-9}$
- Depth: up to 7,000 m



- Highly Robust, Accurate and Power Efficient
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# OCEAN INDUSTRY

## BOEM announces selection of Dr. William Yancey Brown as Chief Environmental Officer

Bureau of Ocean Energy Management (BOEM) director Tommy P. Beaudreau announced the selection of Dr. William Yancey Brown, the former chief executive officer of the Woods Hole Research Center (WHRC), to serve as the bureau's chief environmental officer.

"We are very excited to welcome Dr. Brown to BOEM," said Beaudreau. "He will have a critical role in setting the scientific agenda for the nation's oceans and in developing the research and analysis necessary for sound offshore energy and resource decisions."

"Dr. Brown's extensive experience, education and lifelong dedication to science and environmental responsibility make him an excellent selection for the position of chief environmental officer."

Brown served as the science advisor to the Secretary of the Interior, Bruce Babbitt, from 1997 to 2000 and also worked for the Interior Department earlier in his career. He is a former president and CEO of the WHRC, a leading non-profit research organization that applies science to global environmental challenges. Brown also is a former president and CEO of the Academy of Natural Sciences in Philadelphia, Pennsylvania, the nation's oldest natural history museum, and former president and CEO of the Bishop Museum, the leading cultural and natural history museum of the Pacific. He has also served as a volunteer director on many non-profit boards, including chairing the Ocean Conservancy Board.

"I am delighted and honored to join director Beaudreau and BOEM to further our understanding of the oceans and their resources and to ensure that effective, appropriate and scientifically based environmental safeguards are applied in energy development on our nation's vast outer continental shelf," said Brown.

As the chief environmental officer, Brown will direct BOEM's environmental studies program, which addresses research issues concerning decisions about energy development on the outer continental shelf and priorities for ocean science generally. He will also direct BOEM's environmental assessment program, which assesses the environmental impacts of bureau decisions and provides recommendations on alternatives and on conditions and stipulations to prevent environmental harm. The environmental assessment program is implemented primarily through review under the National Environmental Policy Act of 1969 and the requirements of other applicable environmental laws.

Brown earned the degrees of Juris Doctor from Harvard Law School in 1977, Doctor of Philosophy in zoology from the University of Hawaii in 1973, Master of Arts in teaching from Johns Hopkins University in 1970, and Bachelor of Arts in biology from the University of Virginia in 1969.

For more information, visit [www.boem.gov](http://www.boem.gov).

### CSA Ocean Sciences Inc. awarded Gulf of Mexico BOEM contract

CSA Ocean Sciences Inc. (CSA) through their Ocean Sound and marine mammals business line has been awarded a contract from the Bureau of Ocean Energy Management (BOEM) for conducting measurements and modeling of the underwater pressure waves produced during explosive well decommissioning in the Gulf of Mexico.

The Bureau of Safety and Environmental Enforcement (BSEE) Idle Iron policy keeps inactive facilities and structures from littering the Gulf of Mexico by requir-



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### Urgent reforms needed to change tuna longline fisheries

A grave lack of regulations hinders sustainable management of the world's oversized longline tuna fishery fleets, Greenpeace International warned as it released a new report. The report, 'Out of line, the global failure of tuna longline fisheries,' outlines the main environmental and social impacts of the tuna longline fishing business, arguing that governments responsible for the management of longline fisheries either in their capacity as flag States or through Regional Fisheries Management Organizations are not living up to their obligation to ensure these fleets operate sustainably. This includes ensuring an adequate control of the fishing activities, keeping the capacity of these fleets in line with precautionary limits and minimizing the impacts of fishing on the whole ecosystem. Large international trading companies often facilitate supplies and operations of longline fisheries. Taiwanese FCF, Japanese Mitsubishi and Itochu as well as Singapore/U.S. based Tri Marine are the main traders of longline caught tuna, which they sell to markets in Japan, elsewhere in Asia or as canned albacore products in North America. Greenpeace International is calling for sustainability and equity standards to be implemented without delay by the key traders, market players and fishing operators active in the longline tuna sector.

### Gulf of Mexico Research Initiative announces new grant competition

The Gulf of Mexico Research Initiative (GoMRI) announced that it plans to award up to \$105 million to support research consortia investigating the effect and the potential associated impact of hydrocarbon releases on the environment and public health as well as to develop improved spill mitigation, oil detection, characterization, and remediation technologies. The funding under this program, known as RFP-IV, will support research in the Gulf of Mexico conducted by consortia of four or more institutions between 2015 and 2017. It is anticipated that each team will be funded at levels between \$1 million and \$7.5 million per year. "We have been talking with and listening to the research community, citizens of the gulf communities, as well as stakeholders in the Gulf region.", said Dr. Rita Colwell, chairman of the GoMRI Research Board. The GoMRI is an independent scientific research program. The Research Board is the decision-making and oversight body regarding research supported by GoMRI and consists of 20 members. More than \$175 million has already been awarded by GoMRI to support research.

ing companies to dismantle and responsibly dispose of infrastructure after they plug non-producing wells. According to BSEE's June 2013 data, there are 356 platforms that fit the criteria for Idle Iron removal.

Many of these platforms will be removed using explosives. Although non-explosive severance methodologies (i.e., sand cutters, diver severance, abrasive water jet cutters, etc.) are also used, explosive severance charges can offer a more flexible, efficient, and safer cutting option. However, marine mammals and sea turtles may be harmed by the resulting blast pressures and potentially affected by noise levels produced during severance. BOEM, BSEE, and offshore operators must comply with the Endangered Species Act and the Marine Mammal Protection Act, which requires that estimates of species impacts, or takes, must be established for explosive removal of these structures and corresponding mitigation programs implemented appropriately.

Calculation of take estimates for explosive severance is done by utilizing an underwater modeling approach that assists in predicting the shockwave, acoustic impulse, and energy flux for underwater detonations. CSA, with its project partners, Marine Acoustics, Inc. and Explosive Services International, will collect additional acoustic data under various settings during explosive severance operations. With more accurate measurements, operators should be able to increase the efficiency of their operations while providing protection to marine mammals and sea turtles.

In situ measurements from this project will enable the fine-tuning of modeling efforts, resulting in a better estimation of acoustic propagation and exposure during decommissioning activities as well as the ability to focus mitigation measures within the areas experiencing the greatest amount of potential marine species impact.

For more information, visit [www.csaocean.com](http://www.csaocean.com).

## ABS introduces enhanced fire protection guide

ABS, the leading provider of classification services to the global offshore and marine industries, has released the ABS Guide for Enhanced Fire Protection Arrangements as guidance for improved safety on offshore vessels and installations as well as oceangoing vessels.

"Protection against fires on board

vessels and offshore installations is critically important," says ABS chairman and CEO Christopher J. Wiernicki. "This new Guide represents another significant step taken by ABS toward safer operations."

According to ABS director of Marine Technology Christina Wang, one of the primary goals of this new guide is to provide criteria for notations that increase the level of protection against fires on board vessels, mobile offshore drilling units (MODUs), mobile offshore units (MOUs), and offshore installations. Another objective is to reduce the consequences of an onboard fire through specific measures for prevention, detection, and fire extinguishing.

"Current rules and regulations identify certain fire safety arrangements that must be provided on board a vessel, drilling unit or offshore installation," Wang explains, noting even though the rules and regulations have mandated such "minimum" requirements for many years, fire and explosion continue to remain one of the top safety hazards for any vessel and its crew.

While other classification societies provide fire safety notations, ABS is the first to address the industrial portions of offshore units to this extent. The Guide for Enhanced Fire Protection Arrangements is the first such document to provide requirements to protect against the unique fire risks associated with the industrial areas of floating production, storage and offloading units, Wang says.

The optional Enhanced Fire Protection notations in the Guide include EFP-A and EFP-A+ for accommodation areas, EFP-M for machinery spaces, EFP-C for cargo areas, and EFP-IA for industrial areas. "Combinations of these notations can be awarded as well," Wang says.

The new Guide is available for free download at [www.eagle.org](http://www.eagle.org).

## U.N. World Ocean Assessment selects pool of experts

The United Nations (U.N.) is undertaking an inaugural World Ocean Assessment (WOA) — the first of a regular process for global reporting and assessment of the state of the marine environment, including socioeconomic aspects.

The WOA will include more than 50 subjects grouped within four main themes:

- Marine environment and under-

standing the ocean's role in the global integrated Earth system;

- Food security and food safety;
- Marine biological diversity; and
- Human activities that influence the ocean or are influenced by the ocean.

The U.N. sought nominations for the Pool of Experts to be authors and reviewers of the first WOA, which is to be completed in 2014. Criteria for participation in the Pool of Experts include internationally recognized expertise and ability to serve in a voluntary and independent individual capacity, with the work to be completed through electronic communications.

The Pool of Experts selected can be found at [www.un.org/Depts/los/global\\_reporting/Pool\\_of\\_experts\\_Chart.pdf](http://www.un.org/Depts/los/global_reporting/Pool_of_experts_Chart.pdf).

## U.S.-NZ workshop to tackle ocean acidification

Around 60 shellfish aquaculture experts converged on Nelson to attend a joint New Zealand-U.S. workshop to consider the best ways to future-proof New Zealand's shellfish aquaculture industry from ocean acidification.

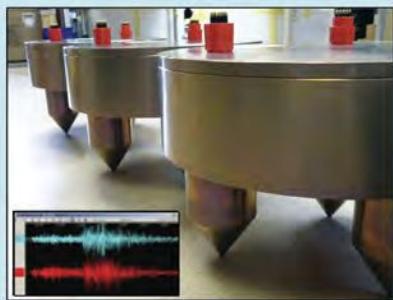
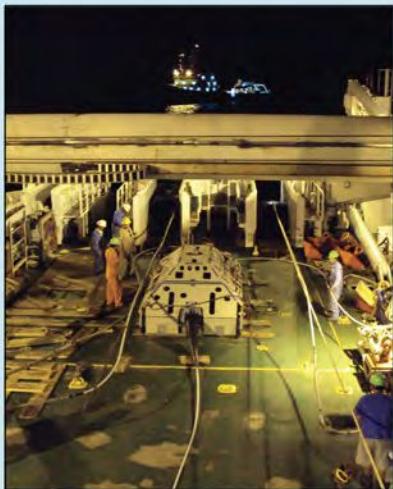
Ministry for Primary Industries (MPI) Director of Aquaculture, Growth & Innovation, Kathy Mansell says that New Zealand has a 5-year strategy for aquaculture that includes investigating the impact of climate change and measures to adapt and respond.

"The workshop represents an aspect of New Zealand's aquaculture strategy in action. It enables New Zealand experts to obtain a greater understanding about the issues from our American counterparts and to discuss potential solutions as well as foster the exchange of knowledge between scientists, industry and policy makers from both countries."

Ocean acidification is not currently a major problem for the New Zealand aquaculture industry. However, it is important that ocean monitoring systems are in place to enable the Government to track future changes in ocean chemistry.

The New Zealand aquaculture industry is currently worth \$350 million per annum.

The workshop entitled "Future Proofing New Zealand's Shellfish Aquaculture: Monitoring and Adaptation to Ocean Acidification" took place from 3-4 December and was facilitated by two noted American scientists — Dr. Todd Capson from the Sustainable Fisheries Partnership and Dr. John Guinotte from the Marine Conservation Institute.



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- Pipeline and Infrastructure Monitoring
- *In-Situ* Sensor Evaluation Test Bed

## Experts in Seafloor Communications Network

CSnet offers end-to-end solutions providing global users a pre-engineered, expandable, portable system that can be deployed and redeployed anywhere – in water depths up to 3,000 meters. Meeting the needs for a wide range of spatial, power or bandwidth requirements, the Offshore Communications Backbone (OCB) serves research, industrial and government applications, providing the infrastructure needed to deliver power in support of continuous 24/7 monitoring; delivering data and providing command and control on-shore via satellite or shore-ended cable.

## Offshore Communications Backbone

The OCB is a modular seafloor communications network that is directly connected to the Internet. Clients can provide and control their own sensors and data outputs, or CSnet can provide a suite of sensors from the surface to the seafloor with data directly forwarded to the client's onshore facilities. CSnet's OCB allows for individual component and end to end networked testing of power and communications functionality during the buildup and pre-deployment phases, ensuring a cost effective and successful installation. The OCB represents a proven network module that has been designed, constructed and tested, eliminating upstart time and cost. Each OCB module is expandable and so can be configured to accommodate large or small applications at a predictable cost.

# Global Marine Contracting and Subsea Market Forecast

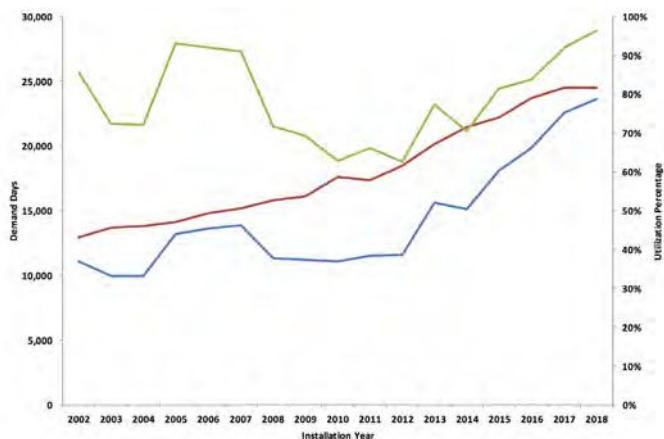
By Quest Offshore

## Global Marine Contracting Market

By Krystal Littlefield, Market Analyst

Global flowline & umbilical Installation demand is building to record levels in 2016-2018. Quest estimates that there are over 7,000km of 0-14-inch OD flowlines planned for installation in 2017 and 2018. World pipeline demand will continue its growth trend into the foreseeable future with the development of large projects such as those in the Brazilian Pre-Salt and investments in export infrastructure in select regions such as Australia and the Norwegian Sea.

With the large number of flexible infield flowlines forecasted to serve pre-salt FPSO developments, along with gas export pipeline installations, South America is a leading region for flexible flowline demand from 2013-2018 accounting for a 22% share. The Rota

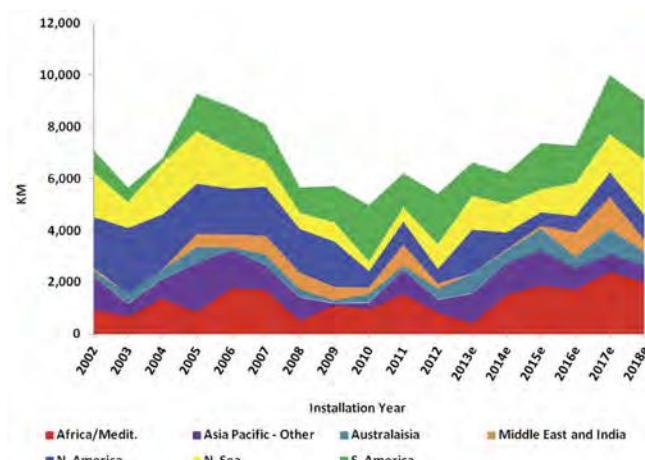


**Global Marine Construction Supply Demand Balance  
Total Utilization – All Activity**

Cabiunas and Rota Marica Santos Basin Gas Export Trunklines are a large contributor to Brazil's demand within this region.

Tendering levels remain strong in the North Sea and Norwegian sectors led by a high and sustainable level of subsea awards. Additionally, increased platform activity in the region has buoyed utilization near-term. North American pipeline installation activity has seen an upswing from 2012 to 2013 with marine installation for the Walker Ridge Gathering System, SECKO pipeline, and the Keathley Canyon Connector serving the Jack St. Malo and Lucius projects in the US Gulf of Mexico accounting for over 4,000 demand days.

The long-term outlook of the marine construction market looks positive as the market continues to see robust growth in subsea awards leading to higher investment for both new and existing subsea infrastructure along with continued expansion in exploration and appraisal drilling.



**Global Marine Construction Total Demand Worldwide Pipeline (KM)**

## Global Subsea Market

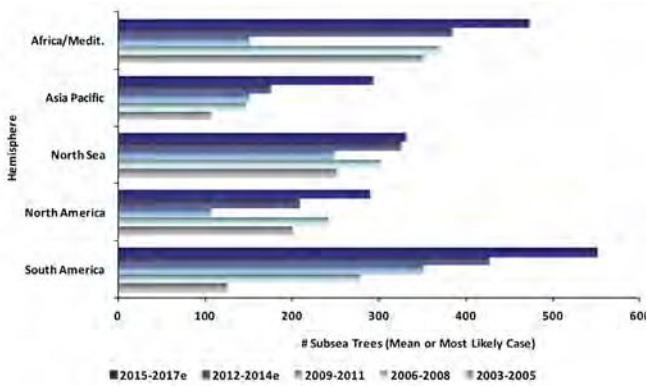
By Caitlin Traver, Director Market Research & Data Division

According to Quest's most likely forecast (mean case), the market will see orders for over 3,000 new subsea trees through 2017 (>60% growth from 2008-2012). Two thirds of that future demand is expected to come from Africa, the U.S. GoM and Brazil. The North Sea is set to remain steady with a high volume of subsea demand for the Norwegian and UK sectors and Asia remains a strong source of growth over time.

Deep and ultra deepwater subsea demand is expected to increase by 90% through 2017 compared to the previous five years. This increase in deep and ultra deepwater projected developments is led by Brazil, West Africa and the US GoM and will continue to drive demand for higher spec drilling rigs, subsea equipment and installation assets as these developments move towards first oil.

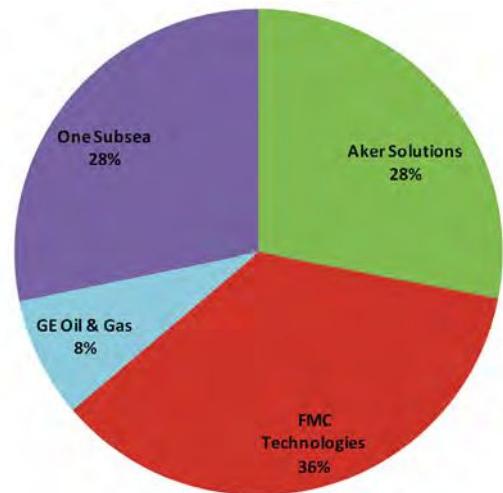
In 2014, Quest's subsea tree award forecast for the rest of the world (excluding Brazil) reveals double digit growth of 19% compared with 2013 (high case). It is widely accepted and expected that Brazil subsea tree demand will be down next year from 2013's record level of demand. That said, meaningful growth potential of other deepwater basins (particularly in Africa and Asia) are expected to offset a significant portion of the reduced Brazil expectations.

In line with Quest's directional forecast, 2013 will set new record demand levels – breaking the record for the most subsea trees awarded since 2006. The first half of 2013 saw awards



**Subsea Tree Award Trends by Region**

almost equal to all of 2012 with over 400 trees ordered; orders through Q3 2013 (500+ trees) already surpass 2006 levels (460+ trees). A significant contributor to order levels eclipsing previous high water marks are demand levels outside of Brazil which have gained ground since 2005 record awards.



**Q1-Q3 2013 Subsea Tree Market Share (500+ Units)**

A notable regional trend in 2013 is the record level of demand from the North Sea. This year, the North Sea is expected to meet, if not exceed, recent demand records for the region with over 120 subsea tree awards. With subsea equipment demand growth from large developments in the UK and Norwegian sector, the area has a strong foundation to see continued demand throughout the forecast period (~20% of global demand 2013-2017, in the mean or most likely case). Additional activity from small independents and ongoing brownfield activity adds to confidence that the region will realize a 30% growth in the next five years.

On the strength of the North Sea market and garnering over 80% of the region's subsea tree orders in Q3 2013, OneSubsea saw the lion's share of global market share with 53 percent by volume in Q3. FTI's orders were enough to retain the lead in overall 2013 market share with 36% of Q1 to Q3 subsea tree orders. Year to date 2013, Aker Solutions and OneSubsea are roughly equal with ~28% of overall tree orders.

For more information, visit [www.questoffshore.com](http://www.questoffshore.com).

# Subsea Vessel, Hardware, ROV, and Offshore Wind Market Forecast

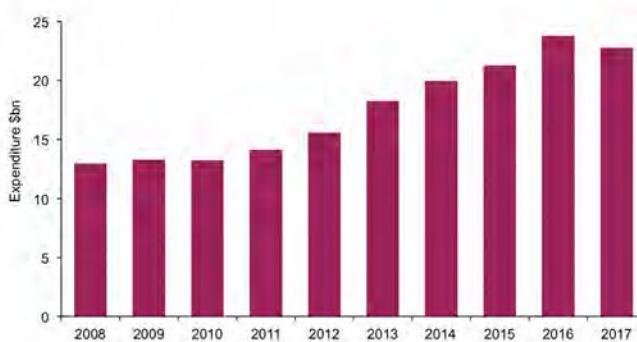
By Douglas-Westwood

## Subsea Vessel Operations Market

By Calvin Ling, Douglas-Westwood, Singapore

In their latest subsea vessels report Douglas-Westwood forecast over \$100 billion (bn) of expenditure on subsea vessel operations over the next five years – with global demand expected to increase by 23%. The increase in expenditure is expected to be higher than the growth in vessel days, due to the move towards higher specification vessels to cater for deeper and more complicated field development programmes.

Dayrates for high specification dive support vessels (DSV) and multipurpose support vessels (MSV) are expected to increase by over 40% by 2017. High spec flexlay dayrates are expected to remain similar and low spec decrease marginally. Pipelay vessel rates are expected to increase by up to 8% for high spec, while light well intervention vessel (LWIV) rates are anticipated to increase slightly.



**Global Subsea Vessel Operations Expenditure 2008-2017.**  
Source: Douglas-Westwood

The deepwater ‘Golden Triangle’ (Africa, GoM and Brazilian areas), is expected to account for the majority of global expenditure on vessel operations over the forecast period. North America is forecast to be the largest market followed by Latin America and Africa.

## Subsea Hardware Spend Forecast

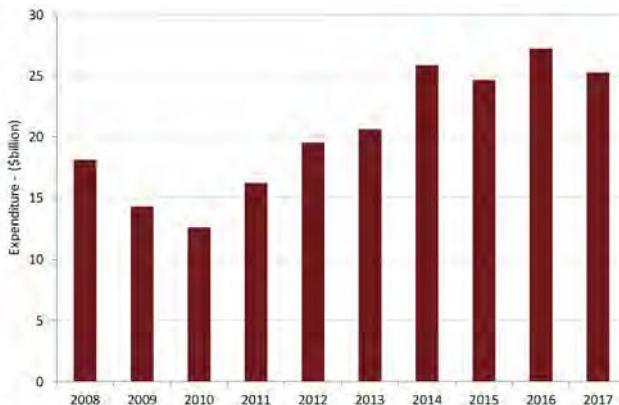
By Rachel Stonehouse, Douglas-Westwood, London

Douglas-Westwood forecast subsea hardware spend during 2013-2017 will double to \$124 bn compared to the preceding five-year period.

Deepwater activity is booming in the ‘Golden Triangle’; Brazil, West Africa and the Gulf of Mexico, which is forecast to account for 44% of total subsea hardware expenditure. The downturn in offshore installation activity between 2009 and 2011 is being followed by strong recovery and this is expected to continue through to 2017. Trunkline projects are of particular significance with major deepwater connections planned for, and extending beyond, the forecast period.

The subsea hardware market, excluding installation spend, can be broken down into subsea trees, controls, templates & manifolds, flying leads and jumpers.

Subsea production hardware spend is directly driven by drilling and completions activity, however, it tends to contribute a smaller proportion of total regional subsea hardware expenditure compared to SURF and trunklines. Forecast expenditure on subsea production hardware is expected to be up \$16bn (75%) on the previous five-year period; \$38bn is expected to be spent between 2013 and 2017.

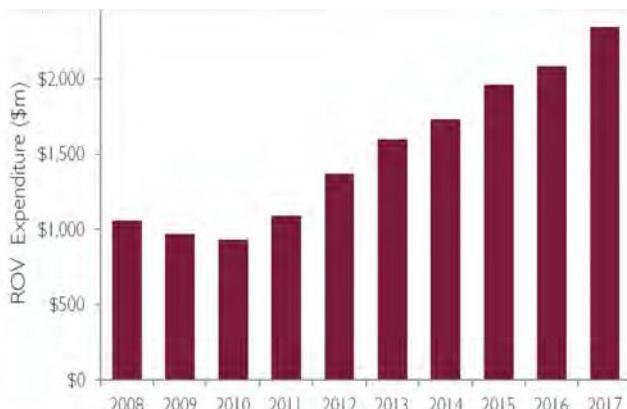


**Global Subsea Hardware Capex 2008-2017**

Source: Douglas-Westwood

SURF – derived on a km installed basis and includes subsea umbilicals (steel and thermoplastic), risers and flowlines (rigid and flexible) – hardware spend is driven by the number of wells drilled and usage of floating production units. The forecast \$43bn SURF expenditure (35% of the total market) is boosted in ultra-deepwater drilling regions where floating units are a preferred production method, for example offshore Brazil, Africa and Asia where longer riser bundles are required. Low project numbers in 2015 for FPS installation, due to project delays, has impacted upon the expected riser installations.

We expect to see almost \$43bn subsea hardware expenditure on trunklines in the next five years. Regions benefitting from this include Eastern Europe & FSU, Asia, Australasia and the Middle East. These regions



**Market for Work-Class ROV Operations 2008-2017**

Source: Douglas-Westwood

total 77% of forecast trunkline expenditure to 2017. In the previous five-year period \$32bn was spent on subsea pipelines with a peak expenditure of \$8.5bn in 2012. In 2010 this dipped to \$4.7bn with a number of large projects slipping.

Subsea developments will continue to account for an ever increasing share of global offshore activity. The technologies deployed are unlocking reserves that would previously have been difficult or impossible to access and our study shows the sector has become a very sizable opportunity for the oilfield service and equipment industry. The outlook for the subsea hardware market shows long-term growth potential, particularly in Africa, Asia-Pacific and Brazil and in addition new markets are developing in the Eastern Mediterranean and East Africa.

## ROV Work-Class Operations Expenditure

By Kathryn Symes, Douglas-Westwood, London

In the latest addition of their World ROV Operations Market Forecast, Douglas-Westwood expect annual expenditure on work-class ROV operations to increase from \$1.6 bn in 2013 to \$2.4bn in 2017, a compound annual growth rate (CAGR) of 11.3%. The market is expected to total \$9.7bn over the period, a growth of 79% over the previous five years.

Expenditure is forecast to increase more than operational days due to the move towards deeper waters and more complicated offshore field development programmes. These are demanding higher specification, higher cost ROVs to cater for their support needs.

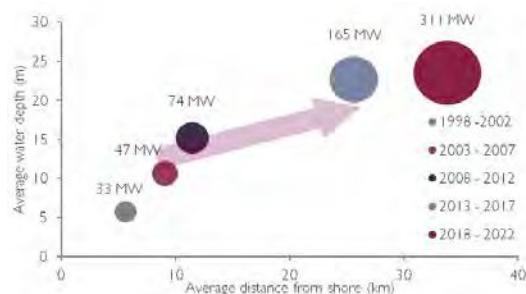
Drilling support, of both exploration and appraisal (E&A) and subsea development (DV) wells, is the main ROV activity demand driver, accountable for 75% of the total expenditure between 2013 and 2017. Construction support accounts for 20% and repair and maintenance (R&M) for 4%.

The largest regional market is expected to be Africa, with Latin America, North America and Asia also important players. The "Golden Triangle", is forecast to account for the majority of global ROV demand, but Asia will see significant growth.

# MARKET FORECAST

The current industry structure is the result of many mergers and acquisitions over more than 30 years. The world fleet of work-class ROVs currently consists of over 1,100 units operated by 25 companies. Of this the top-ten players dominate the market with almost a 60% share.

Oceaneering are the largest operator with 316 ROVs in their fleet, accounting for approximately 30% of the global total with their operations primarily being on drilling support. In their 2013 3rd quarter release, Oceaneering say they anticipate adding 20 units to their fleet. Longer-term, the company believes it could add 90–95 incremental vehicles (55 drilling support, 40 vessel support) by 2017 based on its current market share and its outlook for demand.



*Projects scale average project capacity, distance from shore and water depth. Source: Douglas-Westwood*

The chart above shows how this trend is set to continue over the next 10 years. For example, the majority of UK Round 3 projects are over 30 km from shore and over 1,000 MW in size. In total, the nine designated Round 3 zones represent over 30 GW of potential capacity and would require capital expenditure levels of more than £80 bn (€93.6 bn).

Due to uncertainties in the industry and the slow growth experienced historically, Douglas-Westwood takes a conservative view when undertaking its market modeling, with particular sensitivity placed on the more speculative projects. However, there is a positive upward trend with significant expenditure expected, which has attracted many of the largest industrial players that are already involved in the onshore wind industry.

The future growth of offshore wind is highly linked to achieving meaningful cost reduction, which would, in turn, unlock investment from both project financiers and the supply chain. Unfortunately, there is no single answer to cost reduction and it will only be achieved through a combination of approaches, including increased competition in the supply chain, higher reliability levels, new maintenance strategies, and optimized wind turbine designs.

There is evidence of new approaches in areas such as contracting strategy and risk sharing between project developers. Several major industrial players, including Samsung and Areva, are also in varying stages of development of new offshore wind turbines. This development should bring increased competition to an area currently dominated by a single player. Leveraging experience from the established offshore oil and gas sector is another promising development, especially in areas such as offshore construction and maintenance activities.

For more information on any forecast report, please visit [www.douglas-westwood.com](http://www.douglas-westwood.com).

## Offshore Wind Spending Forecast

By Dmitry Dovgan, Douglas-Westwood, Aberdeen

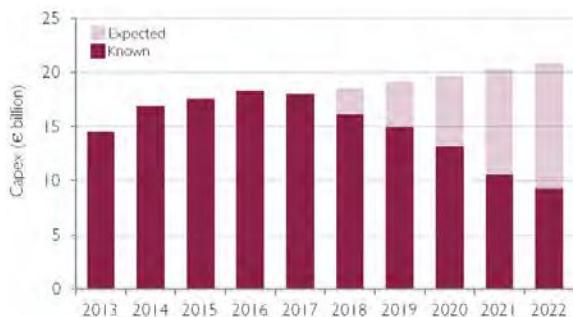
January 2014

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Ocean News & Technology

Douglas-Westwood this year released the 5th edition of the World Offshore Wind Market publication where they forecast offshore wind installations averaging 3.2 GW per year over the next 10 years. Capital expenditure is expected to hit a peak of €18 bn in 2016. The market will remain highly concentrated in the Northern European region, particularly in UK and German waters. The Chinese market will also grow quickly during the forecast period.

Increasing project scale has been a major underlying trend in the industry. Early offshore wind farms were located in water depths of 10 m or less and were typically less than 5 km from shore. Capacity, water depth, and distance from shore have all been increasing since these early projects.



*Total Offshore Wind Capital Expenditure, 2013-2022.  
Source: Douglas-Westwood*

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## Kongsberg integrated technology chosen for 10 UASC owned ultra-large boxships

Kongsberg Maritime has secured contracts with a value of NOK 150 million to deliver fully integrated navigation and automation systems for a series of 10 container vessels ordered by United Arab Shipping Company (UASC). The five 14,000 TEU class and five 18,800 TEU class vessels will be among the largest, most technologically advanced and environmentally friendly containerships ever built. They are scheduled for delivery by builder Hyundai Heavy Industries (HHI) during the first half of 2015. UASC has an option for seven more vessels to the same specification under its contract with HHI. Kongsberg Maritime will deliver "Full picture" integrated vessel control systems, including navigation, communication, and automation for machinery and propulsion systems. Included in the Kongsberg scope of supply is also a state-of-the-art vessel performance system, which monitors and provides accurate, detailed decision support advice for operators regarding energy efficiency, fuel usage, and optimal sailing. The K-Chief automation system and vessel performance system integrate with the electronically controlled main engines, which were chosen to maximize fuel efficiency and reduce noise, vibration, and carbon emissions by automatically controlling fuel consumption to suit sailing speed and sea conditions. "We are proud that United Arab Shipping Company and Hyundai Heavy Industries selected the 'Full Picture' for these class-leading and environmentally friendly vessels," comments Leif Kristian Weum, VP sales, merchant marine, Kongsberg Maritime AS. "Our integrated navigation and automation technology is used by a significant proportion of the vessels in the merchant marine sector, and with substantial projects like this, we continue to increase our market share with the major shipbuilders and owners worldwide."

## WOC and The Nautical Institute launch guide to marine spatial planning for the shipping industry

The World Ocean Council (WOC) and The Nautical Institute (NI) have jointly produced a guide to assist maritime professionals to better understand and engage in Marine Spatial Planning (MSP). The guidance will also help MSP proponents understand shipping industry requirements in relation to management of ocean areas. With this guidance document, "The Shipping Industry and Marine Spatial Planning: A Professional Approach," WOC and the NI are working to ensure that maritime professionals can readily become more informed and involved in MSP, particularly at the local level. The guide provides an introduction to MSP and an overview of key shipping-related issues that need to be considered as MSP moves forward in various parts of the world. David Patraiko, director of projects at the NI, said, "As more and more stakeholders seek to make use of the marine environment, it is vital that professionals from all disciplines within the maritime community play a role in ensuring users of the ocean act in a coordinated and informed way. Re-routing a shipping lane may seem like an obvious solution in accommodating a new offshore wind farm, for example, but if it increases the risk of a collision or grounding, then this needs to be factored into the decision-making process." Leslie-Ann McGee, WOC programs director, explained, "Proactive, constructive and coordinated participation in MSP by an informed ocean business community is critical. The shipping industry and maritime professionals must be at the heart of this process. The new guide from WOC and the NI will assist maritime professionals with developing the knowledge base for leadership in ocean planning." The jointly produced guide identifies each of the main steps involved in a typical MSP process and highlights how the shipping community might participate and offer its expertise. It also contains a number of case studies and annexes, providing useful information on issues such as risk assessment and space needed for maneuvering and collision avoidance. "The Shipping Industry and Marine Spatial Planning: A Professional Approach" was launched by Patraiko and Holthus at an MSP seminar hosted by the Nautical Institute's Hong Kong branch on 8 November 2013. More information is online at <http://www.nautinsthk.com/MarineSpatialPlanning.pdf>.

## Danish Yachts to build more carbon fiber SWATH vessels



Danish Yachts are to build the first in their second series of carbon fiber SWATH vessels, due for delivery in 2014 for operation in Northern Europe. With construction already underway, this will bring the fleet total to five vessels by the middle of next year, achieved in just 18 months.

The design of the vessel will include a restyle of the superstructure to provide enhanced, all-round vision from the bridge as well as a lower center of gravity in the hull form. Danish Yachts' new-build 124 will also feature the compression/vacuum active trim system, allowing fast transfer between CAT and SWATH modes. Additionally, the design teams at the shipyard in Skagen are currently working on new designs for different sizes of SWATH vessels, suited to either the offshore wind farm industry or other offshore industries such as oil and gas.

Patrik von Sydow, CEO at Danish Yachts said, "We are absolutely delighted to be adding to our fleet of SWATH vessels — this underlines the view that carbon fiber is the future, with its longevity and cost savings over the life of each vessel. At the same time, safety is always uppermost in our minds and our teams work closely with the latest regulations with this fleet being built to DNV and Germanischer Lloyd with reinforcement to ice classifications."

For more information, visit [www.danishyachts.com](http://www.danishyachts.com).

## Maersk Training's new program addresses human error in incidents at sea

Maersk Training announced that it launched a new training program aimed at minimizing incidents through human error in marine environments. The course is designed to help offshore workers understand the impact of the human error in marine incidents and enhance their leadership and management skills in order to prevent them.

This course meets the latest mandatory requirements for approved training in the human element, leadership and management at management level as directed by the STCW2010 convention and based on the Merchant Navy Training Board's criteria. This 5-day program will build on the theory using a range of practical exercises designed around shipboard drills, bridge and engine room simulation, and maritime experiential team exercises. It will be available for marine professionals from November 2013 onwards.



Maersk Training in Newcastle also specifically addresses safety issues in offshore renewables environments through a course that provides managers and supervisors in offshore wind, wave and tidal with the essential tools for competently and safely leading their teams. The course, named Managing Safely for Offshore Renewables, will be run from early December onwards and is approved by the Institution of Occupational Safety & Health (IOSH), the world's largest health and safety membership organization.

For more information, visit [www.maersktraining.com](http://www.maersktraining.com).

#### **Fourth PSV "World Emerald" delivered to World Wide Supply**

Damen Shipyards Group has recently delivered the fourth Platform Supply Vessel (PSV) in a series of six to World Wide Supply of Norway.

World Emerald is a Damen PSV 3300 CD. The first ship, World Diamond, was delivered in July. The fifth PSV, "World Opel," will be handed over in a few weeks, and the last in the series, "World Sapphire," is due to be delivered mid-December.

Delivery of the new design involved extensive CAD/CAM modeling by Damen Shipyards Gorinchem in The Netherlands and model testing at Maritime Research Institute Netherlands (MARIN). The 3300 is part of an entire new range of Damen PSVs. With an 80.1-m length, the PSV 3300 has a deck load of 1,500 tonnes. The new type can be used to transport crew and equipment to and from offshore platforms, but it also offers fire-fighting and oil pollution recovery capability. Equipped with azimuth thrusters and dynamic positioning (DP2), the design is distinguished by slender hull lines to meet challenging conditions, minimize fuel consumption, and enhance crew comfort.

Four of the six World Wide Supply PSV 3300s have secured long-term contracts supporting Petrobras, offshore Brazil. The remaining two are expected to be offered to the North Sea spot charter market.

For more information, visit [www.damen.com](http://www.damen.com).

#### **BMT Defence Services goes 3D with AVEVA Marine**

AVEVA announced that BMT Defence Services Ltd (BMT) has chosen AVEVA Marine software to enable tighter integration between its hull and outfitting disciplines, aiming to improve design efficiency through closer collaboration between disciplines.

One of the main reasons behind BMT's decision to adopt 3D software was the ability to produce an accurate weight estimate from the model, which was previously done using a combination of 2D and spread sheets. This alone saved BMT around 2 to 3 man-months of effort on this project. AVEVA provided tailored training for BMT employees to ensure rapid and efficient implementation.

For more information visit [www.aveva.com/marine](http://www.aveva.com/marine).

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## University researcher grows oyster reef by electrically charging sea water

Normally, electrical current is something you want to keep away from water, but researchers at Texas A&M University-Corpus Christi have refined a way to create oyster reef by charging sea water with electricity. Those involved with the project say they can use this information to restore, maintain and protect oyster reefs in Coastal Bend bays and coast-wide in the state of Texas. It's a project that could hold the key to replenishing a key Gulf Coast ecosystem. In some areas of the Gulf of Mexico, oyster reefs have declined nearly 90% over the last 130 years, jeopardizing the well being of several Gulf Coast industries, the infrastructure that supports them, and the residents who depend on them. "Oysters are an important ecological and economic resource," said Dr. Paul Zimba, Director of the Center for Coastal Studies at A&M-Corpus Christi. "They create habitats for fish and shellfish, filter and clean bay waters, protect shorelines from erosion, and are a valued commercial fishery element." While electrically charging water to create artificial reef is not a new concept, Zimba and his team performed lab studies to determine exactly how much electrical current was needed. "We knew carbonate accumulation could be stimulated using electrical currents," said Zimba. "But there wasn't enough research done on specific polarity, voltage, and electrical current types needed to maximize growth." Zimba's team evaluated polarity, voltage, and electrical current to identify the conditions under which artificial oyster or hard bottom substrate habitat could be created and to determine correct current type and voltage to maximize reef formation. Zimba found that the growth was strongly affected by current type and polarity, making it important to have just the right mix. Once they were able to perfect the formation of artificial reef in a laboratory setting, they moved their work to the field. A site in Corpus Christi Bay was used to test this system consisting of structures built from rebar and charged them using solar power. "After 1 month, we had a solid community covering the original material," said Zimba.

## Expedition yields unexpected clues to ocean mysteries

A University of Houston (UH) geoscientist and his colleagues are revealing new discoveries about the Earth's development following a major international expedition that recovered the first-ever drill core from the lower crust of the Pacific Ocean. Co-chief scientists Jonathan Snow from UH and Kathryn Gillis from University of Victoria in Canada led a team of 30 researchers from around the world on the \$10 million expedition, finding a few surprises upon penetrating the lower crust of the Pacific. Their findings are described in the 1 December issue of *Nature* in a paper titled "Primitive Layered Gabbros from Fast-Spreading Lower Oceanic Crust." Traveling aboard the Integrated Ocean Drilling Program Expedition 345 to the Hess Deep in the Pacific Ocean, the scientific voyagers recovered core sections of lower crustal rocks, called gabbros, that formed more than 2 mi beneath the seafloor. A large rift valley in the eastern equatorial Pacific, the Hess Deep is like an onion sliced and pulled apart, revealing its deeper layers. "Hess Deep is like a window into the lower crust of the ocean, where we can drill directly into these lower crustal levels," Snow said. "This is where magma rising up from the Earth's mantle begins to crystallize on its way to eventual eruption at the seafloor." The 2-month expedition aboard the drilling vessel JOIDES Resolution confirmed for the first time the widespread existence of layered gabbros in the lower crust. This observation had been predicted by plate tectonic theory and analogies made to fragments of ocean crust found on land, called ophiolites, but only rarely had actual layered rocks been recovered from the ocean floor. A second surprise discovered by the explorers was akin to "finding gold in a silver mine," according to Snow. By studying thin slices of the gabbros under polarizing microscopes, the scientists identified substantial amounts of the mineral orthopyroxene, a magnesium silicate that was thought to be absent from the lower crust. "Orthopyroxene by itself is nothing special. Traces of it are often found at late stages of crystallization higher in the crust, but we never in our wildest dreams expected a lot of it in the lower crust," Snow said. "Although this mineral is not economically valuable, the discovery means that basic chemical reactions forming the lower crust will now have to be re-studied."

## GEOMAR researchers involved in new EU project PREFACE



Photo H.v. Neuhoff

How does the climate change in the tropical Atlantic? And how does this affect marine ecosystems and the fishing industry in West Africa? These are questions that scientists are now trying to answer in the framework of the EU project PREFACE, including scientists from GEOMAR Helmholtz Center for Ocean Research Kiel who have raised a total of almost €1 million for climate research at GEOMAR.

Rain or no rain in Kiel usually only decides whether you put on your foul weather gear. The situation is different in regions such as West Africa, where the rainfall has a significant impact on agriculture, water resources, the spread of diseases, and, accordingly, on the well being of the population. The rain, or more generally, the climate in West Africa, is in turn influenced by the surface temperature of the tropical Atlantic. Such far-reaching interactions between ocean and atmosphere are no longer a secret. "But modern climate models, which are also used to predict precipitation, have problems in this region. The eastern tropical Atlantic is typically too warm in the models, and the cause remains unclear. This makes predictions so difficult for this sensitive region," says Prof. Dr. Peter Brandt from GEOMAR Helmholtz Center for Ocean Research Kiel. Together with Prof. Dr. Noel Keenlyside of the University of Bergen, the Kiel oceanographer coordinates the new EU research project PREFACE, which aims to significantly improve the forecasts for West Africa over the next 4 years. During the past week, the scientists involved met for the kickoff workshop in Madrid. In total, scientists from 18 European and 10 African institutes and universities collaborate in the EU project PREFACE.

PREFACE — which stands for "Enhancing Prediction of Tropical Atlantic Climate and its Impact" — is funded through the 7th Framework Program of the European Union. The objectives of PREFACE include a better understanding of the climate in the area of the tropical Atlantic and a more precise quantification of the impact of climate change on the region. In addition, the interaction of climate change and fishing in marine ecosystems is part of the investigation. The project runs until the end of October 2017. Then the scientists plan on delivering improved simulations and predictions on the subject.

For more information, visit [www.geomar.de](http://www.geomar.de).

## New generation of micro sensors for monitoring ocean acidification

The first step in developing a cost-effective micro sensor for long-term monitoring of ocean acidification has been achieved by a team of scientists and engineers.

The new technology that will measure pH levels in seawater was developed by engineers from the National Oceanography Center in close collaboration with oceanographers from University of Southampton Ocean and Earth Science, which is based at the center.

The team successfully tested the new device aboard the old RRS Discovery and presented their results recently in the scientific journal *Analytica Chimica Acta*. In its current form, it can be used for onboard analysis of seawater samples, but the ultimate aim is to further develop the design so that it can be deployed for long periods of time in the ocean taking in situ measurements.

As well as monitoring global change, the sensors can be used to measure more localized human impact. The micro sensors could be deployed to detect leakages from carbon capture and storage sites — whereby CO<sub>2</sub> is artificially removed from the atmosphere and

stored in subsea reservoirs — by measuring any proximal fluctuations in pH. The oil industry is also interested in this technology for monitoring seawater acidity around drilling sites.

The sensor works on the same principles as litmus paper that many people may have used in chemistry lessons at school, whereby the colour changes depending on the acidity of the solution.

The next stage is to develop an in situ system that can be deployed on ocean observing platforms as has been done with other sensors measuring different chemical properties of seawater. "Now that we know that the bench top system works, we can use the technology from other systems to create in situ pH micro sensors," says Dr. Rérolle. "This is what we are working on now, in collaboration with oceanographers based at NOC."

Collaborating institutes were the National Oceanography Center, University of Southampton Ocean and Earth Science, the Norwegian Institute for Water Research, the Uni Bjerknes Center Norway, and the University of Bergen.

For more information, visit [www.noc.ac.uk](http://www.noc.ac.uk).

## Genome-scale view of great white shark uncovers unexpected and distinctive features

A new study by scientists from Nova Southeastern University's (NSU's) Save Our Seas Shark Research Center and Cornell University published in final form in the journal *BMC Genomics* undertakes the first large-scale exploration of the great white shark's genetic repertoire and comes up with unexpected findings.

The researchers compared the transcriptome (i.e., the set of RNA sequences expressed by the organism's genes) from the white shark heart to the transcriptomes from the best-studied fish research model (the zebrafish) and humans to look for similarities and significant differences that might explain the distinctiveness of the white shark. So they had a common comparative base, the researchers compared gene products that had known functions in all three species.

Surprisingly, the researchers found that the proportion of white shark gene products associated with metabolism had fewer differences from humans than zebrafish (a bony fish).

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Multibeam Imaging Sonar

Navigation / Coverage Mapping

Still / Video Capture

Scanning Sonar

Side Scan Sonar

Magnetometer



## Putting It All Together



Field Proven on The NAVIGATOR Diver Held Sonar Imaging and Navigation System, DIVELOG software is now available for use on topside computers. Providing an easy to learn / operate software solution for any survey or search and recovery operation.

Indeed, more broadly speaking, the researchers were also surprised to find that other aspects of the white shark heart transcriptome, including molecular functions as well as the cellular locations of these functions, also showed greater similarity to human than zebrafish. Like many first looks at complex scientific questions, the unexpected results of this study raises more questions than provides answers.

For more information, visit [www.nova.edu](http://www.nova.edu).

### **Maldives to create world's largest marine reserve**

The Indian Ocean archipelago of the Maldives announced at the Rio+20 summit that it would create the world's biggest marine reserve to protect its fisheries and biodiversity.

"I would like to announce today Maldives will become the first country to become a marine reserve," president Mohamed Waheed said in a speech.

"It will become the single largest marine reserve in the world. This policy will allow only sustainable and eco-friendly fishing. It will exclude deep-sea, purse-seining and other destructive (trawling) techniques," he said.

### **Research finds more than 50 fish species in Gulf of Mexico rely on decommissioned rigs**

Early research from Texas A&M University-Corpus Christi's artificial reefs monitoring program shows that decommissioned oil and gas structures converted to artificial reefs are supporting a high abundance and diverse fish assemblages within the Gulf of Mexico.

The new data from the western Gulf shows a high abundance of red snapper living around these structures for years at a time. Researchers in the Harte Research Institute for Gulf of Mexico Studies (HRI) at Texas A&M-Corpus Christi say 52 fish species from 18 families have been identified at 13 surveyed sites near Port O'Connor, Port Aransas, and Port Mansfield, Texas.

"There's a lot of evidence that the red snapper populations we see today wouldn't be here if we didn't have all of these converted oil and gas platforms," said Dr. Greg Stunz, director of the Center for Sportfish Science and Conservation. "Red snapper is the most economically important fish in the Gulf of Mexico."

Stunz, who is the principal investigator for a recently awarded grant, says

that in addition to supporting a variety of fish populations, artificial reefs lure commercial fishermen, recreational fishermen, and divers benefiting many Gulf Coast economies.

This new evidence is the reason the HRI's newly formed Center for Sportfish Science and Conservation was recently awarded \$600,000 by Texas Parks and Wildlife and \$50,000 from the Fondren Foundation to expand their studies on artificial reefs. Researchers will monitor sites around the western Gulf and log the amount and types of marine life that create homes around the reefs. They will use these data to determine how to sustain these new "fish homes," including finding what characteristics are best suited to become habitats for each type of fish and to find the long-term effects of keeping rigs in the Gulf after they stop functioning.

For more information, visit [www.tamucc.edu](http://www.tamucc.edu).

### **BOEM/LSU AG Center begin economic study in Gulf of Mexico**

The Bureau of Ocean Energy Management (BOEM), in partnership with the Coastal Marine Institute at Louisiana State University, has launched an economic study of the Gulf of Mexico Coastal Ocean Observing System (GCOOS). The three-year cooperative project between BOEM and the LSU will enhance our understanding of the social and economic value of GCOOS, while providing decision makers the data necessary to plan for future changes to the GCOOS.

GCOOS is a stakeholder-based partnership of academic/research institutions, non-profit and for-profit private corporations, and local, state and federal agencies that support important integrated ocean observations, data products, and outreach and education. Together, they support resilient Gulf of Mexico communities, ecosystems and economies. GCOOS is one of 11 regional networks analyzing data transmitted via satellite from ships, buoys, underwater gliders and other technologies that monitor the earth's oceans and atmospheric conditions.

Having fully aggregated, integrated and searchable ocean and atmospheric information available prior to, during, and following catastrophic events has significant implications for the forecasts directed at saving lives, property, and ecosystem function. This was demonstrated repeatedly by events such as

Hurricanes Ike, Isaac, Katrina, Rita, Sandy, and the Macondo oil spill. From an economic perspective, the nominal investment made to date in observing systems has great value to society. Yet, the benefits the system provides both to direct users of the data and the public at large have not been accurately quantified. Activities associated with the Gulf of Mexico account for more than \$2.2 trillion in ocean-related revenue.

The study's Principal Investigators, all from the Center for Natural Resource Economics and Policy in the LSU AgCenter Department of Agricultural Economics and Agribusiness, include Drs. Richard F. Kazmierczak, Professor of Natural Resource Economics, Center for Natural Resource Economics & Policy (CNREP); J. Matthew Fannin, Associate Professor of Regional Economics and Community Development, Louisiana Center for Rural Initiatives (LCRI); Rex H. Caffey, Professor of Natural Resource Economics, Center for Natural Resource Economics & Policy (CNREP) and Louisiana Sea Grant Program; and Michelle A. Savolainen, Ph.D. Candidate. The study will have a total fixed budget of \$752,517, shared between BOEM and the Coastal Marine Institute at LSU.

The current study will not only assess the value of GCOOS during catastrophic events, but for routine operations of U.S. Gulf of Mexico activities that include 11 of the top 15 U.S. tonnage ports, four of the top seven fishing ports by weight, 20% of domestic crude oil and about 5% of natural gas production, and a tourism industry exceeding \$34 billion annually. The project duration is for three years. Click here to view the GCOOS study profile.

For more information, visit [www.boem.gov/studies](http://www.boem.gov/studies).



*A University of South Florida researcher deploys Tavros02, a solar-powered "towing" AUV (SAUV)*

## Building the world's most advanced deep-diving robotic vehicle

Schmidt Ocean Institute (SOI) has begun working with Woods Hole Oceanographic Institution's (WHOI) Deep Submergence Laboratory to design and build the world's most advanced robotic undersea research vehicle for use on SOI's ship Falkor. The new vehicle will be capable of operating in the deepest known trenches on the planet, including the nearly 11,000-meter-deep Challenger Deep in the Mariana Trench. The design will capitalize on lessons learned from past WHOI vehicle designs, as well as advanced technologies developed for DEEPSEA CHALLENGER, the submersible and science platform that explorer and director James Cameron piloted to Challenger Deep in 2012 and donated to WHOI in 2013.

On 8 December, Victor Zykov, SOI's director of research, publicly discussed the project for the first time at a University-National Oceanographic Laboratory System's (UNOLS) Deep Submergence Science Committee meeting in San Francisco.

"We are excited to provide our collaborating scientists with a unique capability to conduct interactive scientific research and experimentation at the deepest places in the world's ocean starting in 2015," says Zykov.

Upon completion, the new vehicle will be one of only two robotic vehicles in the world capable of operating throughout the world's hadal depths—from 6,000 to 11,000 m. The other is WHOI's Nereus hybrid remotely operated vehicle (HROV), which dove to the Challenger Deep in 2009.

"It's great that Eric Schmidt and the institute have decided that hadal depths are worth exploring," says director and explorer James Cameron. "It excites the imagination that there are still places on Earth that aren't explored."

Lack of access has left most of the planet's deepest ocean areas virtually unexplored. WHOI's Nereus, a proof of concept vehicle now being used on Falkor and other research vessels, offers unprecedented access to the deepest regions for scientists, enabling them to begin the first systematic exploration and studies of deep trenches. However, the globe is a large area to cover with a single vehicle, and engineers and scientists are eager to apply the latest technologies to a new vehicle.

"The vehicle being built for Falkor is a next-generation system that's going to have expanded capabilities," says Andy Bowen, the WHOI principal engineer behind the Nereus vehicle and leader of the SOI vehicle project at WHOI's Deep Submergence Laboratory.

The new Schmidt Ocean Institute vehicle will double deepest robotic ocean access for scientists, and will offer specific strengths. The SOI vehicle will be, like Nereus, a hybrid remotely operated vehicle (HROV), meaning it can be configured to operate in a remotely controlled, tethered mode, or a free-swimming autonomous mode. In the remote configuration, the vehicle will connect to Falkor via a hair-thin fiber optic cable. This allows the vehicle to send high-resolution video up to the ship, and for pilots on the ship to control the vehicle. The thin tether weighs much less than a conventional ROV cable, vastly simplifying operation at great depths.

In the autonomous mode, the HROV will operate without the optical tether and instead follow pre-programmed exploration and data gathering plans. In this mode the HROV can cover up to 20 kilometers of territory, which is appropriate for high-resolution seafloor mapping, for instance, or collecting chemical data across a large area. If the thin tether breaks



*Recovering Nereus after work on Falkor at the Cayman Trough.  
Credit: Leighton Rolley*

while in remotely controlled mode, the vehicle automatically returns to the surface in the autonomous mode.

SOI's HROV will also be designed to operate in a new wireless remotely controlled mode via optical signals between the vehicle and what amounts to an underwater hotspot lowered from Falkor for operation down to 6,000 meters. Down to that same depth, SOI's vehicle can also operate with a more traditional ROV tether that provides additional power and other capabilities.

In contrast to Nereus, designers are optimizing the new vehicle for the remotely operated configurations. Among other goals, this will include more workspace to expand options for sample collection and the deployment and recovery of instrumentation. The SOI vehicle will also be equipped with two manipulator arms that will allow an operator to hold a position with one arm by grabbing a fixed object such as a rock while using the other arm to collect a sample. The vehicle will be designed so that it can be outfitted with a variety of data and sample collection devices to accomplish a wide range of research goals.

As designers optimize the new vehicle plan, they'll be drawing from lessons learned from both Nereus and Cameron's DEEPSEA CHALLENGER. They are also exploring potential application of specific technologies developed for Cameron's sub. These include advanced lighting and high-definition camera systems, as well as a patent-pending foam that can maintain buoyancy while also functioning as a structural element, eliminating the need for heavier components.

"It's exciting to have made a legitimate contribution to deep-sea technology," says Cameron, who serves on the advisory board of a new Center for Marine Robotics at WHOI, "I think for me that's as much a fulfillment of a dream as actually having made the dive."

Schmidt Ocean Institute and WHOI are finalizing design plans, with vehicle construction scheduled to begin next summer and completed by early 2015. After testing, the vehicle will be integrated into SOI's 272-foot research vessel Falkor. The ship is dedicated to accomplishing SOI's mission to enable research that expands understanding of the world's ocean using advanced technology, intelligent observation, and open sharing of information. "Once this vehicle is integrated onto Falkor it will greatly expand our ability to accomplish our mission and provide scientists with unprecedented access to sectors of the ocean previously only imagined," says Eric King, SOI's director of marine operations.

For more information, visit [www.schmidtocean.org](http://www.schmidtocean.org).

# UKTI looks to bring UK experience to US Offshore Wind Market

By John Manock, Ocean News & Technology

*Offshore wind is an area of potential symmetry for UK-U.S. investment. In the United Kingdom, offshore wind is an established industry, with numerous wind farms already operational or under construction and a fully developed supply chain of international companies to install and maintain them.*

In contrast, offshore wind in the United States is a market that is still taking its first steps, with several wind farms planned but none as yet under construction. The market in the U.S., however, has great potential. This, combined with the UK's experience, is prompting many U.S. companies to look to the UK to bring their expertise to the U.S.

Demonstrating this, UK Trade & Investment (UKTI), the government department that helps UK-based companies succeed in the global economy, had a large pavilion showcasing UK companies at the 2013 AWEA Offshore Wind Conference held in October. Mike Rosenfeld, UK Trade & Investment Vice Consul – USA Clean Technology Sector Lead, spoke with ONT on the sidelines of the conference about the potential for cooperation between U.S. and UK companies working in the offshore wind sector.

"We think there is a very viable offshore wind industry here in the U.S. We would like to see this industry emerge more quickly. There are a lot of political and economic issues that affect how this industry emerges. We're competing with other renewable energy technologies, and I don't think we can put our eggs in one basket. There's no silver bullet. We need to look at a variety of sources and offshore wind, on the East Coast, in the areas that they've now identified, makes sense. And so we would like to see that go forward, and we would like British companies be able to participate in the market. We have offerings in professional services, ocean engineering and subsea construction, in understanding what it takes to build offshore wind farms," Rosenfeld said.

Rosenfeld noted an announcement made at the 2012

AWEA conference. There, Bechtel, a large U.S. engineering company, announced a partnership with UK marine services company Subsea 7. "This was a very interesting development in terms of the signal that it sent to the industry. When a company like Bechtel is willing to get involved in the UK's offshore market, de-risking the market in the UK, it sends a signal to others," Rosenfeld said.

There is reason to be optimistic about the U.S. offshore wind market, even though it is frustrating to see the slow pace. The proposed projects such as Cape Wind, Deepwater Wind, and Fishermen's Energy make sense on the East Coast where there are transmission constraints, and these offer a good starting point for the industry in the U.S. Many UK companies are beginning to bring their expertise to help the US market develop. Some of these are SMEs offering consulting. These are interesting and innovative companies that gained their experience in the UK market and now are bringing their services to the U.S.

"PMSS is a good example of a British company that came on one of UK Trade & Investment's trade missions a couple of years ago," noted Rosenfeld. "They established an office in the U.S., and they're doing very well. SgurrEnergy, an engineering firm that is part of the Wood Group, is another one. Most of the work is front-end engineering and planning. We do see some manufacturing of discrete technical components for turbines. BGB Technology established a manufacturing facility in Richmond, Virginia making a discrete component for wind turbines."

For a budding market like offshore wind in the U.S., it is important to have an open economy that will allow foreign companies to participate. It is not practical to re-create all of the expertise already gained by foreign companies from years of effort in an industry as challenging as offshore wind.

"If you look at the UK experience, the developers for the most part are anybody but British," continued Rosenfeld. "The manufacturers are German, Danish, French, Spanish, Japanese, Korean, etc. In the UK, we have an open economy that fosters this global participation. We do want to employ local people. We do want to see

local communities benefit, and they will, because a lot of that work — for instance the ships — is going to be operated by local people. The construction jobs and the supply chain will employ local people. So, I think there is a ripple effect. It does affect everybody. But let's not preclude some companies because they are not U.S. companies. That's how the UK's offshore wind industry developed. Yes, they would like more UK content, of course, we would all like that. But is that entirely practical? What percentage of your car is manufactured in the U.S.? They are assembled, and those are good jobs. But where are the components coming from?"

The opinion at the conference was unanimous that the big challenge for the offshore sector is driving down the cost of building and installing wind farms. "It is working in a harsh environment that is unforgiving, and frankly that has driven the costs up," Rosenfeld noted. "You have to find ways to reduce the costs, and floating turbines are one of the solutions. I'm working with a number of U.S. companies that are working on these technologies. Two of the very viable floating turbine designs come out of the Seattle area. The cost reduction is going to be viable with floating platforms because of the high cost of trying to build in the sea environment."

UKTI is responsible for encouraging foreign direct investment into the United Kingdom as well as helping UK companies enter foreign markets. It has about 125 officers and associates in its U.S. network. Offices are located in several major cities where there are British diplomatic posts. As part of the Foreign Office and the Department of Business Innovation and Skills, UKTI provides these services through the UK's consulates and embassies and has an organization across the world that primarily employs locally engaged staff.

UKTI's services are offered on a confidential basis, and they are free of charge. Its U.S. offices help companies identify locations, access the workforce, and set up and register as UK-registered companies. UKTI also can help companies understand the regulatory environment and address issues that arise.

## Atlantis Resources acquires Europe's largest tidal energy project

International tidal technology and project developer Atlantis Resources Limited has announced its acquisition of MeyGen, Europe's largest tidal power project. Having already held 10% of the company developing the project, MeyGen Limited, Atlantis has elected to acquire the remaining equity from its joint venture partners Morgan Stanley and GDF SUEZ. Morgan Stanley will remain as Atlantis Resources' largest shareholder. The announcement comes shortly after the MeyGen project received its offshore planning consents from the Scottish Government, a key milestone in the development timetable, which significantly de-risks the project's delivery. Atlantis will now work with the Scottish Government, Department for Energy and Climate Change and The Crown Estate towards commissioning of the first MeyGen turbines in 2015. At 398 MW, MeyGen is the largest tidal energy project in Europe. Located in the Inner Sound development zone of Scotland's Pentland Firth, the project was first proposed by Atlantis Resource's project origination team in 2006. The 3.5-sq. km area site is being developed in multiple stages, with first power expected in late 2015 or early 2016.

## U.S. offshore wind gains momentum, but risks challenge future growth

Despite significant advancements in 2013, continued uncertainty regarding federal tax policy and lack of state-level incentives will, if left unchecked, present significant barriers to U.S. offshore wind success. This is according to the North American division of PMSS, an experienced European offshore wind consultancy firm and a part of the TÜV SÜD group. With a series of offshore wind energy areas off the U.S. East Coast already having been auctioned off by the federal government, many within the market have been reassured to witness these first-ever lease auctions as promising signs of market momentum and key progress from the federal government. However, while these advancements reiterate a clear sense of market optimism within the industry, a number of key challenges still remain. "Over the past 12 months, the U.S. offshore wind sector has broken through what had become a protracted industry hiatus, with the result that a number of projects have suddenly made considerable headway and gained ground," said Sebastian Chivers, senior vice president and head of the New York office of TÜV SÜD PMSS. "Indeed, with some of the most advanced projects inching closer to project finance and construction, BOEM now having a defined process and infrastructure in place for lease auctions and having completed auctions for two states (Rhode Island and Virginia) with New Jersey, Massachusetts, and Maryland expected to follow, it's evident that years of hard work and dedication by project developers, AWEA and the OffshoreWindDC is now paying dividends," Chivers continued. "However, despite this, market challenges do remain at both state and federal level. None more critical to investor and supply chain confidence than securing greater policy incentive stability through an extension to the federal investment tax credit (ITC), without which there is a growing danger of alienating investors and reducing financier confidence in this key global energy growth hub." "At a state level, huge progress has been made in establishing supporting legislation for offshore wind, like the Offshore Wind Economic Development Act in New Jersey. What we must do now is maintain traction through clarity of regulations and a clear schedule for both OREC applications and lease auctions, which will ensure a coordinated approach," Chivers added. Despite this, TÜV SÜD PMSS continues to signal its long-term commitment to the U.S. offshore market, with a new office in Albany, New York. The office provides room for the business to grow and recruit new U.S. engineers and consultants for its growing roster of renewable energy project engagements.

## DONG Energy to build two North Sea wind farms



DONG Energy has decided to build the offshore wind farms Gode Wind 1 and 2 in the German part of the North Sea. The construction will represent a total investment of approximately €2.2 billion [DKK 16.4 billion].

Gode Wind 1 (330 MW) and 2 (252 MW) will consist of 97 turbines from Siemens Wind Power, each of 6.0 MW/154 m rotor, with a total capacity of 582 MW. The wind farms will be able to supply CO<sub>2</sub>-free power corresponding to the annual electricity consumption of approximately 600,000 German households. DONG Energy has already secured unconditional grid connection confirmation from the TSO, TenneT, for Gode Wind 1 and 2.

DONG Energy will receive a fixed price per kWh of electricity produced for the first 10 years of operation, following which DONG Energy will receive the market price. The Gode Wind projects will be constructed within the support regime of the German Stauchungsmodell, which is designed to support offshore wind projects built before the end of 2017.

Gode Wind 1 and 2 are located approximately 45 km off the German coast in the North Sea. They will be built in immediate continuation of the Borkum Riffgrund 1 project, which DONG Energy is currently constructing. On completion of Gode Wind 1 and 2, DONG Energy will have built a total of approximately 3.5 GW of offshore wind. DONG Energy has a target to build a total of 6.5 GW by 2020.

Offshore construction of the Gode Wind offshore wind farms will begin in the first half of 2015, and the wind farms are expected to be fully commissioned in the second half of 2016.

The Gode Wind projects increase the robustness and balance in DONG Energy's portfolio of offshore wind farm projects across geographies and regulatory regimes.

For more information, visit [www.dongenergy.com](http://www.dongenergy.com).

## Canadian partnership to establish tidal R&D facilities

The Municipality of Digby, the Town of Digby, and Fundy Tidal Inc. have entered into an agreement to develop the Digby Community Energy Trust to coordinate resources and investment into infrastructure in support of research, development and commercialization of tidal power systems and services in the region.

The Trust also seeks to provide the core operating costs for the Digby Community Energy Center, which will provide ongoing testing and demonstration capabilities across the

three Community Feed-In Tariff (COMFIT) project sites awarded to Fundy Tidal by the Province of Nova Scotia.

Fundy Tidal received COMFIT approvals for projects in Digby County (1.95 MW in Digby Gut and 500 kW in each of Grand Passage and Petit Passage) and in Cape Breton (100 kW in Barra Strait and 500 kW in Great Bras d'Or Channel).

The COMFIT approvals issued by the Province stipulate that Fundy Tidal work with the Province to establish testing and demonstration facilities for small-scale tidal systems as well as implement solutions to overcome distribution grid limitations in rural areas of southwest Nova Scotia that include storage, smart-grid and load balancing scenarios.

Fundy Tidal and BC-based Clean Current Power Systems Inc. recently announced an agreement to test and demonstrate a 3.5-m diameter Clean Current tidal turbine as part of a Tidal Power System (TPS), including energy storage and system controls that enable balancing of power production with community load. The TPS project is expected to last 12 months, with a tar-

get commissioning date in the fall of 2014. These activities are targeted for the Digby Community Energy Center location in Grand Passage, making Clean Current the first company to utilize this new tidal testing and demonstration infrastructure.

A planning group has been formed to finalize the details of the Trust and Community Energy Center, attract further partnerships, and garner financial support from the federal and provincial governments with a target of having firm commitments in place by spring of 2014.

For more information, visit [www.fundytidal.com](http://www.fundytidal.com).

#### **EMEC to support marine energy test site in Singapore**

An international collaboration agreement has been signed between the European Marine Energy Center (EMEC) based in Orkney, Scotland and the Energy Research Institute at Nanyang Technological University (ERI@N), Singapore to support further development of the marine renewable energy industry in Southeast Asia.

EMEC — the world's first and leading facility for wave and tidal energy converters — will advise the University on the setup of scale test facilities in Singapore offering a different climate and sea conditions to EMEC's own scale test sites in Orkney.

A memorandum of understanding was signed in Singapore on 1 November 2013 by Stuart Baird, EMEC's operations director, and Professor Subodh Mhaisalkar, executive director of ERI@N, after Mr. Baird spoke at the Asia Future Energy Forum, part of Singapore International Energy Week.

This is the fifth partnership EMEC have made in Asia, having signed similar agreements with the Ocean Energy Association of Japan, Ocean University of China, Incheon Metropolitan City in South Korea and National Taiwan Ocean University. EMEC has also formed strategic alliances with The Fundy Ocean Energy Center in Nova Scotia, Canada and the Northwest National Marine Renewable Energy Center in Oregon, USA.

For more information, visit [www.emec.org.uk](http://www.emec.org.uk).

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## **A NEW DIMENSION IN SEAFLOOR MAPPING**



Sonar Image of Shipwreck

L-3 Klein's System 5000 V2 Multi-Beam Side Scan Sonar creates a new dimension in seafloor mapping with interferometric bathymetry. The Klein 5000 V2 has everything you would expect in a top-of-the-line side scan sonar. Operating at peak performance and with extended range capability, no single-beam side scan sonar can match its resolution. For more on how L-3 Klein is making oceans transparent, call (603) 893-6131 or visit us at [L-3com.com/Klein](http://L-3com.com/Klein).

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## Offshore wind experiences an "extraordinary" year in the U.S.

2013 was an extraordinary, exciting, precedent-filled year for offshore wind and while there are still significant challenges ahead, the industry has momentum like it has never had it before. That is the view of Tom Keirnan, CEO of the American Wind Energy Association (AWEA). Mr. Keirnan made his comments during a keynote address at the 2013 AWEA Offshore Wind Conference held in Providence, Rhode Island, in October.

Keirnan began by noting that the success of onshore wind is building the momentum for offshore, calling 2013, "the flat out the best year ever for onshore wind."

According to Keirnan, over 13 GW of new wind energy was installed onshore, bringing the total amount of energy generated by onshore wind to over 60 GW. In 2013, onshore wind has been the number one new capacity installed generator. Two states have more than 20% of their generation from wind power, while nine other states have more than 10%.

"We are solving many of the problems onshore. Onshore wind energy has political and economic momentum that sets the right stage for success offshore," Keirnan said.

In addition to the onshore success, 2013 saw a number of major accomplishments for offshore wind. These include:

- The first grid connected offshore turbine was launched in Maine.
- Three projects (Cape Wind, Deepwater and Fishermen's Energy) are in advanced stages of development.
- The Production Tax Credit (PTC) and Investment Tax Credit (ITC) for wind energy were extended.
- The Bureau of Ocean Energy Management (BOEM) conducted the first two competitive lease auctions for offshore wind blocks in federal waters.
- The Department of Energy (DOE) continued to invest in offshore wind research, totaling over \$300 million in the past six years.

Keirnan said that the number one priority for 2014 is to get the PTC and ITC extended again so that the industry has a stable tax policy framework. He noted that 70% of congressional districts have either onshore wind farms or manufacturing facilities, thus providing an economic incentive for Congress to extend them.

Keirnan emphasized how important it is for the offshore wind industry to advocate clearly and in a coordinating way the business case for offshore wind to political leaders and all Americans, delivering a clear concise message about the proven benefits of offshore wind. The business case has four major points:

- That it is critically beneficial to have a diverse energy portfolio. For example, 52% of the energy in New England is derived from natural gas. A few years ago, the price of natural gas spiked more than 400%, causing economic hardships for many. Offshore wind would have moderated this price jump.
- That offshore wind helps suppress prices. In the competitive wholesale market, offshore wind can come in at a relatively low price over the long term
- That offshore wind provides power when it is needed most. In the late afternoon demand peaks just when offshore wind on the East Coast picks up, perfectly paralleling the needs of the grid in New England.
- That offshore wind reduces congestion costs. A lot of congestion has to do with moving power from west to east. Offshore wind generated power would move from east to west and relieve some of the congestion, thus lowering transmission costs.

## Alstom installing world's largest offshore wind turbine off the Belgian coast

Alstom has just completed this week-end the at sea installation of its new-generation offshore wind turbine, the 6-MW Haliade™ 150, off Ostend harbor at the Belwind site in Belgium. This is the largest offshore wind turbine ever installed in sea waters. Thanks to its 150-m rotor (with blades stretching 73.50 m), the turbine is more efficient since its yield is 15% better than existing offshore turbines, enabling it to supply power to the equivalent of about 5,000 households.

The 61-m jacket has been set on top of pillars which have been sunk to a depth exceeding 60 m. Then the 3 elements of the 78-m tower were gradually assembled on the jacket. In all, the nacelle towers at a height of over 100 m above sea level. The overall weight of the turbine and its structure totals 1,500 tons.

This new-generation wind turbine operates without a gearbox (using direct drive). Thanks to a permanent-magnet generator, there are less mechanical parts inside the device, making it more reliable and thus helping to reduce oper-



ating and maintenance costs. Lastly, the Haliade 150 features Alstom's PURE TORQUE® design, which protects the generator by diverting unwanted mechanical stress towards the tower, thereby optimizing performance.

For more information, visit [www.alstom.com](http://www.alstom.com).

## Canada looks at opportunities for tidal power

The Honourable Rob Moore, Minister of State (Atlantic Canada Opportunities Agency), announced federal support for a study to assess the potential economic impact of the tidal energy sector in Atlantic Canada. Marine renewable energy represents a significant emerging global market, and it is estimated that tidal energy has the potential to generate billions of dollars in future economic value to Canada.

The assessment will help industry and governments gain a clear understanding of the wider economic impact of the region's tidal energy activities on the ocean industry supply and service sector nationwide. The Offshore Energy Research Association (OERA) will lead the assessment.

The results of this study will be instrumental in conveying the economic potential of the regional and national tidal industry during the 5th International Conference on Ocean Energy (ICOE), which will be held in Halifax in November, 2014.

With the advantage of having the world's highest tides in the Bay of Fundy, Atlantic Canada is well-positioned to become a world leader in the tidal energy sector. The region's reputation and capacity in the area of tidal power generation is widely known, and Halifax is the first North American city to be chosen to host the ICOE.

The Government of Canada invested \$180,000 in this project through ACOA's Atlantic Policy Research Initiative (APRI).

For more information, visit [www.acoa-apeca.gc.ca](http://www.acoa-apeca.gc.ca).

## Makai awarded \$3.6M to continue work on OTCEC

Makai Ocean Engineering has received a \$3.6 million contract from the Hawaii Natural Energy Institute and the Office of Naval Research for research and design on the marine renewable energy known as Ocean Thermal Energy Conversion, or OTEC. Makai will perform this work at their Ocean Energy Research Center, located in Kona, Hawaii, which is the largest OTEC research facility in the world.

OTEC holds great promise because the tropical ocean is earth's largest solar collector. According to Dr. Joseph Huang, a senior scientist at the U.S. National Oceanic and Atmospheric Administration, "If we can use 1% of the energy [generated by OTEC] for electricity and other things, the potential is so big. It is more than 100 to 1,000 times more than the current consumption of worldwide energy. The potential is huge. There is not any other renewable energy that can compare with OTEC." OTEC is unique among renewables because it can provide large quantities of base load (constant) electricity. France, Korea, Japan, and China also have active OTEC



development programs.

For more information, visit [www.makai.com](http://www.makai.com).

## Damen unveils "Walk-to-Work" wind farm service vessel

Damen Shipyards has unveiled a completely new Wind Farm Service Vessel (WSV) to support and accommodate turbine maintenance crews at sea and allow them to "Walk-to-Work". After industry-wide consultation, the vessel has been designed from first principles to provide on-site work facilities and accommodation for 45 maintenance personnel plus 15 crew for voyages of up to 1 month.

The dynamically positioned (DP2) WSV will include a telescopic, motion-compensated gangway. This will allow

each three-man maintenance team to walk quickly and safely between vessel and turbine.

With a 90 m length overall and a beam of 20 m, the Damen WSV will feature 500 sq. m of deck space, a helideck and a motion and heave compensating crane. Its shallow 4.6-m draft optimizes comfort, while also conferring significant power savings.

Designed to drop all seven maintenance crews within 3 hours, the vessel will remain within range to provide support and emergency assistance through the working day before pick up.

With diesel electric main propulsion, the new Damen WSV will adhere to the company's "E3" commitment to deliver vessels that are "Environmentally-friendly, Efficient in operation and Economically viable."

Special attention has been paid to interiors and onboard service space layout. Public spaces have been mapped for efficient workflows and storage, while 60 single occupancy cabins, a fitness center and Internet/movie services will benefit life at sea.

For more information, visit [www.damen.com](http://www.damen.com).

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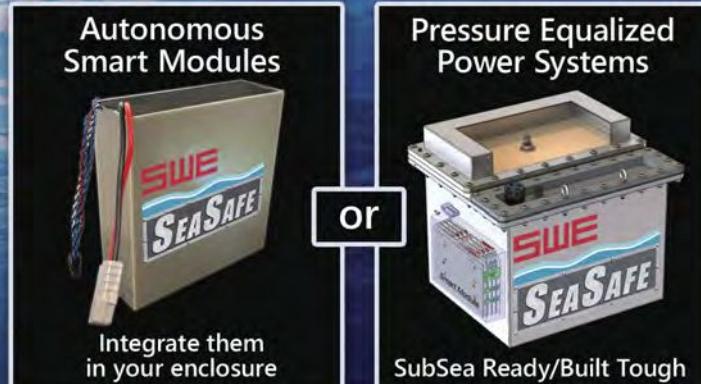
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**ThyssenKrupp Marine Systems receives major submarine order from Singapore**

ThyssenKrupp Marine Systems, a company of ThyssenKrupp Industrial Solutions, has signed a contract for the delivery of two submarines of HDW Class 218SG to Singapore. HDW Class 218SG is a customized design from ThyssenKrupp Marine Systems. The submarines, which will be fitted out with an air independent propulsion system, are going to be built at the Kiel premises of ThyssenKrupp Marine Systems. Compared to the present ThyssenKrupp Marine Systems submarines, the new design has been customized to house additional equipment for present and future operational requirements. Special attention has also been paid to the ultra-modern layout of the tailor-made Combat System of these submarines. ST Electronics, being part of the ST Engineering group, will co-develop such Combat System with Atlas Elektronik GmbH.

**U.S. Navy awards General Dynamics \$17M for support services at Groton Submarine Base**

The U.S. Navy awarded General Dynamics Electric Boat two contract modifications worth a total value of \$16.8 million to perform nuclear and non-nuclear maintenance work for submarines homeported at the Naval Submarine Base in Groton. Under the first contract, valued at \$8.8 million, Electric Boat will continue to operate the Nuclear Regional Maintenance Department (NRMD) at the submarine base. The company will provide project management, planning, training, and nuclear services to support maintenance, modernization, and repairs. A core group of about 25 Electric Boat employees are assigned to the NRMD, with surge groups of up to 100 shipyard employees assigned for short periods. Initially awarded in April 2013, the contract has a potential value of \$164 million over 5 years. For the second contract, valued at \$8 million, Electric Boat will continue operating the New England Maintenance Manpower Initiative (NEMMI) at the submarine base. Electric Boat will provide a wide range of overhaul, repair and modernization services in support of nuclear submarines, floating dry docks, support and service craft and other platforms and equipment. About 270 Electric Boat employees are engaged in the work. This contract was first awarded in December 2012 and has a potential value of \$222.3 million over 5 years.

**BAE to close Portsmouth shipyard**

BAE Systems has announced it plans to shutdown Portsmouth shipyard in the UK as part of the government's naval restructuring program. The move will affect almost 1,800 jobs, including 940 jobs in Portsmouth. A further 835 jobs, mostly in Glasgow but also in Rosyth, will be axed. The decision to cut jobs follows completion of work on the Royal Navy's new Queen Elizabeth-class aircraft carriers and is also attributed to lack of future orders for the company. A BAE Systems spokeswoman said the company and the Ministry of Defence (MoD) will continue to work closely to explore all possible options to determine how best to sustain the capability to deliver complex warships in the UK in the future. "This work is ongoing, and we are committed to keeping our employees and trade unions informed as it progresses," the spokeswoman said.

**ASV delivers C-Target 9 boats to South Korea**

Autonomous Surface Vehicles (ASV) Ltd, the global leader in unmanned marine systems, has successfully completed phase one of a two phase C-Target 9 program with South Korea. The highly-maneuvrable, ultra realistic, high-speed marine target drones will be used in the test and evaluation of a new weapon system. In early 2013, Korean company GigaRF looked to ASV to provide four 9-m target drones for the Agency of Defence Development (ADD). ASV has worked closely with GigaRF to ensure the timely delivery of the first two vehicles. Phase one was completed on 17 October with the first two boats carrying out acceptance tests at ASV's site in Portchester, UK, with GigaRF and ADD in attendance. Construction of the phase two marine target drones is already underway and will be completed in early 2014.

**Navy launches UAV from submerged submarine**

Deployed from the submerged submarine USS Providence, the NRL developed XFC unmanned aircraft is vertically launched from a 'Sea Robin' launch vehicle (bottom right). The folding wing UAS autonomously deploys its X-wing airfoil and, after achieving a marginal altitude, assumes horizontal flight configuration  
(Photo: NAVSEA-AUTEC)

The U.S. Naval Research Laboratory (NRL) with funding from SwampWorks at the Office of Naval Research (ONR) and the Department of Defense Rapid Reaction Technology Office (DoD/RRTO) demonstrated the launch of an all-electric, fuel cell-powered, unmanned aerial system (UAS) from a submerged submarine. From concept to fleet demonstration, this idea took less than 6 years to produce results at significant cost savings when compared to traditional programs often taking decades to produce results.

The successful submerged launch of a remotely deployed UAS offers a pathway to providing mission critical intelligence, surveillance, and reconnaissance (ISR) capabilities to the U.S. Navy's submarine force.

Operating under support of the Los Angeles class USS Providence (SSN 719) and the Naval Undersea Warfare Center-Newport Division (NUWC-NPT), the NRL developed XFC UAS — eXperimental Fuel Cell Unmanned Aerial System — was fired from the submarine's torpedo tube using a Sea Robin launch vehicle system. The Sea Robin launch system was designed to fit within an empty Tomahawk launch canister (TLC) used for launching Tomahawk cruise missiles already familiar to submarine sailors.

Once deployed from the TLC, the Sea Robin launch vehicle with integrated XFC rose to the ocean surface where it appeared as a spar buoy. Upon command of Providence Commanding Officer, the XFC then vertically launched from Sea Robin and flew a successful several hour mission demonstrating live video capabilities streamed back to Providence, surface support vessels and Norfolk before landing at the Naval Sea Systems Command Atlantic Undersea Test and Evaluation Center (AUTEC), Andros, Bahamas.

The NRL Chemistry and Tactical Electronic Warfare Divisions team includes the design-builder of the Sea Robin, Oceaneering International Inc., Hanover, Maryland; the fuel cell developer ProtoneX Technology Corp., Southborough, Massachusetts.; and NUWC-NPT's Autonomous and Defensive Systems Department for Temporary Alteration (TEMPALT) and test demonstration support.

For more information, visit [www.nrl.navy.mil](http://www.nrl.navy.mil).

## U.S. Navy to deploy WindSentinel floating LiDAR

The teams of Sound & Sea Technology Inc., AXYS Technologies Inc., and DNV GL Inc. have announced the award of a contract from the U.S. Navy for the validation of an offshore floating LiDAR wind resource assessment system.

Sound & Sea Technology (SST) will provide overall management of the program, coordination with the Navy, ocean engineering expertise, environmental planning and installation support.

AXYS Technologies Inc. (AXYS) will be supplying their WindSentinel™ floating LiDAR system. The WindSentinel™ uses the Vindicator® III, the world's only simultaneous pulsed LiDAR with integral motion compensation, to accurately measure offshore wind-speed and direction up to the blade-tip heights of 200 m. This project will look to take advantage of recent new developments in the sensor technology derived from AXYS' relationship with OADS, developers of the simultaneous pulse technology.

For more information, visit [www.axystechnologies.com](http://www.axystechnologies.com).

## AAC demonstrates advanced mine hunting capability

Advanced Acoustic Concepts (AAC), a joint venture between DRS Technologies and Thales, successfully demonstrated advanced mine-hunting capabilities with the U.S. Navy during the 2013 Fleet Experimentation (FLEX) Unmanned Systems (UxS) Campaign. By towing the unmanned high-resolution synthetic aperture sonar (T-SAS), the system detected all exercise mines with increased area clearance rates.

According to the Space and Naval Warfare Systems Command (SPAWAR), the FY13 FLEX UxS Campaign Plan was developed to identify potential solutions to the fleet's highest priority operational needs. Specifically, the Naval Warfare Development Center (NWDC), in coordination with the Navy Mine and Antisubmarine Warfare Command (NMAWC), solicited industry participation to demonstrate highly mature mine warfare capabilities that either improve large geographic area search or automate detection and classification of undersea mines and maritime IEDs.

For more information, visit [www.drs.com](http://www.drs.com).

## Simulation-based training and experimentation on display

A unique system that merges the virtual and real worlds to train sailors for combat scenarios was unveiled 2 December in Orlando.

The Office of Naval Research (ONR) demonstrated the Fleet Integrated Synthetic Training/Testing Facility (FIST2FAC) at the Interservice/Industry Training, Simulation, and Education Conference, commonly referred to as I/ITSEC.

Detailed in a new video produced by ONR, FIST2FAC provides an affordable, adaptive way to train. It combines a hassle-free setup, software, and gaming technology to help naval forces develop strategies for a variety of missions and operations.

FIST2FAC allows sailors to interact with artificially intelligent forces in countless settings and train for multiple missions simultaneously. The system can replicate simple and complex situations involving aircraft carriers, helicopters, lethal and nonlethal weapons, and more.

For more information, visit [www.onr.navy.mil](http://www.onr.navy.mil).

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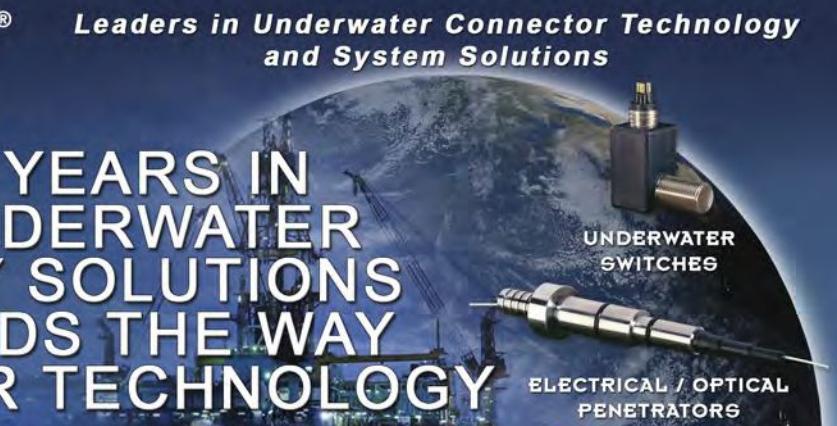


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# Intelligent Mapping Technologies Improve Coral Reef Analysis

By Barbara Shields, Esri Writer

Interacting with thousands of ocean species, coral reefs are one of the most productive systems in the sea and important for maintaining a healthy planet. Coral reefs are becoming less productive in an era when we need them most. To raise awareness of the need to preserve, protect, and restore these natural structures, a team of marine scientists has embarked on a six-year mission to study coral reef ecosystems around the world.

As members of The Khaled bin Sultan Living Oceans Foundation's Global Reef Expedition, the team conducts scientific surveys that characterize and assess the condition of coral reefs throughout the world. An essential technology for this program is geographic information systems (GIS).

## What is GIS?

GIS is a tool for turning geography data into geographic information that people can use and share. They use it to combine different types of information together on a map, see relationships and patterns for analysis, and make better management decisions. A GIS can include powerful data management functions and tools for processing data and building scientific models.

GIS desktop software is often used to run analytic models and create intricate map visualizations. Adding a GIS server allows users to interact with the data using light-weight GIS web tools through online or mobile services. Web GIS has been very successful in growing awareness of ocean concerns. For instance, NOAA uses it to reach out to policy makers and the public. In turn GIS users can go to NOAA's website and download weather and forecast data and bring it into their own GIS science projects.



A diver captures data about the health of reefs in the Galapagos Islands



A web GIS viewer shows the expedition's location and findings in Seychelles

Many organizations provide ocean GIS datasets for free or as a subscription service. It can be a daunting task to find specific information, so organizations, such as the Group on Earth Observation (GEO), have set up GIS portals that make it easier to search and access data.

Robust GIS platform technology allows people to use GIS with or without installing software on a workstation or laptop. The hosting organization bundles geographic datasets, maps, and analysis and makes them available to users via secured or open internet access. The organization keeps data current, develops task specific tools for workers, and basically puts GIS into the hands of many users.

Cloud GIS is a hosted service that includes lots of different types of basemaps; hundreds of authoritative datasets; tools to author, publish, and share maps; software developer toolkits; and a site for various project groups to collaborate on designing sustainable ocean policies.

## Understanding the Ocean with GIS

Khaled bin Sultan Living Oceans Foundation is funded by Prince Khaled bin Sultan of the Kingdom of Saudi Arabia, who sponsors marine conservation programs and scientific research. The foundation uses Esri's GIS software to map the geographic distribution and condition of coral reefs. Esri is the largest GIS company in the world.

GIS provides a means for creating ecosystem habitat maps and analysing survey information. Ocean sci-



Select an island in Seychelles (D'Arros) on the viewer map and zoom to see the island's different habitat types

tists use it to collect and manage data, inventory species, depict benthic measurements, and provide a temporal record of the condition of reefs.

A country or region invites Khaled bin Sultan Living Oceans Foundation to investigate the conditions of a coral reef. When Global Reef Expedition scientists arrive at the scene, they commence collecting reef data with drop camera videos, scuba dives, and GPS. They send the data to the National Coral Reef Institute at Nova Southeastern University in Fort Lauderdale, Florida. The university processes the data using GIS algorithms, creates habitat maps, and returns them to the foundation. Upon completion, Living Oceans Foundation shares findings and maps with countries that host the expedition, including their government agencies and respective nongovernmental organizations (NGOs). They receive the dataset along with detailed reports that describe reef locations, resilience, stress factors, and so forth.

Habitat maps show the structure of the reefs and the substrates of their locations. Amanda Williams, the foundation's previous GIS analyst for the last four years, used these habitat maps along with benthic habitat maps, bathymetry, imagery, and other relevant data layers to understand relationships through the running of queries and models.

"With Esri's tools for spatial analysis, I have combined many different datasets and run queries," Williams said. "I also integrated datasets, layers, and tools within the mapping environment."

To study reef resilience, scientists look for certain characteristics in the environment. For instance, the optimum temperature for coral reefs is 22 – 28°C. By adding a sea surface temperature data layer to the map, Williams could see if temperatures were adding stress to the reef. Agencies such as the World Resources Institute also have coral reef risk data.

The Khaled bin Sultan Living Oceans Foundation's dataset has grown tremendously in the past three years. Recently, it launched a new website with Esri's ArcGIS for Serverthat includes Reef Map Viewer, which was created by GISi. The viewer displays benthic habitats

and bathymetric data derived from high-resolution DigitalGlobe, Inc. satellite imagery around coral reefs. The viewer's easy to use Habitat Tool allows users to draw a polygon around an area of interest and generate a report about benthic habitats. Visitors can also click on a map location and see underwater photos and habitat videos from the research.

Coral reef scientists can view and share the foundation's data from anywhere as well as download vector and raster GIS data for use in their own research. The Reef Map Viewer is accessible from any mobile device.

As The Khaled bin Sultan Living Oceans Foundation scientists continue their Global Reef Expedition through 2016, the Reef Map Viewer will gradually be populated with coral reef habitat and bathymetric data from around the world. The foundation is now equipped to publicly share its data in a sophisticated, user-friendly web map viewer that will support their mission – the conservation and preservation of the world's oceans through research and education.

Once project research is completed for an area, Living Oceans Foundation contributes the dataset to Esri's GIS cloud service ArcGIS Online. This data can be layered on the ArcGIS Online Ocean Basemap. For instance, the foundation contributed Red Sea data that includes a set of bathymetric grids, derived from imagery. It is now available to ArcGIS Online users.

Follow the exploits of the Global Reef Expedition at [www.livingoceansfoundation.org](http://www.livingoceansfoundation.org). Learn about GISI at [www.gisinc.com](http://www.gisinc.com).

Read more about GIS at [www.esri.com](http://www.esri.com).

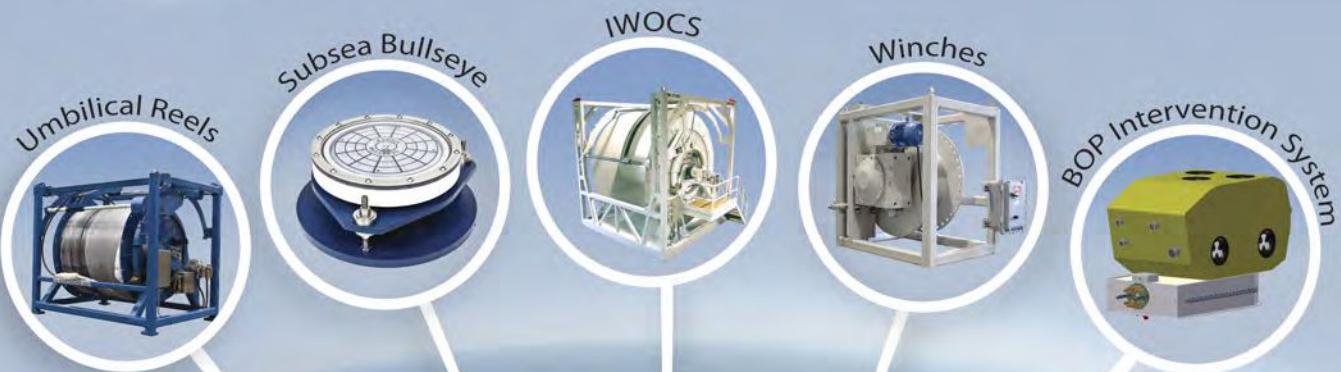


This map tracks the progress of Global Reef Expedition's vessel Golden Shadow during its exploration in the Bahamas. The map is a geographic interface with the crew's blogs, photos, and videos



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# OFFSHORE INDUSTRY

## Sir Ian Wood calls for changes to extend offshore UK production

Former Wood Group Chairman Sir Ian Wood has issued interim recommendations on new ways to maximize recovery of the UK's offshore oil and gas reserves — at least 3 to 4 billion boe more over the next two decades than might otherwise be recovered, providing more than \$317.6 billion additional value to the UK economy.

The "UKCS Maximizing Recovery Review," the first of its kind in more than 20 years, was commissioned by the government in June 2013 to look at how to ensure longevity of the oil and gas industry and the UK's resources.



*Sir Ian Wood*

yet exploration and production rates are falling, with activity focused on smaller fields.

"The UKCS has changed radically over the last 20 years," he said. "While some regions are mature, there are still frontier areas and significant emerging potential where technology is opening important new plays."

His recommendations include a new shared strategy for "maximizing economic recovery (of oil and gas) for the UK," with commitment from the government (HM Treasury and a new regulator) and the oil and gas industry, and creation of a new arm's length regulatory body to oversee and develop a program focused on change and growth.

## Indonesia's oil and gas sector becoming uncertain: report

Business Monitor believes the outlook for Indonesia's oil and gas sector is becoming increasingly uncertain, due in part to the slow pace of exploration and development, exacerbated by an uncertain regulatory environment as resource nationalism creeps into the government's policy towards the sector.

The firm is forecasting a long-term decline in total liquids production and a stagnation of gas production. Moreover,

opportunities for exports will be further compromised by the domestic market's increasing energy demand. Hence, falling oil and gas exports is another key trend identified for Indonesian oil and gas, Business Monitor said in its newly published Indonesia Oil & Gas Report.

Indonesian oil reserves are expected to decrease from an estimate of 4 billion bbl at the beginning of 2013 to 3.7 billion bbl in 2017, falling further still to 3.4 billion bbl by 2022. For gas, the firm expects reserve levels to be stagnant as addition from exploration successes in East Kalimantan cancels out natural depletion from existing fields. Reserves are forecast to fall from 3.07 tcm in 2013 to 2.80 tcm in 2017, and fall further to 2.51 tcm unless the pace of drilling activity picks up.

Business Monitor does expect total liquids production (excluding refinery processing gains) to rise from an estimate of 919,670 bbl/d in 2013 to 926,180 bbl/d in 2014 and 932,260 bbl/d in 2015, owing to major fields finally coming on-stream or ramping up to their full production capacity. However, in the longer term, the firm sees oil output trending downward to 884,840 bbl/d in 2017 and hitting a low of 808,280 bbl/d by 2022.

## Russia, U.S. shale reshape ranking of world's 50 largest oil companies

Energy Intelligence Weekly's ranking of the world's 50 largest oil companies in 2013 saw Russia's Gazprom moving ahead of international majors Chevron and Total to eighth place, while Rosneft climbed three places and is poised to enter the top 10 following its acquisition of TNK-BP last year. Saudi Aramco remained in the top spot, followed by Iran's NIOC and U.S.-based ExxonMobil.

Last year's rankings also demonstrated the impact of the U.S. shale revolution for the first time, with a number of large U.S. independents doing especially well due to their shale exposure. Chesapeake broke into the PIW Top 50 for the first time and Apache, Devon, Occidental, and Anadarko all made solid gains, albeit from the bottom third of the list. By contrast to the dynamic performance of some key national oil companies and U.S. independents, the international majors are not keeping up. While Chevron and Total declined in the rankings, ExxonMobil, BP and Royal Dutch Shell stood still.

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### Energy industry goes on alert after enduring brunt of cyberattacks

The energy industry was the target of 53% of all cyber attacks reported to the Department of Homeland Security between October 2012 and May 2013, according to reports. Manufacturing was the next highest American industry targeted, suffering 17% of the attacks.

Illustrating the problem, two-thirds of Alert Logic's more than 50 energy industry clients experienced "brute force" attacks, where hackers seek out points of vulnerability. The attackers often are looking to steal the company's trade secrets or to damage or destroy data used in energy exploration, the Houston-based network security company said in a report.

Sixty-one percent of the firms had malware attacks, Alert Logic reported, which involve seeking access to systems that control pipelines and other



operations. The stakes are higher in the energy industry than with other businesses, said Stephen Coty, director of security research for Alert Logic.

"It experiences a greater magnitude of security threats that could have global repercussions for years to come," Coty said.

Among the most successful campaign so far against Western oil companies was dubbed "Night Dragon" by the cyber security firm McAfee, the Council on Foreign Relations said. Chinese hackers for years stole confidential data from five unnamed major companies, according to McAfee, obtaining sensitive information on operations and project financing in an operation that extended into 2011.

In a survey of 100 energy executives conducted by Ernst & Young last year, cyber attacks and other IT security issues ranked, for the first time, among the top ten concerns facing the oil and gas industry in 2013.

# OFFSHORE INDUSTRY HEADLINES

Research & Development • Environmental Assessment • Discovery

## Eastern hemisphere cast as new jewel of the global energy scene

The Eastern hemisphere is expected to be a hotbed for oil and gas, as everything from exploration, development, and production to new transportation and consumption patterns unfold in this region between now and 2030.

Moreover, the energy demand growth in Asia, led by China, will shift toward India within this decade and, to a lesser extent, Southeast Asia after 2025, according to the World Energy Outlook 2013 by the International Energy Agency (IEA). The Middle East emerges as a major energy consumer, with its gas demand growing by more than the entire gas demand of the OECD. The Middle East is the second-largest gas consumer by 2020 and third-largest oil consumer by 2030, redefining its role in energy markets.

"The Middle East will have a greater concentration of the world's leading oil and gas players across the value chain, as the major energy producers and consumers are situated here," said Waleed Refaay, International Petroleum Technology Conference (IPTC) project director for the Middle East.

"Many players in Asia Pacific and the Middle East are increasing upstream capital expenditure ahead of other regions. This area will also be the epicenter, especially for LNG trade, as heavy investments from Qatar and Malaysia for liquefaction and regasification plants, for example, will materialize in the near future. Some of the world's first floating LNG (FLNG) units are also being built on these shores."

Refaay added: "We foresee networks of a 'silk road' to transport oil and gas between the Middle East and Asia strengthening in the next decade as the volume of energy trade increases just within this side of the globe."

Industry players looking to monetize opportunities here must possess geological and geographical intelligence of what is often seen as the 'mysterious East,' he said. "New partnerships, innovation and shared capabilities are important to support this growth."

## API unveils state-by-state study of economic gains from LNG exports

A new state-by-state study details significant U.S. job gains, manufacturing growth, and robust economic activity associated with future exports of liquefied natural gas (LNG), according to Kyle Isakower, group vice president for policy and economic analysis for the American Petroleum Institute (API). The study, by ICF International, was released in mid-November.

"The export of liquefied natural gas — or LNG — represents one of the most promising economic opportunities of the shale revolution," Isakower said, adding that these exports will significantly reduce the U.S. trade deficit, increase government revenues, grow the economy, and support millions of U.S. jobs in engineering, manufacturing, construction, and facility operations.

According to ICF, LNG exports could contribute as much as \$10 to \$31 billion per state to the economies of natural gas-producing states, such as Texas, Louisiana, and Pennsylvania, by 2035. However, non-natural-gas-producing states will also benefit, partly due to the boost in demand for steel, cement, equipment, and other goods. According to the report, states with a large manufacturing

to get oil from shale deposits in locations like North Dakota and Texas. EIA says imports now make up 40% of U.S. oil consumption, significantly less than the 60% peak reached in 2005. The organization forecasts imports will make up only 28% of U.S. oil consumption in 2014, which would be the lowest level since 1985.

## Platform spending anticipated to jump 31% to \$672B through 2018

Last year, demand for offshore maintenance, modifications and operations services totaled \$112 billion for the world's nearly 9,000 offshore platforms, research firm Douglas-Westwood said in a new report, adding that over the period 2014 to 2018, spending of \$672 billion is forecast, a 31% growth over the previous 5-year period.

"This growth is driven by a combination of high oil prices, buoyant offshore development activity, aging infrastructure (requiring modification), and price inflation for equipment and services," the firm said.

Asia is forecast to overtake North America's spending during the forecast period to account for 30%, compared to North America's 27%. Asia's large installed and operational base of infrastructure, combined with increasing offshore developments, will drive demand in the region, Douglas-Westwood reported.

Asset services, asset integrity and support service markets are to be dominated by North America, while Asia has the largest modification spend over the forecast period, the firm said, noting that by sector, asset services accounts for the largest share of spend (46%), followed closely by modifications (41%).

## Atlantic OCS drilling would create 280,000 jobs and spur investment

A study conducted by Quest Offshore Inc. shows that offshore oil and natural gas development in the Atlantic Outer Continental Shelf (OCS) could create nearly 280,000 jobs, spur an additional \$195 billion in new private investment, contribute up to \$24 billion per year to the U.S. economy, generate \$51 billion in new revenue for the government, and add 1.3 mmboe/d to domestic energy production, between 2017 and 2035. These jobs would be in addition to any jobs and revenue generated by offshore wind or wave energy projects that might take place. Released by the National Ocean Industries Association and the American Petroleum Institute, the study points out that if lease sales in the Atlantic OCS were held in 2018, exploratory drilling could begin the following year.



Liquefied natural gas tanker departs port

base, such as Ohio, California, New York, and Illinois, will see economic gains as high as \$2.6 to \$5 billion per state in 2035.

In terms of employment, natural gas-producing states could see employment gains as high as 60,000 to 155,000 jobs in 2035, the report said, and large manufacturing states, such as California and Ohio, will see employment gains upwards of 30,000 to 38,000 jobs in 2035. Over half of all states could see over \$1 billion in state income gains from LNG exports by 2035 and at least 6,000 net jobs.

## U.S. oil output beats imports for first time in 18 years: EIA study

U.S. domestic crude oil production has exceeded oil imports for the first time since 1995, according to the Energy Information Administration (EIA). The EIA said petroleum imports were at their lowest since 1991, partially due to surging domestic oil production from hydraulic fracturing, or fracking.

In October, U.S. crude oil output averaged at 7.7 mmbbl/d. The EIA says it expects output to exceed 8.8 mmbbl/d by 2014.

The domestic oil boom has been due mostly to fracking, a new technique used



### BP releases environmental data related to 2010 U.S. Gulf oil spill

BP has released a vast amount of environmental data it uses in its efforts to clean up the Gulf of Mexico, where the company's Macondo well spilled millions of barrels of oil in 2010.

The company is planning to publish data on everything from aquatic life and birds to Gulf shorelines and environmental toxicology, but BP's first data dump includes 2.3 million lines of water chemistry data and measures the amount of crude-related chemicals that were in the ocean. BP also published data on the composition and degradation of the oil released from its well.

The data were collected to help guide clean-up efforts under the direction of the U.S. Coast Guard and to support efforts by state and federal agencies and BP to evaluate potential injury to natural resources in the Gulf of Mexico as part of the Natural Resource Damage Assessment (NRDA) process.

The data are being published on a new website — <http://gulfsciencedata.bp.com>. It is in addition to another website the company launched earlier to "set the record straight" on the Gulf. The second site is an attempt to allow interested outsiders to use the environmental data in scientific studies or to come to their own conclusions about the Gulf, BP said.

The company has collected the data alongside government agencies since the 86-day spill began in April 2010, and releasing it now "will enhance Gulf-related scientific research and improve the public's understanding of the condition of the Gulf of Mexico," said Laura Folsom, BP's executive vice president for response and environmental restoration, in a written statement.

Data to be published in the future include samples that are now in various stages of analysis, validation, and quality control review. Users will have to register an email account with the company to get into BP's spreadsheets and maps.

So far, the company has spent about \$14 billion on its response to the spill and clean-up. BP is still in legal fights over America's worst oil spill.

## MSRC inks remote sensing contract with Ocean Imaging

The Marine Spill Response Corporation (MSRC) has signed an exclusive contract with Ocean Imaging Corp. for cutting edge remote sensing capability. Ocean Imaging will provide its proprietary aerial surveillance technology as part of MSRC's overall strategy for enhancing the ability to tactically position response resources in the optimal areas of oil migration for responding to spills.

"It takes a complete systems approach to effectively respond to oil spills," said Steve Benz, MSRC's president and chief executive officer. "While much of the regulatory compliance focus to date has been on skimmer throughput capacity, the reality is that the skimmer is just one component — and not necessarily the most important component in combating oil spills. It is imperative to determine the location of oil that is most recoverable — whether day or night — and stay in that oil as time moves on. Getting it wrong can mean that response resources have largely been wasted."

Benz added: "Our new arrangement with Ocean Imaging, available exclusively through MSRC, will significantly enhance our overall effectiveness during a response."

MSRC has developed a multi-tiered approach to remote sensing in order to complement and expand on traditional human aerial spotting. This approach is based on the concept that "height of eye" and "vertical viewing angle" are key to any surveillance.

The technology provided by Ocean Imaging enables MSRC to significantly enhance its day and night aerial remote sensing through infrared-multi-spectral technology.

"We are pleased to partner with MSRC as the leading U.S. Oil Spill Removal Organization (OSRO)," Dr. Jan Svejkovsky, president of Ocean Imaging, said. "Ocean Imaging has a decades-long history in unique, innovative remote sensing technology development and its transfer to operational use, including ocean condition maps for fishing fleets to monitoring changes in coastal ecosystems to tracking spilled oil at sea."

"Our technology was used nearly every day for over 3 months on the Deepwater Horizon spill," Svejkovsky added, "and we have capitalized on that experience with further enhancements going forward."

Ocean Imaging systems were designed to be portable in nature. As such, they will be mounted in MSRC-contracted planes on all three coasts for rapid deployment. The oil characterization capability of these systems will be used for real-time tactical use in spills, providing a second set of eyes for determining actionable oil versus sheens, filtering out false targets that are always a challenge to the human eye, and providing information at night to expand the operating window.

Proprietary Ocean Imaging technology also makes available wide-area oil mapping that can be a critical feed to the Common Operating Picture (COP) at the strategic response level. "Having a lifetime of experience working on transferring science research results to operational use, this collaboration with MSRC is by far one of the most needed and immediate," Svejkovsky said.



### BSEE cites 12 operators for SEMS violations, stops operations on five

The U.S. Bureau of Safety and Environmental Enforcement (BSEE) has cited 12 offshore operators for failing to demonstrate compliance with the Safety and Environmental Management Systems (SEMS) requirements of the Workplace Safety Rule, 30 CFR Subpart S. Of the 12 operators, BSEE director Brian Salerno directed five to halt operations for failure to provide a safety audit plan and completed

audit by the deadline. The other seven companies have submitted audit plans that comply with the regulations but did not complete the audits by the 15 November deadline. BSEE said it may take other enforcement measures, including civil penalties for each day of non-compliance. Each of those seven companies was required to immediately supply BSEE with a copy of its SEMS program, have the chief executive certify under penalty of perjury that the company has implemented the plan, and complete the audit without delay.

**McDermott awarded \$200M EPCI contract in Arabian Gulf**  
 McDermott International, Inc. said one of its subsidiaries was awarded an engineering, procurement, construction, and installation (EPCI) project for a customer in the Arabian Gulf. The value is about \$200 million and will be included in McDermott's fourth quarter 2013 backlog. The contract includes the fabrication, transportation and installation of offshore facilities, including two production deck modules and 10 observation platforms. The scope also includes works for two subsea pipeline installations, three submarine power cables, and two fiber optic cables. Installation will be carried out using vessels from its global fleet, which are expected to mobilize in the end of the second quarter of 2014. Project completion, including hookup and commissioning, is expected during the first quarter of 2015. Engineering will be undertaken by the Dubai and Al Khobar offices, with construction and transportation from its Jebel Ali fabrication facility.

#### Petronas awards \$3.12B contract to six companies

Malaysia's state oil firm Petronas awarded a \$3.12 billion, 5-year offshore hook-up, commissioning and maintenance services contract to six local service providers — Kencana, Dayang Enterprise, Petra Resources, PBJV, Carimin Engineering Services, and Sigur Ros. The contract began in 2013. According to the company, the contract also includes all the necessary services such as manpower services, marine spread services, and tools and equipment that are needed for the execution of the respective work scopes. The six contractors will be providing HUC and TMM services to nine Petronas' production sharing contractors (PSC). The PSCs include Petronas Carigali, Sarawak Shell Berhad & Sabah Shell Petroleum, ExxonMobil Exploration and Production Malaysia, Murphy Sarawak Oil, Hess Oil and Gas, Talisman (Malaysia), Newfield Peninsula Malaysia, and JX Nippon Oil and Gas Exploration (Malaysia).

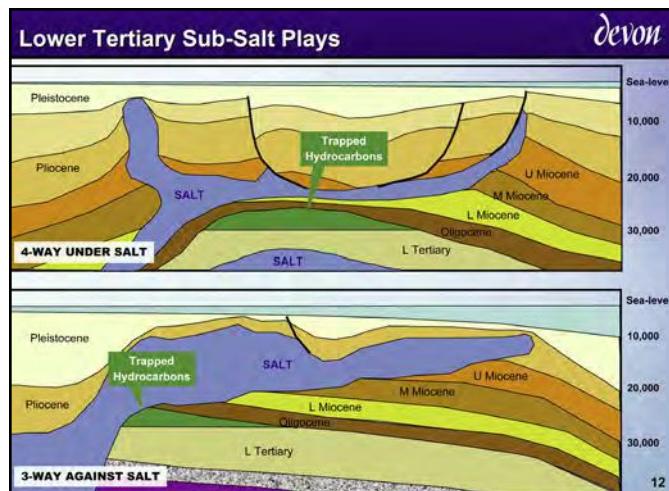
#### Rolls-Royce wins Campos basin power support contract

Brazil's Petrobras awarded Rolls-Royce a 5-year, \$138 million power services contract for oil production activities offshore Brazil. Rolls-Royce will provide maintenance and repair services to support 15 Rolls-Royce RB211-G62 industrial gas turbine power generation units installed on four oil production platforms serving the pre-salt Campos basin. These platforms, which can collectively deliver more than 500,000 bbl/d of oil, rely on about 375 MW of power to sustain their output. Rolls-Royce Energy's workshop at Macae in Brazil will support the program. This year the company will inaugurate a new, \$100 million-plus, purpose-built gas turbine package, assembly, and test facility in Santa Cruz in Rio de Janeiro state.

#### Wood Group Mustang to provide FEED for Stampede TLP

U.S.-based engineering services provider Wood Group Mustang has secured a contract to offer front-end engineering design (FEED) services on Hess' Stampede tension leg platform. The new Stampede TLP, which is expected to have dry topsides weight of 11,500 tons, will be located in 3,500 ft of water in the Gulf of Mexico's Green Canyon. Currently undergoing the designing process, the Stampede TLP is expected to be capable of producing 80,000 bbl/d of oil, 60,000 bbl/d of water, and 120 mmscf/d of gas when operational. Currently, Wood Group Mustang is offering engineering services for the topsides of 10 Gulf of Mexico facilities that have a combined production capacity of about 1 mmbbl of oil a day. The company has designed more than half of the 42 floating facilities in deepwater Gulf of Mexico.

## Lower Tertiary capex to exceed \$50B by 2020



The Lower Tertiary play will drive long-term production growth in the deepwater U.S. Gulf of Mexico with an expected \$50 billion in development capital expenditure to be spent through 2020, according to an analysis by Wood Mackenzie.

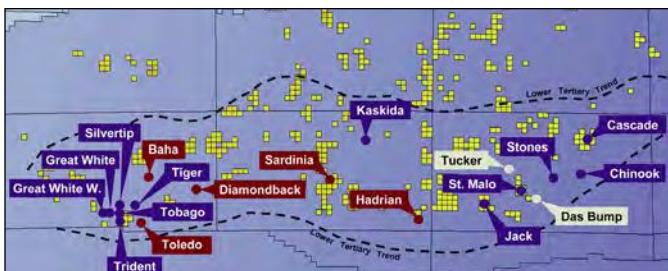
"The commercial success of the Lower Tertiary has been robust, leading all other plays in our probable (commercial, pre-FID) development category with 54% of recoverable reserves," said Jackson Sandeen, analyst at Wood Mackenzie.

"Our base case model for a generic 300 mmboe Lower Tertiary field indicates a total valuation of \$575 million, but this does not come without uncertainty," Sandeen added, noting that reservoir characteristics can greatly impact project value depending on initial production rates and the pace of well decline. If the recovery factor in the company's base case is increased by 2%, an additional \$462 million could be realized.

Wood Mackenzie estimates Lower Tertiary production in 2013 to be 113,000 boe/d, roughly 8% of regional production. By 2028, the play's production will outgrow the current leading Subsalt Miocene Play to roughly 41% of regional production or 533,000 boe/d.

Sandeen said technical challenges of the Lower Tertiary must be overcome for the play to remain attractive, but warned that costly solutions have the potential to erode project value if operators fail to increase recovery factors.

The Lower Tertiary Play was first deemed commercial in 2002 following Shell's success at the Great White (AC 857) discovery. Since then, a total of 15 commercial discoveries have been made, amounting to recoverable reserves of over 4 billion boe. BP, Shell, and Chevron account for the majority of activity holding 45% of remaining reserves in the play.



Many of the Lower Tertiary wells drilled in the U.S. Gulf

## BP adds two drilling rigs in deep waters of the U.S. Gulf of Mexico

BP has added two drilling rigs to the deepwater Gulf of Mexico, bringing its fleet there to a company record of nine rigs, according to the company.

One of the rigs is a new ultra-deepwater drillship known as the West Auriga, which is under long-term contract to BP from Seadrill Ltd. The vessel, capable of operating in up to 12,000 ft of water, has begun development drilling work at BP's Thunder Horse field.

The other is a reconstructed drilling rig on BP's Mad Dog oil and gas production platform. It replaces the original rig on the platform that was badly damaged and left inoperable by Hurricane Ike in 2008. With this new rig, the platform has resumed development drilling at the Mad Dog field complex.

BP is also advancing a strong pipeline of future development projects in the deepwater Gulf. In April, the company started up the Atlantis North expansion, the first of seven additional wells to be tied back to the existing Atlantis platform. At Na Kika, another field expansion is planned, following the successful startup last year of the Galapagos development, a subsea



*West Auriga rig working in U.S. Gulf*

tieback to the Na Kika production facility. BP is also pursuing plans for a second phase of the Mad Dog field.

## Eastern Gulf of Mexico lease sale to open 465,000 acres for drilling

The federal government plans to open areas off the coasts of eastern Alabama and western Florida for new oil and gas drilling in March 2014, the first lease sale in that area in 5 years.

The Bureau of Ocean Energy Management (BOEM) said it will put more than 465,000 acres in the eastern Gulf of Mexico up for lease at the Mercedes-Benz Superdome in New

Orleans on 19 March. The leasing area covers waters more than 3 mi off the coast of eastern Alabama up to an eastern borderline that falls around Pensacola, Florida.

The sale will immediately follow the planned central Gulf lease sale announced in October, which will open 39 million acres offshore Louisiana, Mississippi, and Alabama for oil and gas exploration and development.

The last time oil and gas companies had the chance to bid in the eastern Gulf was in March 2008. Many of the 134 leasing blocks to be included in next year's sale were offered but passed up by companies in the 2008 sale. However, it's believed companies might show more interest this time around given higher oil prices, new oil and gas mapping technology, and the announcement of major discoveries farther west.

BOEM estimates the 465,200 acres that will go up for lease hold about 71 mmbbl of oil and 162 bcf of natural gas. The majority of that will be subject to a revenue-sharing agreement under the Gulf of Mexico Energy Security Act of 2006. Gulf states will share in 37.5% of the lease payments to the federal government.

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*Ulstein SX165 design OCV vessel*

## **Ulstein to build two SX165 design OCV vessels for Island Ventures**

Ulstein Verft will build two OCV vessels for U.S.-based Edison Chouest Offshore and Island Offshore in Norway, which have ordered for their purchase through Island Ventures II. Ulstein will build one vessel at Ulstein Verft, Norway and another in the United States.

The new offshore construction vessel of the Ulstein SX165 design is said to be the largest vessel built at the yard so far and is expected for delivery during the third quarter of 2015.

Ulstein Group chief executive officer Gunvor Ulstein said the company will develop the next generation of offshore vessels together with Edison Chouest Offshore and Island Offshore.

"We have worked very well together on other innovative projects and look forward to delivering a high-quality product that will serve the ship owners well for years to come," Ulstein said.

Island Ventures II has also ordered design and engineering packages for construction of an Ulstein SX165 design vessel at Edison's own yard in the United States. The agreement also includes options, and the new vessel will be the first Ulstein-designed vessel to be constructed in the United States.

The existing fleet of Island Offshore includes four vessels from Ulstein.

At Ulstein Verft a construction vessel for Island Ventures II is currently under construction and is set for delivery in June 2014. The vessel, with an SX165 design, is 28 m wide and 145.7 m long with a capacity to accommodate 200 people and is equipped with two cranes, which can lift 400 tons and 140 tons, respectively.

The vessel has a large moon pool measuring 11.2 m by 12 m and also consists of two smaller moon pools, with ROVs installed in a hangar. With three separate engine rooms, the vessel provides operational reliability, has four lifeboats — two on each side — and is equipped with an SCR catalyst system for NOx emission reduction.

## **Allseas to invest in second heavy lift, decommissioning vessel**

Allseas has committed to build a second single-lift platform installation and decommissioning vessel. This will be 525 ft wide, larger than Allseas' new flagship vessel Pieter Schelte, which has a width of 406 ft. It will also be equipped to remove all platform topsides in the North Sea, which is beyond the capability of Pieter Schelte.

Additionally, the new vessel will be available for installation of very large topsides worldwide. Planned topsides lift capacity is 79,366 tons, more than 50% greater than the capacity of Pieter Schelte. The new vessel is expected to be operational in 2020.

## **Demand for greater lift capabilities calls for subsea MacGregor crane**

MacGregor, part of Cargotec, has won a contract to deliver a 250-ton SWL active heave-compensated (AHC) subsea crane for the 120-m construction vessel, Island Intervention. The crane was ordered by Marine Procurement Ltd., part of the U.S. company Edison Chouest Offshore.

An existing vessel operated by the U.S.-Norwegian partnership between Edison Chouest Offshore and Island Offshore requires greater lifting capability. A MacGregor 250-ton SWL AHC subsea crane is said to fulfill the upgrade requirements. Island Intervention is currently operating in the North Sea for the partnership. The vessel works in the offshore construction market and was delivered by Norwegian yard Ulstein Verft in 2011. Its current lifting capacity is 140 tons.

"The vessel simply needs a bigger crane for the jobs that it undertakes," said Frode Grøvan, director of sales and marketing for Advanced Load Handling. "The order confirms the trend that we see of subsea modules getting larger and heavier, therefore requiring operators to equip their vessels with ever more capable cranes."



*The 120-m construction vessel, Island Intervention, will be equipped with 250-ton MacGregor active-heave compensated subsea crane*

"At MacGregor, we have the expertise necessary to ensure that retrofit projects like this run smoothly and successfully, with downtime kept to a minimum," Grøvan said.

MacGregor sales totaled EUR 3.3 billion in 2012, and the company employs approximately 10,000 persons.

## **Prospector Offshore Drilling takes delivery of jack-up in Scotland**

Jack-up drilling contractor Prospector Offshore Drilling has taken delivery of its first jack-up drilling rig, Prospector 1, in the Cromarty Firth, Scotland. The rig, which represents an investment of more than \$200 million, is the first of six rigs ordered by the company.

The new jack-up rig was built by Dalian Shipbuilding Industry Offshore at construction shipyard in Dalian, China and features fully automated drilling sys-



*Prospector 1 arrives at Cromarty Firth*

tems. According to the company, the rig's platform at 231 ft by 250 ft is the size of four Olympic swimming pools and has a height of almost 775 ft when fully jacked-up. Prior to being jacked-up in the Cromarty Firth the rig, which was transported on Dockwise's heavy lift vessel, the Talisman was to be floated off the vessel, according to the company.

With a capability to operate in nominal water depths of up to 400 ft, the rig is equipped to drill wells to a depth of 35,000 ft in high-pressure and high-temperature environments and offers improved safety and working conditions for offshore crews.

Prospector Offshore Drilling European operations director Darren Sutherland said the company aims to deliver safe and modern drilling capacity for the upstream industry globally.

"The rig represents the next generation of technology for the oil industry. The cyber drilling technology creates significant efficiency and safety benefits for operators," Sutherland said.

The rig was to be in the deepwater port while its crew continued an intensive training program, and later on it will travel to the Central North Sea to commence operations for Total E&P UK.

## UK awards 52 further offshore licenses under 27th round

The UK government has awarded 52 more offshore licenses to oil and gas exploration firms, bringing overall licence awards to a record 219 in its 27th offshore round, surpassing the record of 190 licenses in the 26th round. Being awarded as part of the government's efforts to revive oil and gas exploration, latest license winners also include 21 smaller independents that are new to the market and focus primarily on exploration.

UK Energy Minister Michael Fallon said the level of interest in this round demonstrated the continuing attractiveness of the UK's oil, resources, and licensing system.

"BRINDEX members form part of the vanguard of oil and gas explorers who are finding new ways to get at and extract these vital resources," Fallon said.

"The UK's oil and gas industry is of strategic national importance. Some 20 billion more barrels of oil and gas could be produced, and it is vital that we maximize the opportunities available both in the North Sea and onshore to boost growth, energy security and jobs."

With fossil reserves in the North Sea declining, Britain is looking to bolster exploration by mainly looking at linking new oil and gas fields to already available infrastructure.

The UK government also rolled out fiscal incentives for offshore exploration by boosting the size and scope of the small field allowance, while it also proposed a tax rule for shale gas and a shale gas "pad" grant to support onshore unconventional oil and gas exploration.

In addition, the PILOT Exploration Taskforce has been working to motivate smaller firms to take a look at exploring undeveloped areas of the North Sea.

Sir Ian Wood carried out a review of the UK offshore oil and gas recovery and its regulation in June 2013 and temporarily proposed boosting third-party access to infrastructure, promoting collaboration across the industry to improve transparency and access to data, and determine commercial disputes rapidly. The final proposals of the review carried out by Wood are due to be published in 2014.

## Lebanon extends deadline for first offshore bid round until January

The Lebanese Minister of Energy and Water has extended the deadline for bids for Lebanon's first offshore licensing round to 10 January 2014. The month-long extension is due to the Lebanese Cabinet's delay in issuing decrees related to delineation of the offshore blocks and the model exploration and production agree-

ment. Pre-qualification for the first license round closed on 28 March 2013. In total 52 companies submitted applications.

## Cobalt confirms successful test at Lontra #1 pre-salt discovery

Cobalt International Energy, Inc. confirmed that it successfully tested its previously announced Lontra #1 pre-salt discovery well in Block 20 offshore Angola. During the recently completed drill stem test, the Lontra well produced at a stabilized flow rate of 2,500 bbl/d of condensate and 39 mmcf/d of gas. The flow rates were significantly restricted by the surface test facilities on the SSV Catarina drilling rig.

"While further appraisal drilling will be required to determine the ultimate size of the Lontra field, it is clear that Lontra is a discovery on a global scale," said Joseph H. Bryant, Cobalt's chairman and chief executive officer. "The exceptional reservoir system that we have discovered ranks among the best that we have seen."



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Maintenance completed on Jubilee FPSO Kwame Nkrumah

## Production ramps up at Jubilee field offshore Ghana

Tullow Oil said the first planned maintenance shutdown on the Jubilee FPSO Kwame Nkrumah offshore Ghana was completed ahead of schedule. Current focus is on optimizing the vessel's gas handling. A third gas injection well has come online, and gas export infrastructure is expected to be operational during the second half of 2014. Phase 1A development drilling has boosted well capacity to more than 150,000 bbl/d of oil. Tullow expected Jubilee to produce more than 120,000 bbl/d by year-end, subject to completion of the gas optimization work. The recently drilled Akasa-2A appraisal well successfully tested the downdip extent of the Akasa accumulation, and the partners continue to study development options for Mahogany, Teak, and Akasa in the West Cape Three Points license.

## First oil flows to Papa Terra FPSO offshore Brazil

Petrobras and partner Chevron have started oil production through the Papa Terra field FPSO P-63 in the Campos basin offshore Brazil. The location is in block BC-20, 70 mi southeast of Rio de Janeiro in water depths ranging from 1,312 to 4,593 ft.

Papa Terra, discovered in 2003, is a heavy-oil field with reservoirs containing 14-17 degree API crude. Petrobras says this has been one of its most challenging projects to date, demanding various novel solutions.

The FPSO was a former oil tanker, converted at the COSCO Shipyard in China with the last stages of construction performed at Canteiro da QUIP-Honório Bicalho in Rio Grande, Brazil, by Quip (Queiroz Galvão, UTC, Iesa and Camargo Correa) and BW Offshore.

Its hull is 1,115 ft long, 190 ft wide, and 92 ft high and supports topsides (deck-module) that weighs 18,500 tons. It has the capacity to produce up to 140,000 bbl/d of oil, to compress 35 mmcf per day of gas, and inject 340,000 bbl/d of water. The vessel will be connected to five producer and 11 injector wells using flexible subsea pipes with electric heating (integrated production bundles).

Brazil's first tension leg wellhead platform, P-61, will also operate in the area, connected to 13 producers, all dry completions, with control valves on the platform. It was to be towed to its final location and is expected to start operations in 2014.

All 18 Papa Terra producer wells will be equipped with submersible centrifugal pumps. Output from P-61 will be transferred via multi-phase flow to the FPSO. P-61 will be supported by a tender-assisted drilling rig to be towed from China over the next few days. Produced oil will be offloaded using shuttle tankers. Excess gas will be reinjected into a nearby reservoir.

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## Conoco reports first production from Jasmine field in North Sea

ConocoPhillips announced first gas production from the Jasmine field in the United Kingdom, Central North Sea.

"The startup of Jasmine represents another important milestone for ConocoPhillips and builds upon the recent successful startup of Ekofisk South in Norway and the Christina Lake Phase E oil sands project in Canada," said Matt Fox, executive vice president, exploration and production.

"Jasmine is one of several major growth projects that will contribute to ConocoPhillips' 3% to 5% production growth rate through 2017."

Jasmine was discovered in 2006 by ConocoPhillips as operator (36.5%), together with its co-venturers Eni (33%) and BG Group (30.5%), and is one of the UK's largest discoveries in the last 10 years. The Jasmine facility has the gross capacity to produce 140,000 boe/d. In 2014, ConocoPhillips expects net production to be about 40,000 boe/d.

The triple-jacket Jasmine development comprises a 24-slot wellhead platform with a bridge-linked accommodation and utilities platform, a 6-mi 16-in. multi-phase pipeline bundle, and a riser and processing platform bridge-linked to the existing Judy platform. The field is a high-pressure, high-temperature gas-condensate reservoir, which is located in Blocks 30/6 and 30/07a of the Central North Sea, about 6 mi west of the Judy platform.

## Chevron says North Sea Rosebank oil discovery won't pay to develop

Chevron Corp. said its Rosebank oil discovery off the coast of Scotland would be unprofitable to bring into production at this time. The company plans to continue evaluating the 240-mmbbl field along with partners OMV AG and Dong Energy A/S for ways to improve the project's potential returns, the San Ramon, California-based company told Bloomberg in an e-mailed statement. A final decision on whether to proceed will be made next year, according to the statement.

Rosebank's unprofitability is a blow to UK and Norwegian efforts to halt the slide in North Sea oil output as fields first drilled in the 1970s and 1980s near the end of their productive lifespans. Dropping North Sea supplies are expected to drive a 15% decline in European crude and gas liquids production by 2018,

the Organization of Petroleum Exporting Countries said in its annual world outlook, according to Bloomberg. Rosebank "does not currently offer an economic value proposition that justifies proceeding with an investment of this magnitude," Chevron said in the statement.

Chevron hasn't disclosed any cost estimates for the total development. Rosebank is located 80 mi northwest of the Shetland Islands and 3,700 ft beneath the sea surface. Chevron discovered Rosebank in 2004.



Matt Fox



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## EnQuest gets approval for \$6.5B Kraken development

The UK Department of Energy & Climate Change (DECC) has approved EnQuest's \$6.5 billion field development plan for the Kraken field in the North Sea, off the Shetland Islands. EnQuest, which operates the Kraken field, will develop the project, its sixth production hub in the UK North Sea, on behalf of itself and its partners.

According to the company, the development has two separate heavy oil fields, both of which will benefit from heavy oil allowances.

EnQuest CEO Amjad Bseisu said Kraken is a transformational project for the company and it will proceed with working with the government and its partners to increase the extraction of approximately 140 mmbbl of oil in the field.

"EnQuest extends the lives of mature oil fields and brings to life previously undeveloped oil fields, using the integrated technical skills of our people and our significant operational scale as the largest independent North Sea producer," Bseisu said.

Located in the East Shetland basin, to the west of the North Viking Graben, Kraken is claimed to be a large heavy oil accumulation in the UK North Sea and contains 140 mmbbl of oil.

Out of the \$6.5 billion capital and operational investment, 80% will be spent in the UK, estimated to generate future revenue of \$14.75 billion. The Kraken development will use Oil & Gas UK's reporting metrics and will support more than 20,000 UK jobs during the construction period of the project and an average of about 1,000 operational jobs in the UK annually.

Gross peak oil production from the field is expected to be more than 50,000 barrels of oil a day, and first oil production is expected in 2016/2017. The field development will consist of 25 wells, tied back to the vessel.

EnQuest has a 60% interest in Kraken, and its other partners include Cairn Energy and First Oil.



Satellite view of Shetland Islands

### Noble Energy reports deepwater finds in U.S. Gulf, Mediterranean

Noble Energy has found oil and gas in wells under Gulf of Mexico and Mediterranean Sea waters more than 1 mi deep, the company said.

Its Dantzler exploration well in the U.S. Gulf encountered 120 ft of net pay, mostly crude oil, in two Miocene trend reservoirs, the Houston-based independent said, adding that the well is in 6,580 ft of water and has a total depth of 19,234 ft.

And the Tamar SW well, testing a new exploration prospect in offshore Israel, encountered 355 ft of net natural gas pay at a total depth of 17,420 ft in 5,405 ft of water. Noble said the discovery was its eighth in the Levant Basin, which stretches from North Africa to Turkey in the Eastern Mediterranean.

Noble Energy operates the Dantzler project and has a 45% interest. Also invested are Ridgewood Energy Corp.,

including Riverstone Holdings and ILX Holdings II, with 35%, and W&T Offshore subsidiary W&T Energy VI, with 20%. Noble has a 36% interest in Tamar SW and is operator. Other owners are Isramco Negev 2, 28.75%; Delek Drilling, 15.625%; Avner Oil Exploration, 15.625%; and Dor Gas Exploration, 4%.

### Statoil, partners opt to extend life of North Sea Statfjord platform

Statoil and partners ExxonMobil and Centrica have decided to extend production from the Statfjord A platform in the Norwegian North Sea until 2020.

This is Statoil's longest-serving fixed installation offshore Norway. The original goal was to recover 40% of the oil in the Statfjord field, but new techniques have lifted the threshold for reserves recovery to 60%.

In recent years, the field has been

depressurized and now mainly produces gas sent to customers in mainland Europe and the UK. Statoil is now targeting 74% recovery.

Drilling continues to maximize recovery. This year, the partners sanctioned 11 wells on the field, with an additional 10 planned for 2014. To date, Statfjord has produced more than 4.7 Bboe. Statfjord A's highest producing well, A-06, has delivered 120 mmbbl.

### Duma Energy receives resource estimate on Namibia concession

Duma Energy Corp. has received positive news from an independent resource estimate for its oil and gas concession in the Owambo Basin, adjacent to the Angola border in northern Namibia.

Netherland, Sewell & Associates, Inc. (NSAI) has assigned 1.1 billion bbl of unrisked potential in-place oil resources in the Oponono prospect located in a portion of the concession, jointly operated by Duma and Hydrocarb Energy, encompassing blocks 1714A, 1715, 1814B, and 1815A, Duma said in a statement.

Unrisked potential recoverable oil resources from this single prospect range from 46 to 295 mmbbl of oil. Approximately 15% of Duma's 5.3 million acre concession has been explored with 2D seismic data. The remaining 85% is currently unexplored with plans for future regional seismic exploration. Should a commercial oil discovery be made in the future, it would have an unrisked average recoverable resource estimate of 170 mmbbl, Duma added.

### Dana Petroleum discovers more gas in UK southern North Sea

Dana Petroleum reported the discovery of gas in the Pharos field in the UK southern North Sea. The jack-up Noble Lynda Bossler drilled the 47/5d-6 well, which encountered gas in a Rotliegendes age sandstone reservoir.

According to partner Parkmead, downhole data gathered included wireline logs, gas samples, reservoir pressures, and coring of the reservoir. Detailed evaluation of the discovery will follow to determine the volume of in-place gas.

Pharos could be jointly developed with the Platypus gas field, which was discovered in 2010 and appraised by a horizontal well in 2012. A flow test on Platypus delivered 27 mmcf/d of gas.

It is believed there could be further prospectivity south of Pharos in the Blackadder structure.

The Noble Lynda Bossler has since transferred to the Dutch North Sea for further operations for Dana.

## Unique supplies ADOC with data monitoring system

Unique System FZE, a Unique Maritime Group company, has supplied meteorological and oceanographic data to the Abu Dhabi Oil Co. (ADOC). Unique installed the system at a single point mooring (SPM) buoy at sea for mooring and filling oil tankers during the course of several days.

The upper sections of SPMS are said to be above the surface and have a single terminal offloading point around which the off take tanker can normally weathervane. The loading hose and the mooring hawser have been connected to the bow section of the off take tanker, wherever relevant. According to Unique, the system has been installed to provide real-time data about conditions surrounding the buoy.

Both weather parameters and sea conditions, including wave height, wave direction, current strength, current direction, water depth, wind speed, wind direction, gusts, temperature, air pressure, and visibility, are measured and relayed to the operations center on nearby Mubarraz Island.

With the help of the information, better informed decisions can be made about operations and vessel movements, while ADOC can also safeguard the natural environment by preventing any mishaps or spillages.

Unique installed the meteorological sensors in a new mast, which is bolted to the deck of the buoy and is sufficiently high to avoid any interference with wind readings by other obstacles. Wave and current information is gathered by an acoustic doppler current profiler (ADCP) mounted in a ballasted stainless steel frame, which will be placed on the seabed near the buoy.

A data logger located in the central compartment of the SPM buoy collects data from weather sensors and ADCP and will



*Unique installed an SPM buoy at sea for mooring and filling oil tankers. Photo courtesy of Unique System FZE*

transmit it to Mubarraz Island through GPRS telemetry. A solar panel will also be mounted on the deck, near the mast, along with an extra battery in the buoy's dedicated battery room. Unique System FZE general manager Ian Huggins said the monitoring system analyses meteorological and oceanographic data well.

"We are confident that our expertise with environmental monitoring solutions, both above and beneath the water surface, will help us achieve the desired results," Huggins said.

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Ocean News & Technology

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**\$9,495**

## FMC Technologies awarded \$30M contract for ROVs

FMC Technologies, Inc. announced that it has received an order from Tidewater Subsea (Tidewater) to supply a fleet of six work-class ROV systems for its subsea operations business. The ROV systems will be supplied by FMC Technologies' Schilling Robotics business unit and are expected to be delivered before the end of 2013. The contract value is approximately \$30 million in revenue. FMC Technologies will supply integrated Heavy Duty work-class ROV systems, which will be mobilized on board Tidewater's deepwater vessels to service the global oil and gas offshore construction and Inspection, Maintenance, and Repair (IMR) markets. "FMC Technologies is very pleased to have been awarded this contract by Tidewater," said Tore Halvorsen, FMC Technologies' senior vice president, subsea technologies. "These heavy duty work-class ROV systems will allow Tidewater to further expand its life of field service offering to the oil and gas market."

## RPS Evans-Hamilton, Inc. awarded metocean survey work

RPS Evans-Hamilton, Inc. was awarded the Golfinho area metocean survey work for Anadarko in Mozambique. Anadarko requires accurate in situ measurements of the metocean conditions for the Golfinho offshore development area. The in situ data will be used to aid with day-to-day drilling operations, and to create hindcast reports applicable for the offshore designs and installation. RPS Evans-Hamilton will be collecting wave, current, CTD, and sediment transport data for a 2-year period. RPS Evans Hamilton is a member of the RPS Oceanography division with offices in Houston, Seattle, Charleston, Rhode Island, China, Abu Dhabi, and Perth.

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## Eight MacArtney winches for new JAMSTEC research vessel

MacArtney has supplied a major consignment of high-performance oceanographic winches to JAMSTEC, the Japanese Agency of Marine-Earth-Science and Technology. The total of eight winch systems and appurtenant equipment were delivered to Mitsubishi Heavy Industries who, in cooperation with specialist MacArtney launch and recovery technicians, installed them on board the brand new JAMSTEC research vessel, the R/V Shinsei Maru. Built at the Mitsubishi Heavy Industries Shimonoseki Shipyard and Machinery Works, the R/V Shinsei Maru was completed and delivered to JAMSTEC in June 2013, hereby marking the latest addition to the extensive JAMSTEC fleet of modern research vessels. In the hands of the JAMSTEC scientists and empowered by state-of-the-art functions and equipment, R/V Shinsei Maru is bound to offer an invaluable contribution to the recovery of marine ecosystems and fisheries in post-earthquake disaster coastal Japan. This will be achieved through comprehensive studies, hereunder efficient marine environmental observation, bathymetric survey and ocean-atmosphere research. In order to effectively carry out these kinds of oceanographic surveying, the R/V Shinsei Maru is equipped with a wide variety of on-board observation systems, portable research equipment and a remote-controlled unmanned probe. For launching and recovering this multitude of surveying systems and equipment, the R/V Shinsei Maru is outfitted with a cutting-edge total MacArtney winch solution comprising eight winch systems (four stationary and four portable). Adding to the overall system performance, six of the MacArtney winches on board the R/V Shinsei Maru are empowered by Active Heavy Compensation (AHC). AHC dramatically reduces unwanted undulation, cable slack, pull and equipment instability by compensating for the motion caused by heavy seas. This way, AHC works to dramatically decrease weather-related downtime.

## The SeaExplorer underwater glider breaks world record



ACSA is pleased to announce that the SeaExplorer glider, developed by ACSA in partnership with ACRI, CNRS and IFREMER, successfully completed a 2-month record mission in collaboration with the Laboratoire d'Océanographie de Villefranche (LOV) of National Center for Scientific Research (CNRS) and Pierre and Marie Curie University (UPMC).

"The mission objective was to evaluate the endurance of our first glider equipped with rechargeable batteries while performing several round trips between France and Corsica Island," said Dr. Hervé Claustre of the CNRS LOV. Indeed, although all gliders on the market traditionally use alkaline or primary Lithium, ACSA is the first glider's manufacturer to introduce rechargeable Li-Ion batteries as an effective, reliable, and affordable solution for the market. "The SeaExplorer glider has also acquired a wealth of high-resolution data along its transects whose results will be presented by LOV at the Ocean Science Meeting in Honolulu Hawaii in February 2014," said Dr. Claustre. The LOV team is now planning in the coming weeks the next deployment of this new sensing platform with additional biogeochemical sensors (e.g., Chlorophyll fluorescence, backscattering).

Launched on 5 September 2013, LOV scientists recovered their glider on 5 November at the Bay of Angels on the French Riviera. Completing a 2-month mission, the SeaExplorer glider became the first glider to break a double world record for multi-sensors Unmanned Underwater Vehicle (UUV) with rechargeable batteries.

Reaching the mythic milestone of 60 days and a total of 1,183 km on a single battery charge, the SeaExplorer glider has successfully set a duration and distance record. Launched south of Nice, SeaExplorer averaged 0.5 kts and provided over 1,168 profiles of the water column from near surface to 500 m depth with 100% communications even in high sea-states. Supervised by satellite telemetry from the onshore office using ACSA's IRIS software, the performance was manually stopped whereas internal parameters indicated 18% of its battery energy remaining.

The success of this world's longest mission performed by a rechargeable powered UUV highlights the reliability of the SeaExplorer glider. Besides the platform's endurance record, the scientific payload was equipped with SeaBird pumped conductivity/temperature/depth (CTD) and dissolved oxygen sensors recording continuously at 4-sec inter-sample time (metric resolution). First comparisons of the SeaExplorer dataset with simultaneous profiles from a ship-borne CTD-rosette show very good data quality, even across strong temperature gradients.

For more information, visit [www.acsa-alcen.com](http://www.acsa-alcen.com).

## EdgeTech 2205 AUV-based sonar assists GLRC in pipeline survey

Underwater pipeline surveys are of the utmost importance. Ensuring the location and integrity of a pipeline is important for the environment, the community and the operators of the asset. With the addition of high-resolution and high-quality sonars on smaller AUVs, these pipeline inspections can occur more readily and cover areas that can sometimes be a challenge to ship-based sonars alone. While recognized, this solution is not common. The Great Lakes Research Center may help to change that.

While side-scan sonar and multi-beam bathymetry information has been, and is still, collected by ships using towed sonar or hull-mounted systems, the addition of ultra-high-resolution sonar and bathymetry on small and cost-effective AUV platforms opens up an even wider and more complete survey in many cases. In some instances, ship surveys can be limited because of the location of the underwater pipeline. Surveying in busy ports, harbors, and channels can be troublesome. Other times, ship size can limit potential survey areas, neglecting either too deep or too shallow water due to ship draft, weather or equipment constraints.

Recently, the Great Lakes Research Center (GLRC) at Michigan Technological University deployed an OceanServer Iver AUV with an EdgeTech 2205 combined side-scan sonar and bathymetry system with the goal of imaging an underwater pipeline. The results were impressive. The autonomous system coupled with the co-registered side-scan sonar/bathymetry system was perfect for the task. Side-scan sonar and bathymetry images were used to check the location and integrity of the pipeline over a long and varied terrain. Using side-scan sonar co-registered with bathymetry, the team was able to view intricate details about the pipeline and the bottom topography, helping accomplish their mission.

For more information, visit [www.edgetech.com](http://www.edgetech.com).

## Alfred Wegener Institute evaluates GeoTexture for backscatter data processing

Back in 2012, the Alfred Wegener Institute Helmholtz Center for Polar and Marine Research (AWI) began assessing the pace of coastal erosion and the nature of sediment and organic matter transfer in nearshore areas of the southern Canadian Beaufort Sea. Within the framework of the Coastal Permafrost

Erosion research project (COPER), AWI scientists began investigating both the terrestrial coastal dynamics, as well as assessing the fate of sediments and carbon released into the nearshore.

An integral part of the fieldwork is seafloor mapping, for which AWI chose the Kongsberg Geoacoustics GeoSwath Plus Compact system. In the 2012 field season, c. 3.1 sq. km of survey data were collected, along with surface sediment samples. Survey depths ranged from 1 to 17 m. The system delivers high-resolu-

tion bathymetry with coverage of up to 12 times the water depth in this shallow water environment and co-registered, geo-referenced backscatter data. Decisive factors in operating in remote and harsh environments are the portability and reliability of the equipment. The remote location makes it necessary to airlift all equipment and personnel. The surveys were carried out with an inflatable craft on which the splash protected (IP54) system was installed in a portable installation and powered by 24-V battery.

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Regarding co-registered, geo-referenced backscatter data, AWI has been recently evaluating GeoTexture, a Kongsberg Geoacoustics software suite for backscatter data processing, mosaic creation and seabed classification. The performance of the software has been optimized for the analysis of GeoSwath Plus backscatter data as it allows for beam pattern correction, vessel motion, and sea-bottom topography, which substantially improve the quality of the mosaics and ease image analysis and interpretation.

For more information, visit [www.awi.de](http://www.awi.de).

## Sonar Equipment selects Applied Acoustics' CSP

Sonar Equipment Services of Great Yarmouth, UK has recently added the new Applied Acoustics' CSP-N seismic power supply to its equipment pool. The 1200 Joule reverse polarity unit selected by Sonar Equipment will operate a variety of Applied Acoustics' sound sources, including the triple boomer plate S-Boom System, single plate boomers and the new long-life Dura-Spark 240. This novel catamaran-based sparker assembly has extremely durable electrodes that rarely need replacing and is ideal for high- and ultra-high-resolution geophysical surveys. Sales and operations manager Neil Jackson quickly recognised the advantages of the new power supply. "We're really pleased to offer this truly versatile seismic power supply to our customers across the world," he said. "It's got all the high-quality features and high-safety standards that Applied Acoustics products have established over the last two decades or more, as well as the flexibility to work with a variety of sound sources, including the latest models." The CSP-N1200 is a compact 7U unit supplied in a durable transit case. It not only incorporates a unique negative voltage output, but also proprietary variable input power circuitry facilitating a "soft-start" to ease generator load.

For more information, visit [www.appliedacoustics.com](http://www.appliedacoustics.com).

## Delta SubSea LLC awarded Gulf of Mexico repair / IMR scope of work

Delta SubSea (DSS) has been selected by EMAS AMC (EMAS) to provide ROV services in support of EMAS's current Gulf of Mexico deepwater repair campaign. DSS will deploy a Schilling HDTM 150-hp ROV as well as ROV tooling, including Class 1-4 torque tools, water

blaster, and hotstabs. DSS also fabricated a customized ROV subframe assembly in support of this scope of work. "DSS looks forward to providing EMAS with best-in-class ROV services," said Scott Dingman, DSS's CEO. "Delta brings to bear its experienced ROV crew as well as engineering and fabrication expertise to maximize efficiency for this scope of work." "We appreciate DSS's quick mobilization time and highly proactive approach to this project's challenges," said Andrew Pasch, EMAS Project Manager.

For more information, visit [www.deltasubsea-rov.com](http://www.deltasubsea-rov.com).

## Exocetus Development LLC sets new shallow water record for coastal glider

The Exocetus Coastal Glider (CG), a new oceanographic underwater glider that was developed to operate in coastal waters at depths as shallow as 10 m, has now been successfully tested in coastal waters shallower than 5 m. This was announced by Dr. Joe Imlach, CEO/CTO of Exocetus Development LLC.

The Exocetus [x-o-seat-us -- is the name of a flying fish] glider is designed for environmental monitoring in coastal waters with currents in excess of 1m/s and can operate in waters with large density variations due to the Exocetus patent-adaptive ballasting control system.

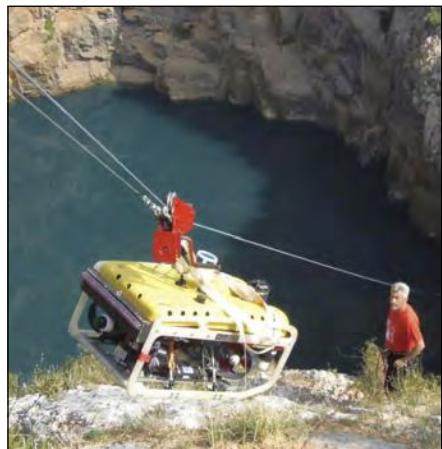
With the support of the University of Southern Mississippi [USM] staff at the Stennis Space Center, glider tests were conducted in the Pearl River on November 20, 2013, where water depths vary from 1 to 5 m. The Exocetus Coastal Glider operated in both upstream and downstream water conditions. The Exocetus Glider was surprisingly able to successfully complete 180° turns in waters as shallow as 3 m, surpassing previous demonstrations of the product.

When weather conditions improve in the Gulf of Mexico at the beginning of 2014, the hypoxia sensors on the Exocetus Coastal Glider will be further tested by USM staff. The hypoxia sensors include a WetLabs ECO FLNTU with a turbidity and fluorescence sensors; and a RINKO dissolved oxygen sensor.

For more information, visit [www.exocetus.com](http://www.exocetus.com).

## The mystery of Red Lake

Set in a sheer-sided bowl of rock accessible by climbing gear alone, the Red Lake in Croatia has never revealed the secret of its depths. Now, mountaineering skills and a Saab Seaeye



Falcon ROV will offer the first ever insight into the third largest sinkhole lake in the world.

Many attempts to survey the lake have failed, even thwarting an earlier team of underwater specialists. No one knows how deep it is, how it is fed, or if it is connected to other water systems. A ray-finned fish, particular to the lake, sometimes appears in nearby waterways to give the only clue that an underwater connection might exist.

Solving the mystery became urgent when the level of the lake dropped 80 m and sent the Croatia Faculty of Civil Engineering in search of answers. They commissioned top Adriatic ROV and diving company, Neptun-Sub to undertake the daring task of sending down the Falcon ROV. Their mission was to discover the depth of the lake, create a 3D profile, and film the underwater surfaces.

Lowering the Falcon down a 300-m vertical cliff face needed the skills of mountaineers. Their task was only made possible because the Falcon is small enough to be manhandled, yet powerful enough to perform precise work, carrying a wide range of sensors and tools such as high-specification cameras and sonar systems as well as manipulators. It is packed with advanced technology usually found in much larger underwater vehicles.

Once the exploration team sent the Falcon diving, it discovered that the Red Lake — taking its name from iron oxide coloring of the rocks within which it sits — is in fact 255 m deep, 4 m of which are below sea level — and it is funnel-shaped.

The filming and 3D survey results along with data collected by instruments left in the lake, are currently being evaluated by the Croatian Faculty of Civil Engineering, and will be published at a later date.

For more information, visit [www.seaeye.com](http://www.seaeye.com).

## N-Sea launches mobile TUP Diving System®

N-Sea celebrated the official launch of the TUP (Transfer Under Pressure) Diving System® at the TUP Aware Party at N-Sea Head Quarters in Zierikzee, The Netherlands.

The TUP Diving System® is the world's first air diving system that can be equipped with a hyperbaric lifeboat, enabling N-Sea to offer a safer, more efficient, and cost-effective diving solution to the market.

The TUP Diving System® consists of a three-man diving bell, launch and recovery system, triple-lock decompression chamber, gas diver control (air/Trimix/Nitrox), and hyperbaric rescue craft. The TUP Diving System® refit and enhancement conforms to IMCA guidelines and surpasses the uppermost standards set by Lloyd's.

N-Sea designed and manufactured the TUP Diving System® in-house. The system has an extensive track record with over 2,300 bell runs to date. The system has undergone a comprehensive refit and been converted into a mobile system, deployable from most

DPII support vessels and platforms.

The re-introduced TUP Diving System® is a safe system that saves you money and time on diving operations. It offers a number of advantages

when compared to traditional surface supply diving operations and saturation diving operations.

For more information, visit [www.n-sea.com](http://www.n-sea.com).



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## NSSLGlobal's cruise-IP coverage keeps extending

NSSLGlobal Ltd has announced the further expansion of its VSAT Ku-Band network to include an additional two satellite beams covering the South Atlantic and Indian Ocean region. These two beams were active as of the 15 October, combining with the current VSAT coverage offered by NSSLGlobal, creating the world's most comprehensive VSAT Ku-Band network in the industry. Current and new customers on commercial vessels and super yachts will benefit from the additional beams, which come via Intelsat's Rugby based Earth Station. The first beam utilizes Intelsat's IS21 satellite and is primarily aimed at the commercial maritime sector. The satellite is positioned 58° west, with a large proportion of the beam covering the South Atlantic, south of South Africa across to Buenos Aires. This beam complements the NSSLGlobal TL11 North Atlantic beam that is already part of the global coverage offered by the company. The second beam, MID-IOR, covers the Maldives and Seychelles area with the primary customer base stemming from the super yacht community.

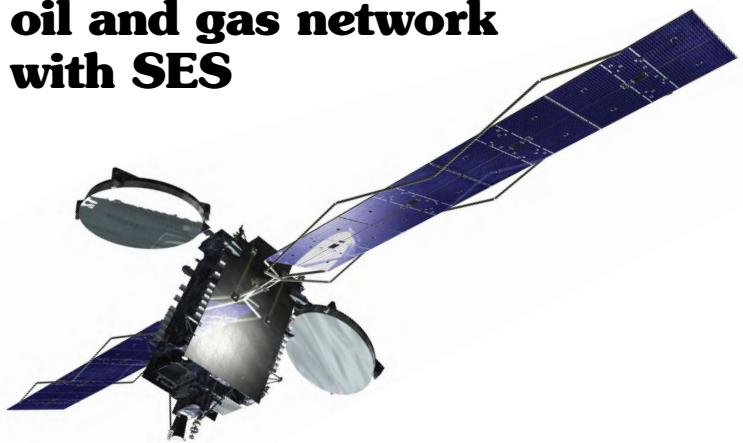
## Thuraya certifies RedPort Optimizer

Thuraya Telecommunications Company and RedPort Global announced the successful certification of the RedPort Optimizer satellite Wi-Fi router and the RedPort XGate satellite email and data service software. Thuraya's users can now use the RedPort Optimizer for ship-to-shore and remote land-based data email and other data services via computers, laptops, and smartphones, including those from Google Android and Apple iOS. The RedPort Optimizer is currently used with the Seagull 5000i to optimize email communications on board commercial vessels operating across Thuraya's coverage area. It enables a vessel operator to stay in contact with its crew 24/7 and to optimize ship operations while controlling costs. Its powerful firewall ensures there are no unintended data transmissions to and from the vessel that could result in unexpected airtime bills. The RedPort Optimizer is certified for use on the Thuraya network with the Seagull 5000i and Thuraya Maritime Broadband. In addition, it is certified for the Thuraya XT, IP and IP+. The RedPort Optimizer works exclusively with the RedPort XGate software to provide email, web browsing, social media, blogging, weather data, GPS tracking, and GPS NMEA Repeating.

## Wasserstein & Co. to acquire Globecom Systems

Globecom Systems, Inc. announced that an affiliate of Wasserstein & Co. has entered into a definitive agreement to acquire Globecom for \$14.15 per share in cash. The purchase price represents a premium of 21.9% over the closing price on 14 January 2013, the day on which Globecom announced that it had retained Needham & Company to assist it in a review of potential strategic alternatives to enhance shareholder value. The transaction is valued at approximately \$340 million. The transaction was unanimously approved by Globecom's board of directors and is expected to be completed in the fourth calendar quarter of 2013. The merger is subject to antitrust clearance and other governmental approvals, Globecom stockholder approval, the satisfaction of certain financial conditions, and other conditions. The transaction is expected to be financed through a combination of cash provided by Wasserstein & Co. affiliates and other co-investors as well as debt financing. Highbridge Principal Strategies, LLC, on behalf of its affiliates, has entered into a commitment letter for the debt financing, subject to the terms thereof.

## ITC Global expands oil and gas network with SES



ITC Global and global satellite operator SES announced a capacity deal to connect remote oil, gas, and mining operations throughout North America.

As part of the renewed agreement, ITC Global is using the extensive reach and C-band capacity aboard the SES-2 satellite to deliver high-speed broadband to crews operating exploration vessels and oil rigs from the Gulf of Mexico to Northern Canada. SES-2 and its broad footprint is enabling oil, gas, and mining companies to operate more effectively and efficiently by extending corporate network capabilities into some of the remotest and harshest locations in the world, including the resource-rich Yukon region of the Canadian far north.

Crew welfare and the increasing need for real-time rig and pipeline monitoring is driving demand for reliable satellite coverage. Cellular providers are utilizing GSM backhaul services over SES-2 to extend their mobile communications networks offshore to meet operational connectivity needs aboard manned and unmanned rigs deep in the Gulf.

ITC Global utilizes capacity across a number of SES satellites. SES' AMC-9 spacecraft enables a broad range of applications across the U.S. and beyond, including unique maritime applications across the Canadian Great Lakes. SES' NSS-10 satellite is playing an important role in ITC Global's rapid growth in Africa's oil and gas market, while its NSS-12 satellite is also serving the oil rich coasts of Africa and Australia.

SES-2 has extensive coverage over Canada, the U.S., and the Caribbean. The spacecraft is specially designed to provide communication links to offshore platforms for customers in the oil and gas and maritime markets. SES-2 is also host to the Air Force's experimental Commercially Hosted Infrared Payload (CHIRP).

For more information, visit [www.itcglobal.com](http://www.itcglobal.com).

## KVH expands capacity of mini-VSAT Broadband in Asia-Pacific

To serve its growing commercial maritime customer base in the Asia-Pacific region, KVH Industries, Inc. has doubled the service delivered by the JCSAT-1B satellite, which is part of KVH's mini-VSAT Broadband network. This additional capacity, available as of last month, will support mariners in the Asia-Pacific region, which includes some of the world's busiest shipping routes and is one of the fastest-growing areas in the world for maritime broadband demand.

An advantage of the mini-VSAT Broadband service is that existing TracPhone® V-series and V-IP series terminals will automatically be able to access the additional capacity when

they receive a simple, over-the-air software update. The mini-VSAT Broadband network is part of KVH's end-to-end satellite communications solution, which also includes the new TracPhone® V-IP series of on-board antenna systems. Designed to take advantage of advanced spread spectrum technology, TracPhone® V-IP series antennas are 85% smaller than similar VSAT antennas using older TDMA technology. With downloads as fast as 4 Mbps and uploads as fast as 1 Mbps, TracPhone® V-IP series terminals also provide on-board network management and crystal-clear Voice over IP (VoIP) telephone lines with optimized service. Another feature of the mini-VSAT Broadband network is the upcoming IP-MobileCast™ content delivery service that KVH recently announced, which will utilize multicasting technology to bring news, sports, movies, chart updates, and more to subscribing vessels.

The new satellite capacity in Asia is the latest in a series of recent network enhancements made by KVH to help maintain a high quality of service for its rapidly growing customer base. In July, KVH announced deployment of Variable Coding, Spreading, and Modulation (VCSM) technology provided by ViaSat, Inc., KVH's partner in the mini-VSAT Broadband network. KVH's mini-VSAT Broadband network is the world's leading maritime VSAT choice, according to three independent industry research reports published in 2012 by Euroconsult, NSR, and Comsys.

For more information, visit [www.kvh.com](http://www.kvh.com).

### **Farice upgrades the FARICE-1 with Ciena GeoMesh**

Ciena® Corporation announced that Farice, the main provider of international capacity from Iceland to mainland Europe, has deployed Ciena's 100G coherent optical transport technology to upgrade its submarine cable system that connects Iceland and Scotland. With Ciena's converged packet optical and GeoMesh solutions, Farice will be able to satisfy the growing and unpredictable bandwidth demands of both its traditional telecommunications carrier customers, as well as the rapidly growing Icelandic data center industry being driven by Iceland's low cost and green energy sources.

Farice operates submarine cables between Iceland and both Scotland and Denmark. The company is the main provider of wholesale capacity in and out of Iceland and operates a city-to-city

network in five European countries. The network is optimized for delivery of wholesale capacity to service providers, content providers, cloud service providers, and data center customers.

Farice selected Ciena's 6500 Packet-Optical Platform, powered by 100G WaveLogic 3 Coherent Optical Processors, and GeoMesh optical bypass for deployment on its 1,200 km submarine cable system, FARICE-1, and almost 800 km of terrestrial backhaul network where Ciena is the alien wavelength. This will provide high-bandwidth connectivity between Reykjavik and Keflavik, Iceland to Dunnet Bay, Scotland. It will also enable Farice to provide high-speed, reliable and flexible on-demand service delivery.

Ciena's GeoMesh solution incorporates an all-optical network design to connect submarine and terrestrial segments into a single seamless link, with high-capacity optical signals carried as foreign wavelengths over the existing terrestrial backhaul network, reducing capital and operational expenses – savings that allow Farice to offer its customers higher capacity at more competitive prices. By allowing Farice to use the same technologies over land and undersea, it can efficiently interconnect its points of presence and service switching centers, with end-to-end service provisioning to make the global network operate as a single, unified network.

Additionally, GeoMesh's simplified all-optical design delivers lower power consumption, therefore supporting Iceland's green data center goals, while also supporting lower latency to improve connectivity between Iceland's data centers and the rest of the world.

Farice will also leverage Ciena's advanced management solution for simplified low-touch service activation, which provides rapid service delivery, comprehensive service visualization and network monitoring.

This deployment builds on an earlier agreement between the two companies to enhance Farice's submarine cable system DANICE, which connects Iceland with Denmark. The DANICE upgrade was completed in January 2013.

For more information, visit [www.ciena.com](http://www.ciena.com) or [www.farice.is](http://www.farice.is).

### **Huawei Marine's new manufacturing plant ramps up**

Huawei Marine Networks Co., Ltd. announced the commercial operation of its second generation undersea repeater and branching unit manufacturing plant in Dongguan, China. The factory is

ramping up to full production capacity as Huawei Marine prepares for a new project in the West African region.

Completed in April 2012, with an initial investment of \$9 million, the new Dongguan plant is 3,700 sq. m, of which 1,600 sq. m is dedicated to a world-class clean room facility comprising Class 1,000 and Class 10,000 clean rooms to meet the most rigorous standards of particulate management and environmental control for repeater assembly and sealing. The plant is also equipped with newly developed technology and production facilities for the manufacturing, assembly, testing, quality management, and assurance of all core elements associated with building undersea repeaters and branching units. The key technologies and equipment to be used include the world-class Optical Amplifier Module final assembly equipment, Automatic Test Equipment (ATE), Hydraulic Test Equipment, a Hermeticity Verification system, and a full set of tools for repeater and branching unit integration. All of this enables the highly precise and reliable assembly of these innovative subsea products to meet and exceed the 25-year reliability lifespan required by the industry.

Currently, the new Dongguan plant can support production capacity of 20 repeater modules per month but is engineered to meet future market demand by up to four times this throughput, culminating in 80 units per month. When the plant operates at full manufacturing capacity, it will be one of the largest in the world and is able to support the construction of two transoceanic systems in one year.

The new plant will also deploy the in-house developed repeater integration processes, equipment, and facilities, incorporating the industry standard UJTM cable jointing solutions that are firmly built into the repeater and branching unit designs. Modularized and containerized, the platform enables system integration to take place in cable factories, remote locations, or potentially on board suitable vessels, offering flexibility and efficiency for customers. Each integration platform can currently handle a rate of 10 repeater integrations per month, per site or factory. The application of proven UJTM technology, together with an innovative repeater design, can provide operational benefits and simplification, enabling significant savings in project cost and time.

Huawei Marine's production team at the new plant consists of optical and electrical experts, mechanical engineers,

and production technicians who have undergone rigorous production training and are experienced in repeater and branching unit production process for major commercial projects.

The new Dongguan plant is also located near Huawei Marine's terrestrial production plant, which offers production for dry plant products, such as Submarine Line Terminal Equipment (SLTE), Submarine Line Monitor (SLM), etc., enabling the integrated inspection, testing, and handover of both dry and wet plant products to customers.

For more information, visit [www.huaweimarine.com](http://www.huaweimarine.com).

## Astrium delivers maritime X-band capability to UK MOD

Astrium, the world's second-ranking space company, is now delivering to the UK Ministry of Defence (MOD) enhanced overseas tactical, land and maritime communications capability that directly links to Astrium Services's new IP-core-based modular infrastructure.

This capability allows UK Armed Forces to securely connect users to one core defense infrastructure — supporting all voice and data traffic with encryption from tactical, land and maritime operations across the globe — rather than having to recreate a network of services. Astrium Services provides a flexible and scalable environment that can cost effectively accommodate all expected connectivity needs.

Astrium Services is delivering the first two Deployable Maritime Milsat (DMM) SCOTPatrol terminals, which feature reduced top-weight and a compact footprint both above and below deck for easier integration on small vessels. These terminals will enable IP-based communication on board smaller Royal Navy ships, including mine counter measure vessels on operations in the Arabian Gulf.

The SCOTPatrol next generation naval satellite communications terminal, along with all of the baseband equipment, allow the vessels to fully integrate into the network via Skynet 5's resilient and hardened X-band satcoms. Further terminals are on order and are being delivered during the next year.

The services offered as part of the Skynet 5 contract also cover training, spares/maintenance support, assurance monitoring, and reporting as well as 24/7 customer services and more.

Through the Skynet program, Astrium Services operates the Skynet military satellite constellation and the ground network to provide all beyond

line of sight communications to the UK MOD. The program, covering a 22-year period, has also enabled Astrium Services to provide Skynet-based communication services to other government institutions, including the UK Cabinet Office and armed forces from other nations such as The Netherlands, Portugal, and also to NATO.

For more information, visit [www.astrium.eads.net](http://www.astrium.eads.net).

## MCP strengthens mobile connection between DeepOcean and Statoil

Maritime Communication Partner (MCP) has agreed a contract with leading subsea services company DeepOcean to provide state-of-the-art online and mobile communications for a newbuild MT6022 offshore vessel. The vessel, built by Kleven and to be chartered from REM Maritime AS, will provide inspection, maintenance, and repair (IMR) services for all Statoil operated fields on the Norwegian Continental Shelf (NCS). This 5-year IMR agreement, commencing in the first quarter of 2014, is worth more than NOK 1.5 billion (\$253 million).

MCP's role will be to keep DeepOcean and Statoil connected. The Telenor-owned business, an established leader in the mobile communications at-sea market, will provide the new vessel with high-bandwidth online services and mobile network coverage. This will facilitate the seamless transfer of large quantities of data between the vessel and DeepOcean and Statoil's onshore operations, while providing excellent internet/Wi-Fi and mobile connections for crewmembers.

MCP's solution features "multiple data link bundling," which provides optimum bandwidth by combining multiple data links together with the VSAT. This means that when a ship is in position to connect with land- or oil rig-based mobile data networks (2G/3G/4G) or at harbor in the proximity of a WLAN access point, it does so, boosting the bandwidth available over the VSAT. The greater the bandwidth, the greater the quantity of data that can be handled by smartphones, Internet-enabled PCs or any other applicable device.

The 3-year deal marks a further new agreement for MCP in the offshore sector, after it secured a contract with Gulf Offshore in September to provide mobile and Internet services to three vessels operating on the NCS. The segment has emerged as a new target market for MCP, which is looking to lever-



age its extensive expertise and established number one position in the cruise and ferry sectors (where CellAtSea connected over 13 million users last year) to attain offshore leadership.

DeepOcean's contract with Statoil includes a further 3-year option, pushing its potential value close to NOK 2.5 billion (\$421 million). MCP's system will be installed the 108 m long, 22 m wide offshore construction vessel (to be named REM Ocean) upon completion at Kleven's yard in Ulsteinvik, Norway. The cutting-edge ship is equipped with a 150-ton offshore crane and features two work ROVs and one observation class ROV.

For more information, visit [www.mcp.com](http://www.mcp.com).

## Demand For MTN megayacht services surges

MTN Communications (MTN) reported at the recent Ft. Lauderdale International Boat Show that it has reinforced its position as the leading communications service provider to the world's Top 200 megayachts (66 m and above). The company also serves one-third of the Top 500 (53 m and above). Further solidifying the organization's thought leadership, MTN managing director of yacht services, Derik Wagner, has joined the Boards of the U.S. Superyacht Association (USSA) and International Superyacht Society (ISS).

MTN reported customers increased demand for additional bandwidth on the MTN network by 61% over the same period 2012. This increase is a result of planned activity in highly trafficked regions, particularly in the summer Mediterranean season as well as winter in the Caribbean and South Pacific. MTN easily met this demand due to its flexibility and robust network offering ideally suited to this market.

MTN's continued growth further solidifies its leadership in delivering the speed, throughput and flexible terms demanded by this segment. More than 50 MTN employees are dedicated to the yacht market, including sales, network management and support, and yacht installations. Their job is to ensure each yacht gets delivered exactly what is

expected and needed, wherever it is setting sail. These employees are mobile and ready to travel and join a yacht if the customer requests on-site technical support. The company expects ongoing growth and revenues from new offerings in the coming year.

MTN provides secure and reliable yacht connectivity and content for leisure, business and mission-critical communications. The company brings more than 30 years of experience in global VSAT satellite technology. MTN holds a tradition of constantly innovating the way it manages the industry's largest and most redundant independently-run network.

MTN provides voice, broadband Internet, high-definition TV (HDTV), and news to yachts worldwide. The company supports the complex communications needs of large vessels that carry up to 5,000 passengers and crew in the yacht, cruise, government, energy, and commercial shipping markets. MTN's focus on yachts began 6 years ago due to its proven solutions addressing reliability, constant connectivity everywhere, and delivery of the highest possible throughput.

For more information, visit [www.mtnsat.com](http://www.mtnsat.com).

#### **B & J Martin chooses Boatracs for Mini-VSAT broadband solution**

Boatracs Inc. has received a contract to provide a broadband communications solution to B & J Martin, Inc., an offshore service company providing supply, crew and site clearance vessels as well as offshore living quarters. B & J Martin will be outfitting the site clearance trawling division of their fleet, consisting of six boats with KVH TracPhone® V7-IP VSAT terminals, including a mini-VSAT Broadband service unrestricted airtime plan and continue using Boatracs BTConnect® for vessel tracking to maintain two-way voice and data communications ship to shore.

Maintaining constant communications with its vessels is vital in B & J Martin's business. The company has seen the benefits of having broadband on its trawling vessels and, after working with other communications providers, decided that Boatracs offered the level of dependable connectivity it requires. The new deal will allow B & J Martin to move forward with the installation of the KVH systems, including the TracPhone® V7IP, a high-performance maritime VSAT terminal, on its

vessels, integrated with Boatracs BTConnect® on shore.

B & J Martin is an innovative company that has extensive experience serving the oil and gas industry. It is a leader in site clearance with U.S. Department of Interior BSSE site clearance NTL, a leader in ABS classed crew quarters and the owner, Jimmy Martin, developed the patented Gorilla Net®, an apparatus to aid in the removal of the debris from the ocean

floor. B & J Martin became a Boatracs customer in 2008 with the installation of narrowband satellite communications on their entire fleet and Boatracs BTConnect® on shore to monitor and message the boats. Boatracs is one of the few maritime software providers that also sells satellite communications hardware resulting in a seamless experience for customers.

For more information, visit [www.boatracs.com](http://www.boatracs.com).

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A photograph at the bottom shows a white research vessel with a clear protective hull section operating in the ocean, with an oil rig visible in the distance.

## Sunesys to provide backhaul for Seaborn

Seaborn Networks and Sunesys announced that Sunesys has been selected by Seaborn Networks to provide a diverse back-haul solution in the U.S. for the Seabras-1 submarine cable project. Seabras-1 is a 40-Tbps submarine cable system being built for Seaborn Networks by Alcatel-Lucent Submarine Networks. The system will provide the first direct route between São Paulo and New York, with a branch landing in Fortaleza, Brazil. Sunesys, LLC, a dark fiber and lit network services provider with over 8,900 fiber route miles in the U.S., will shortly commence the construction and delivery of a new diverse fiber backhaul network to provide Seaborn Networks with connectivity from Seabras-1's U.S. landing station to CoreSite and Equinix facilities in New Jersey. The ready for service date for Seabras-1 is in 2015.

## SubCom honored with 2013 Edison Patent Award

TE SubCom and inventor Neal Bergano were recognized by the Research and Development Council of New Jersey as a 2013 Edison Patent Award winner in the category of communications technology at the organization's 34th Patent Award Ceremony on 7 November. Neal Bergano, inventor and managing director, system research and network development at TE SubCom, accepted the award for his "Synchronous Amplitude Modulation for Improved Performance of Optical Transmission Systems" (U.S. Patent 7,292,793 B2), an invention used in undersea cable systems that improves performance of long-haul optical telecommunications systems by remodulating a high-speed optical data channel with a synchronous amplitude, phase and/or polarization modulation. "For 34 years, the Council has recognized the outstanding scientific advances of New Jersey's research community, and it is an honor for TE SubCom to be recognized for the second year in a row for our contributions to undersea communications technology," said Bergano.

## Hawaiki secures U.S. landing site

Hawaiki Cable Limited, the New Zealand owner and developer of Hawaiki submarine cable system, will land its proposed 14,000-km trans-Pacific cable in Oregon, USA. The company signed turnkey contracts with U.S. providers Tillamook Lightwave and CoastCom for key infrastructure and connectivity, including a cable landing station, terrestrial infrastructure, and a new fiber backhaul network that will connect the cable landing station to the city of Hillsboro, near Portland. Hawaiki's cable system, scheduled for completion in late 2015, will link Australia, New Zealand, and Hawaii to the U.S. West Coast. Tillamook Lightwave, an Oregon Intergovernmental Agency, will host the Hawaiki cable system in its Pacific City landing station and provide terrestrial infrastructure, including conduit from the beach manhole to the landing station. CoastCom, a privately held Oregon Competitive Local Exchange Carrier, will supply and install a brand new fiber optic backhaul network that connects the cable landing station with networks in Hillsboro. Both contracts cover the 25-year life of the cable.

## Global Marine, Triasmitra form joint venture

Subsea cable installation companies Global Marine Systems, Ltd. and PT Ketrosden Triasmitra have announced their agreement to form a joint venture to provide subsea cable engineering and installation services to the telecommunications and oil & gas industries within the Indonesian market. The partnership between the two companies will see the installation of more than 600 km of cable this year as the companies collaborate on the Luwuk-Tutuyan and Jambi-Batam submarine cable projects and another 2,000 km projected over 2014. The joint venture will address the Indonesian market and will own and operate cabotage-compliant vessels. In addition, the joint venture will provide feasibility studies, marine survey, shallow and deepwater installation and burial solutions.

## ABB wins offshore wind project in North Sea



ABB has won a significant order from the Dutch-German transmission system operator TenneT to supply an AC power transmission link connecting Sandbank, an offshore wind farm in the German North Sea, to the HVDC (high-voltage direct current) converter station SylWin alpha.

The link will have the capacity to transmit 288 MW of clean wind power — enough to supply energy to around 300,000 German households. Once the connection is commissioned, the offshore wind farm will be able to save 1,500,000 tons of carbon dioxide emissions per year by replacing fossil fueled generation.

The connection will link the AC platform of the Sandbank offshore wind farm to the HVDC converter platform of SylWin alpha. The Sandbank wind farm is situated around 90 km off the island of Sylt.

The connection will deploy two 3-core 155 kV AC submarine cables, each 36 km long. ABB has already successfully commissioned nine AC cable projects worldwide for offshore wind connections and others are under execution.

For this project, ABB will have turnkey responsibility for the design, engineering, supply and installation of the subsea cable system, including two shunt reactors on the AC platform. The project is scheduled for completion in 2015.

Sandbank is the fifth offshore wind connection project in Germany awarded to ABB by TenneT. ABB is presently executing the Nordergründe AC cable link connecting an offshore wind farm directly to an onshore substation. The other three projects are offshore wind connections based on HVDC Light technology of which BorWin1 has already been commissioned and DolWin1 and DolWin2 are under construction.

For more information, visit [www.abb.com](http://www.abb.com).

## SubPartners appoints SubCom as exclusive supplier for APX-East

SubPartners Pty Ltd has announced the signing of a Memorandum of Understanding appointing TE SubCom as the exclusive supplier for the APX-East submarine fiber optic cable system connecting Sydney, Australia to the mainland U.S.

APX-East will be the world's first multi-purpose, ultra long-haul submarine cable system delivering low-latency, spectrally efficient telecommunications services between Australia, the United States, and several Pacific islands. APX-East will also form the backbone of the Oceania Sensor Network, which will provide a wealth of submarine data for research and disaster management purposes such as real-time tsunami warnings.

With exclusive access to specialized submarine technology, the Oceania Sensor Network will be the world's longest pow-



## Quintillion confirms technical feasibility of Arctic cable

Quintillion Networks will complete final landing site selection within the next 2 months for six proposed landing sites in Alaska. This follows Arctic Fibre's successful completion of landing site surveys in Canada. Arctic Fibre is planning to build a submarine fiber optic cable between Europe and Asia through the Arctic. Quintillion has exclusive rights to connect Alaska spurs to the Arctic Fibre backbone. Arctic Fibre completed identification of seven cable-landing points across Nunavut as part of its 15,700-km subsea fiber optic network through the Northwest Passage between London, England and Tokyo, Japan.

The Quintillion project will construct a local broadband network to serve Alaskans living in communities adjacent to the subsea backbone network. Alaska landing locations now identified are Prudhoe Bay, Barrow, Wainwright, Kotzebue, Nome, and Shemya. This critical new fiber optic cable investment will reduce the cost of service and provide virtually unlimited high-speed bandwidth essential to resource development companies, government operations, health care, education and individual Alaskans.

Arctic Fibre is also examining the economic feasibility of constructing a branch off the backbone network at the westerly end of the Aleutian Islands to provide low-latency, transpacific capability between Tokyo and Seattle. This Aleutian line could also contain a spur to serve Unalaska.

The upcoming Alaska marine surveys will refine and confirm previous landing site locations identified in consultation with the local Alaska communities. In the spring of 2013, Quintillion and its contractors visited and worked with local government, business and residents of Barrow, Wainwright, Kotzebue and Nome.

Due to the shallow continental shelf in northern and western Alaska, it is anticipated that the spur cables off the backbone will be installed through horizontal drilling or trench to depths of 3 to 5 m.

The Quintillion Network will initially be lit with a capacity of 100G, but the number of wavelengths can be increased as demand warrants. The fiber pair serving Alaska and the Canadian Arctic has a rated capacity of 8 Tb.

For more information, visit [www.quintillionnetworks.com](http://www.quintillionnetworks.com).

ered subsea sensor array and will provide its users access to an unprecedented amount of reliable real-time subsea environmental data without the technical limitations of conventional buoy and satellite systems.

In addition to the Oceania Sensor Network, APX-East will be the backbone for the Oceania Research Network, providing educational institutions across the Pacific with dedicated low-cost international connectivity.

This announcement follows the signing of a system supply contract for SubPartners' APX-West cable system between Perth, Australia, and Singapore.

APX-East is approximately 12,700 km long and has an initial design capacity exceeding 38 Tbps. It will provide a direct optical path between Australia and the United States without signal regeneration on a Pacific island. This will reduce the cost of capacity activation while providing greater reliability and lower latency compared to existing cable systems.

APX-East is expected to be Ready for Service (RFS) by the fourth quarter of 2015 and is believed by SubPartners to be the world's longest digital line segment between submarine cable stations. The system will connect Sydney, Australia to Hermosa Beach, California, with a branch connecting Hawaii and with potential landings to Pacific Islands such as Vanuatu, Fiji, Tonga, and Samoa.

The APX-East repeaters can be equipped with externally tethered marine sensor technology to monitor the environment and detect oceanic events. Enabling the monitoring of seabed water pressure, temperature and seismic activity, disaster response teams and academic research groups will gain an unprecedented monitoring and early warning capacity. The Oceania Sensor Network will provide a new feature-rich, real-time, high-resolution, low-maintenance, weather and battery life independent platform for detecting unpredictable natural threats and events.

APX-East will be a platform for

Pacific Island research and academic growth. Dedicated bandwidth between the trunk terminal locations and the Pacific Islands will be allocated for schooling use and will ensure availability of low-cost international connectivity for educational establishments and research organizations.

For more information, visit [www.subpartners.net](http://www.subpartners.net).

## Banks provide \$100M facility for Main One

Standard Chartered Bank Limited, Skye Bank, First Bank of Nigeria Plc and First City Monument Bank have provided a \$100 million refinancing facility for MainOne Company Nigeria Limited to drive the growth plans of the company. Standard Chartered Bank emerged as the lead arranger.

MainOne Cable is the first private submarine fiber optic cable operator in West Africa and is pursuing further expansion in terrestrial fiber networks and data centers. The group continues to expand its capacity and is engaged in several projects that when completed, will further strengthen its existing dominant position in the business-for-business telecommunications sector in Nigeria.

This is a landmark transaction for Standard Chartered, marking its first submarine cable financing in Nigeria. Standard Chartered Bank worked closely with Nigerian lenders in arranging the financing. The other lenders in the deal are First Bank of Nigeria Limited, Skye Bank Plc and First City Monument Bank Plc. Skye Bank was the lead financier of MainOne's first broadband rollout in 2010.

This agreement will enable MainOne to expand its services across Nigeria and West Africa. The key to MainOne's growth strategy and vision is to ensure that it continues to deploy infrastructure required to make its services available and affordable to institutional customers across its markets. Specifically, the company is building a Tier 3 data center and is also deploying an extensive fiber-optic network around Lagos. Access to affordable broadband services will enable Nigeria and other countries in West Africa to continue to grow their economies at a faster pace.

For more information, visit [www.mainonecable.com](http://www.mainonecable.com).

## Emerald, CenturyLink sign agreement for transatlantic capacity

Emerald Networks, a new transatlantic submarine fiber optic cable system provider, has signed an agreement with CenturyLink, Inc. in which CenturyLink will purchase bandwidth capacity on

Emerald's system, known as "Emerald Express." The system will provide CenturyLink with additional connectivity between North America and Europe.

The Emerald Express undersea cable system will be operational by fourth quarter 2014 with connections to North America, Europe and Iceland. It utilizes next-generation capabilities to provide low-latency, coherent, digital transmission at wavelengths of 100 Gbps and beyond.

"Establishing a strong global network and expanding our transatlantic capabilities is key to providing our customers with reliable connectivity on a global basis," said Pieter Poll, CenturyLink senior vice president of national and international network planning, engineering and construction. "Utilizing Emerald Networks' undersea cable system will help us to provide seamless service offerings, including high-bandwidth connectivity between our Savvis data centers globally."

Dr. William C. Marra, Emerald Networks CEO, believes this agreement reinforces the continued success of Emerald Networks' undersea cable system and the urgency for more secure and reliable high-speed data connections between the United States and Europe.

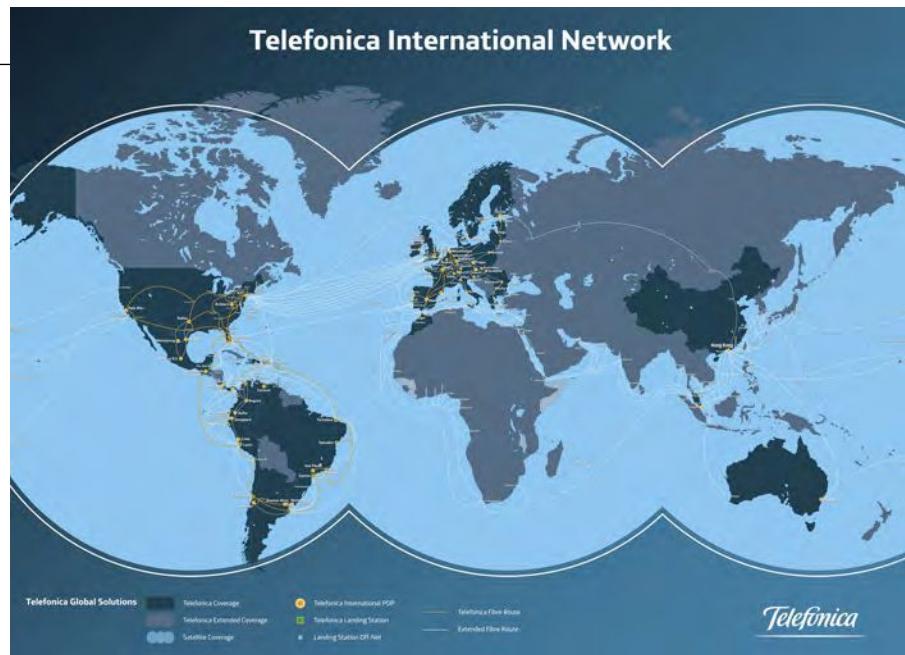
For more information, visit [www.emeraldnetworks.com](http://www.emeraldnetworks.com).

## Telefónica expands SAm-1 with Ciena's GeoMesh

Telefónica Global Solutions and Ciena® Corporation have deployed Ciena®'s 100G coherent optical transport technology on Telefónica's SAm-1 submarine and terrestrial network, which connects the U.S. to Latin America. With Ciena®'s converged packet optical and GeoMesh solution, Telefónica Global Solutions is able to support growing and unpredictable international customer demand for premium bandwidth services like cloud computing, video, and advanced business collaboration services.

The SAm-1 network is the largest fiber optics submarine system connecting the U.S. with Central and South America, with landing stations in Argentina, Brazil, Chile, Colombia, Ecuador, Guatemala, Peru, and the U.S., including Florida and Puerto Rico. The network delivers more than 2 Tbps of data traffic daily at times of peak demand and transports more than 20 billion international voice minutes a year. It provides value-added services for multinational and carrier customers, permanently maintaining an activated IP capacity that exceeds a total of 6 Tbps.

Telefónica Global Solutions deployed Ciena®'s 5400 Reconfigurable



Switching System and 6500 Packet-Optical Platform, powered by WaveLogic 3 100G Coherent Optical Processors, including advanced ROADM features and GeoMesh optical bypass, to support its 25,000-km submarine and terrestrial network. The 5400 equipped with coherent optical processors provides 100G services across multiple network links, including a 6,700-km submarine network link that connects Boca Raton, Florida to Fortaleza in Brazil and a 2,100 km unregenerated terrestrial network link that connects Buenos Aires in Argentina to Valparaiso in Chile, reducing network latency and complexity. The 5400 improves intelligent traffic management and bandwidth availability with 3.6 Tbps of switching capacity in eight of the Telefónica Global Solutions' Central and South America landing stations and 7.2 Tbps of switching capacity in the U.S. landing stations.

Telefónica is also leveraging Ciena®'s OneControl Unified Management System that provides multi-layer service management capabilities to enable streamlined service activation, fault management and performance monitoring. Ciena® is also providing consulting services, network engineering, project management, NOC contingency service, and First Line Maintenance services via its Specialist Services portfolio.

In addition, by applying Ciena®'s OPN architecture approach for creating programmable network infrastructures that deliver much lower cost-at-scale and allow network operators to better monetize their networks, the expanded TGS network has the ability to automatically adapt to changing conditions and network demands. This also makes it possible to safely and easily add 100G services to its existing cables as needs arise.

This deployment builds upon a long-

standing relationship between Ciena® and Telefónica Global Solutions. Ciena®'s converged packet optical technology is leveraged by Telefónica in 14 countries.

For more information, visit [www.ciena.com](http://www.ciena.com) or [www.telefonica.com](http://www.telefonica.com).

## SubPartners award APX-West contract to TE SubCom

TE SubCom and SubPartners Pty Ltd announced the signing of a system supply contract for the APX-West submarine cable system from Perth, Australia to Singapore. APX-West will deliver low-latency, diverse capacity between Australia and Singapore.

APX-West is a four fiber-pair system using the latest state-of-the-art ultra-long haul design delivering much needed capability and resiliency to the region. It will connect Perth, Australia to Changi North, Singapore, with planned branches to Jakarta, Indonesia, and Christmas Island. The system is approximately 4,700 km long and has an initial design capacity of up to 32 Tbps. It is expected to be Ready for Service (RFS) by the second quarter of 2015.

For more information, visit [www.subcom.com](http://www.subcom.com) or [www.subpartners.net](http://www.subpartners.net).

## Vocus lays cable across Sydney Harbour

Vocus Communications Limited has revealed another step in its dark fiber strategy by extending its dark fiber run to key business hubs in Northern Sydney, including Brookvale, French's Forest, Cromer and Manly. This fiber run covers a distance of approximately 20 km and is due to be lit and fully functioning in early November 2013.

The pinnacle of this dark fiber run

took place on Wednesday 30 October when Vocus ran submarine cable through Sydney's Middle Harbour at the Roseville Bridge.

Vocus has once again teamed up with their main cable supplier Prysmian to manufacture the 312 core submarine cable, the company said in a statement. The cable consists of 312 optical fibers in a water-proofed loose tube.

Existing Vocus customer Network Ten is set to benefit from this dark fiber run with the potential to add greater utilization to their existing Vocus fiber links.

This particular fiber run did not come easy, as it had to meet strict guidelines from local councils, RMS, Garigal National Park and NSW Office of Environment and Heritage. The project has taken over 6 months of intense planning so far.

The Northern Sydney dark fiber run is further strategic step in Vocus' plans to become a leading infrastructure provider to the telco, cloud computing and retail ISP markets.

For more information, visit [www.vocus.com.au](http://www.vocus.com.au).

### **World Bank looks to improve access for Palau, FSM**

People in the Federated States of Micronesia (FSM) and the Republic of Palau will get better telephone and Internet connectivity, with support from a new project announced by the World Bank.

The U.S. \$1.1 million grant was announced by the World Bank regional vice president for East Asia and the Pacific, Axel van Trotsenburg, in Palikir, FSM, on 6 September during his first official visit to the North Pacific.

The Telecommunications and ICT Technical Assistance Project aims to help attract new investment and promote competition in the telecommunications sector and bring down service costs. This will make it easier for governments to deliver services and for communities, families and businesses to communicate and share information.

"Connectivity is critical for job growth, for governments to bring health and education to their people, especially in remote Outer Islands, and for families and businesses to keep in touch," said van Trotsenburg. "This project is an important step for Micronesia. As part of a broader program of support, it will help connect people to each other, to the wider Pacific region, and to the world."

Access to broadband is low in both countries by international standards, and in Palau connectivity costs are among the

highest in the world. An entry-level high-speed Internet connection costs 15 times more than in Fiji and around 18 times more than in Australia. Less than 2% of the population, in both countries, subscribes to high-speed Internet services.

In addition to regulatory and policy reform, the World Bank will also support preparations for a possible project to connect Palau and FSM to broadband Internet via a submarine fiber optic cable from Guam as part of the second phase of the Pacific Regional Connectivity Program.

The technical assistance project for FSM and Palau is being funded by the Government of Australia through a grant from the Pacific Region Infrastructure Facility.

For more information, visit [www.worldbank.org](http://www.worldbank.org).

### **Uninett contracts with Global Marine for Arctic Circle cable**

Uninett, a non-profit company delivering telecom and data network connections to Norwegian universities and research institutions, has announced Global Marine Systems as the contracted provider of a new submarine fiber optic cable that will service the research community of Ny-Ålesund.

Uninett's high-speed research and education network connects more than 200 Norwegian educational and research institutions and their more than 300,000 users and links them to international research networks. The Ny-Ålesund research station supports earth and life scientists and is part of an international research community that includes sta-

tions owned by Norway, Germany, Japan, Italy, France and the UK. The station is the world's northern most research community.

Global Marine Systems, a company that specializes in the installation and maintenance of subsea cables, previously installed the world's most northerly commercial fiber optic cable. The company has unparalleled expertise in cable routing, system engineering and cable protection requirements in the Arctic environment.

"Global Marine Systems has a great track record installing subsea cable systems in the Arctic Circle, having previously installed cables from the Svalbard archipelago to the Norwegian mainland," stated Andrew Lloyd, director of installation for Global Marine Systems. "We have a strong appreciation for the unique challenges presented in connecting one of the world's northernmost settlements and look forward to working with Uninett in the successful expansion of the research network to the Ny-Ålesund station."

Uninett supplies a range of services connected with the research network, among other things in the fields of identity management, purchasing co-operation, mobility, network management and security. Uninett carries on innovation and development work in its technical fields and is involved in a wide range of activities internationally.

For more information, visit [www.globalmarinesystems.com](http://www.globalmarinesystems.com) or [www.uninett.no](http://www.uninett.no).



## Makai sees interest growing in offshore renewables

Makai Ocean Engineering has recently made multiple sales of its full-featured GIS route engineering software, MakaiPlan, to power cable installers who serve the offshore renewable energy market.

MakaiPlan allows users to create and edit submarine cable routes, define cables and in-line bodies, define and adjust slack, instantly create RPLs and SLDs, estimate system costs and generate a preliminary cable installation plan. Multiple

planners and designers work interactively on cable installations with easy access to and exchange of project data. The tool is the industry standard in cable route planning and engineering software, with over 300 licenses sold over the last 14 years.

Many of the largest subsea power cable installers and consultants are using MakaiPlan for the route engineering for subsea power cable projects, which already includes over 15 of the offshore wind farms in the UK and Europe. Current MakaiPlan users in the renewable industry include Pelagian International, Global Marine Systems, RES-Offshore, TetraTech, and Mojo Marine among others.

For more information, visit [www.makai.com](http://www.makai.com).

## Prysmian signs major contracts with Petrobras

Prysmian Group has been awarded new major contract worth a total of up to approximately \$260 million related to a frame agreement for umbilical products for offshore oil and gas extraction by Brazilian oil company Petrobras. The award refers to a frame agreement for 360 km of umbilicals, most of it to be used in pre-salt fields, in 16 different cross sections and related ancillaries, offshore services and qualifications, worth approximately \$260 million with 50% minimum purchasing commitment and call-off orders to be placed within a 2-year period.

The Group has also been awarded by Petrobras the extension to 2016 of the existing frame agreement for flexible pipes worth a total of \$95 million, of which \$20 million have already been called off for the Macabu, Jubarte and Marlim Leste fields.

Both the umbilicals and the flexible pipes for the new contracts will be manufactured in the Group's state-of-the-art plants in Vila Velha, Brazil, an industri-

al plant with high production capacity and a strategic location (on the Vitoria channel — Espírito Santo State) fully dedicated to subsea umbilicals, risers and flowlines (SURF).

The Group has a long-standing tradition of more than 35 years of technical and commercial partnerships with Petrobras, with Technical Cooperation Agreements and supplies of flexible pipes and umbilicals — both steel tube and thermoplastic — for several Petrobras' projects. The partnership with Petrobras has represented a major step forward for Prysmian in expanding its business in the Oil Gas & Petrochemicals (OG&P) industry, confirming the Group's strategic commitment to investing in value-added, high-tech businesses requiring specialist know-how.

Over the past years, Prysmian has been investing in the construction of the Vila Velha plants for umbilicals and flexible pipes with the aim of diversifying and further expanding its activities in the market of technology and products for the OG&P industry. The flexible pipes plant has complemented the umbilical plant, opened in 2007, and the addition of flexible pipes to its product range has enabled Prysmian to offer the OG&P industry a comprehensive range of SURF products. Now thanks to the merger between Prysmian and Draka, the Group can also rely on two plants in North America, thus broadening the available range of products technology to special Down Hole Technology systems (manufactured in Massachusetts and New Jersey) and creating interesting cross-selling opportunities to accelerate the business's expansion also in new strategic areas such as ASEAN, Northern Europe and Western Africa.

For more information, visit [www.prysmian.com](http://www.prysmian.com).

## Boskalis, VolkerWessels launch new venture

Royal Boskalis Westminster N.V. and Royal Volker Wessels Stevin N.V. (VolkerWessels) have combined their forces in the field of offshore cable installation by establishing a 50/50 joint venture. The joint venture creates a strong party combining know-how and equipment, allowing it to respond effectively to growth in the market for offshore cable installation projects, particularly in relation to offshore wind farms.

Boskalis and VolkerWessels each hold a 50% stake in the joint venture Visser & Smit Marine Contracting Holding B.V. (VSMC) through Boskalis Offshore Subsea Contracting B.V. and VWS Civil and Offshore Constructions B.V., respectively. VSMC will have two cable-laying



vessels at its disposal, the Stemat Spirit and Ndurance. The Ndurance is expected to be delivered at the end of this year. Both vessels are fitted with DP class 2 equipment with a cable turntable capacity of around 5,000 tons.

Boskalis and VolkerWessels see great potential in the collaboration, given the market developments, VSMC's strong market position, and the resulting strength by combining knowledge and equipment. Boskalis and VolkerWessels have already been working successfully together for some years on a project basis, for example on the installation of power cables for sizeable offshore wind farms such as Nordsee Ost and Meerwind in Germany and Westermost Rough and Humber Gateway in the United Kingdom.

For more information, visit [www.boskalis.com](http://www.boskalis.com) or [www.volkerwessels.com](http://www.volkerwessels.com).

## Van Oord orders cable ship

Van Oord has ordered a new cable-laying vessel. The ship will be built at Damen Shipyards' wharf in Romania and will be completed at the end of 2014. The ship is intended for the installation of electricity cables for offshore wind parks.

Van Oord is making preparations for the Gemini wind park project, which will be constructed 60 km to the north of Schiermonnikoog, one of the Dutch Wadden Islands. The cable-laying vessel will be deployed at that site, among many others.

The investment concerns a multipurpose vessel with a dead weight of 8,500 tons, a length of 120 m, a beam of 28 m and a DP-2 system (dynamic positioning). It will be equipped with a cable carousel with a capacity of more than 5,000 tons and an offshore crane that will enable it to lay heavy and long export cables. On board, 90 people can be accommodated.

The cable-laying vessel forms part of the Van Oord strategy to offer a complete package for the construction of offshore wind parks as an EPC contractor.

For more information, visit [www.vanoord.com](http://www.vanoord.com).

## Reef Subsea awarded Middle East contracts

Reef Subsea Dredging and Excavation (D&E) has secured two contracts in the Middle East involving submarine cable work as the company continues to grow its global footprint.

The Middle East contracts will involve two teams from the company's UK workforce managing subsea excavation work in Saudi Arabia and Iraq. The work in the Al Khafji field in Saudi Arabia, on behalf of Technip and Khafji Joint Operations (KJO), is a shore approach cable excavation in shallow waters. Specialist personnel will also be deployed for the post-lay burial of the 165-mm composite cable.

The second contract is the first project for Reef Subsea in Iraqi waters working with Leighton Offshore as part of the Iraqi Crude Oil Expansion Programme (ICOEEP). The work involves post-lay burial of a fiber optic cable in excess of 50 km in length in Iraq's largest producing oil field.

Reef Subsea's specialist controlled flow excavation tools, the T4000 and Twin R2000, will be deployed for both projects as these can work effectively on live cables and pipelines without compromising the subsea assets integrity. The company has two sets of equipment based in Abu Dhabi for operations in the UAE and surrounding areas.

For more information, visit [www.reefsubsea.com](http://www.reefsubsea.com).

#### **The Vanuatu-Fiji Cable Project: bridging the digital divide**

The international team at Rockwell Olivier Sydney recently advised Australia and New Zealand Banking Group Limited (as the lead arranger) in relation to the historic provision of project financing for the Interchange Vanuatu Cable Project.

The project is a massive milestone for the people of Vanuatu and heralds the arrival of the first submarine optical fiber cable connection for Vanuatu. The project involves Interchange Limited (a Vanuatu-based company) constructing, owning and operating a 1,224-km submarine cable to connect Vanuatu with Suva, Fiji, which in turn provides connectivity of Vanuatu to the Southern Cross Cable Network, which links Australia and New Zealand with the United States.

The new cable will provide additional capacity and speed for international traffic, making it a key infrastructural improvement that will assist Vanuatu both economically and socially.

Rockwell Olivier Sydney's involvement in the project began with conducting the legal due diligence exercise that included, but was not limited to, understanding the corporate structure of the project company; understanding the licenses, regulatory and environmental approvals that had been obtained; and

reviewing the insurances, capacity purchase agreements and supply contracts for the build.

The company also was involved in the documentation and negotiation of the financing of the deal, including the facility and collateral/security package.

For more information, visit [www.rockwellolivier.com.au](http://www.rockwellolivier.com.au).

#### **Coastline Surveys completes sub-marine asset survey for Wave Hub**

Coastline Surveys has completed a

survey of submarine assets involving multi-beam bathymetry and side-scan sonar, ROV visual inspection and cable burial surveys for Wave Hub, a grid-connected offshore facility in southwest England for the large-scale testing of technologies that generate electricity from the power of the waves.

Coastline Surveys was delighted to be awarded the contract to carry out the submarine asset survey, including multi-beam bathymetry and side-scan sonar, ROV visual inspection and cable burial

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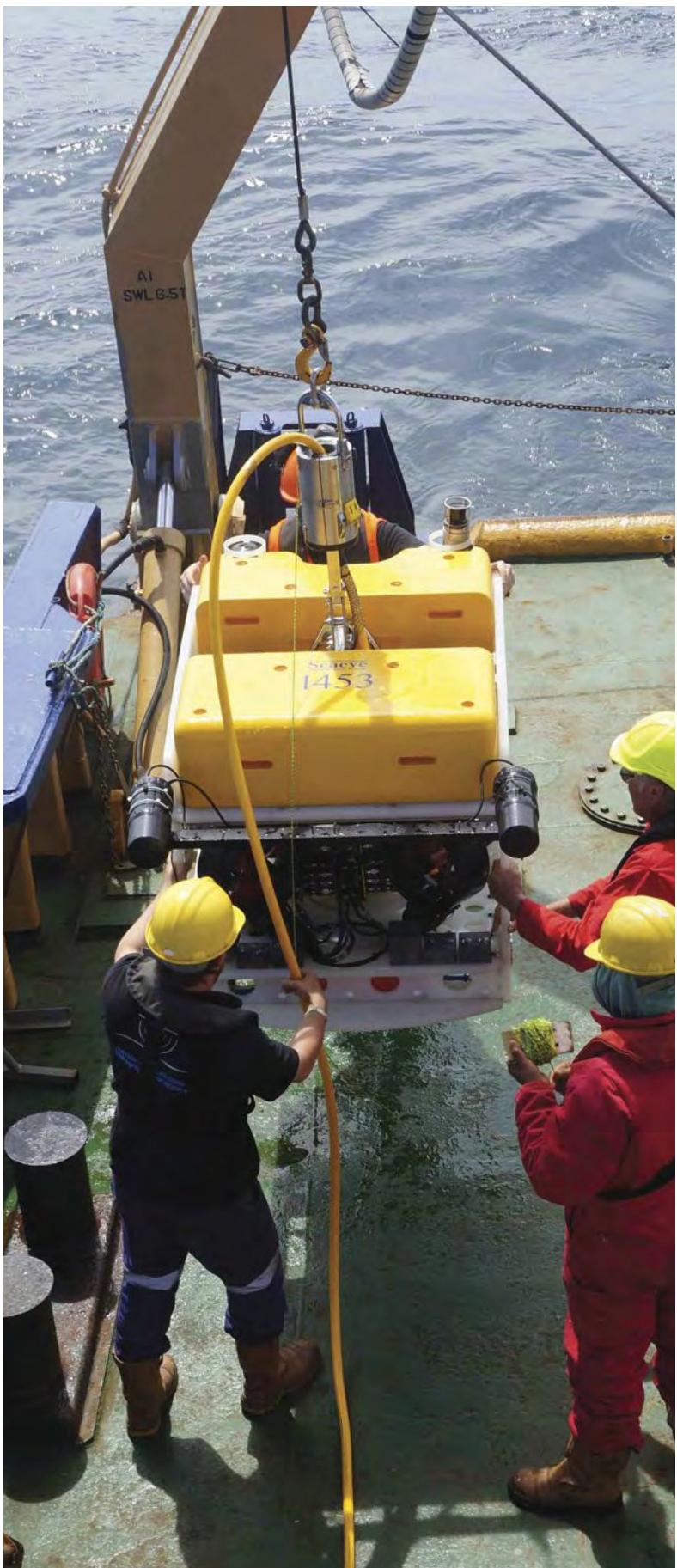
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surveys. Additional geotechnical investigations were undertaken in test berth 4 to assess the seabed nature for future anchoring of proposed test devices. The surveys for this important renewable energy site were successfully completed in July and August 2013. Not only is this an important renewable energy project with which to be involved, it is also located right on the doorstep of Coastlines' head office in Falmouth.

The MV FlatHolm, Coastlines' 24-m fully equipped survey vessel was deployed from its base in Lowestoft and stationed in Newlyn harbor for the duration of the contract along with its full-time crew and an in-house team of specialist hydrographic surveyors and geophysicists.

The scope of work included a complete bathymetric survey of the entire cable route to establish seabed and asset conditions. This was carried out with the high-resolution R2Sonic 2024 Multi Beam Echo sounder together with a Klein 4200 dual-frequency side-scan sonar. A cable burial survey was carried out on the inshore 8 km of the cable. The cable burial survey was completed with an Innovatum Smartrak cable detection system following a tone applied to the cable. The Smartrak system was mounted on a Cougar XT ROV that was also used for the video inspection element of the works. Surface positioning was provided by a C-NAV 3050 GNSS system and subsurface was provided by a Nexus Easytrak USBL system. A combination of QPS QINSy, Fledermaus, EIVA Navipac and Innovatum software was used for acquiring and processing the survey.

The project was split into three phases to make the most of the MV FlatHolm's unique capabilities to carry out all three elements of the scope of works. The Geotechnical investigation was carried out first — comprising vibrocores at each of the proposed anchor locations in berth 4. The vessel was then switched to geophysical mode to complete phase two — the full cable length bathymetric survey. Phase three comprised the ROV operations, including the visual and cable burial surveys.

The biggest challenge to the project was the strong tidal streams on the site that restricted the window of operations for the ROV work. Using the more powerful Cougar XT was a benefit in being able to extend the window of operations. Excellent vessel handling skills by the dedicated Flatholm crew also maximized productivity during this phase of operations. The ability to remain on site for up to 7 to 10 days enabled maximum use of the working windows with minimal time lost for transit back to port.

By breaking down the project into phases, Coastline was able to offer an efficient and cost-effective solution with a platform that was able to complete the entire scope of work from very shallow inshore operations out to the offshore end of the project. All operations were completed within anticipated timescales on site while maintaining their enviable safety record.

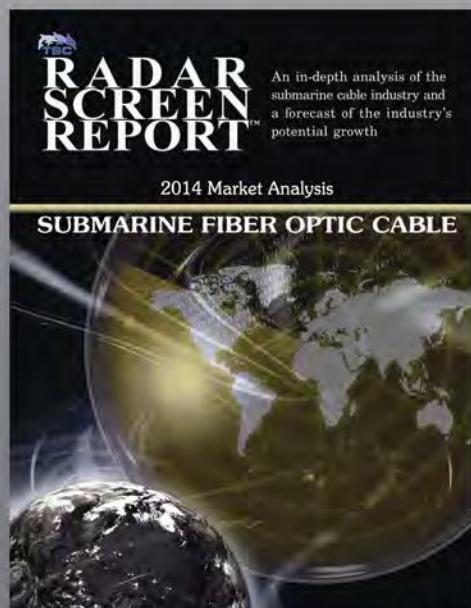
For more information, visit [www.coastlinesurveys.co.uk](http://www.coastlinesurveys.co.uk).

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# FIBER OPTIC CABLE

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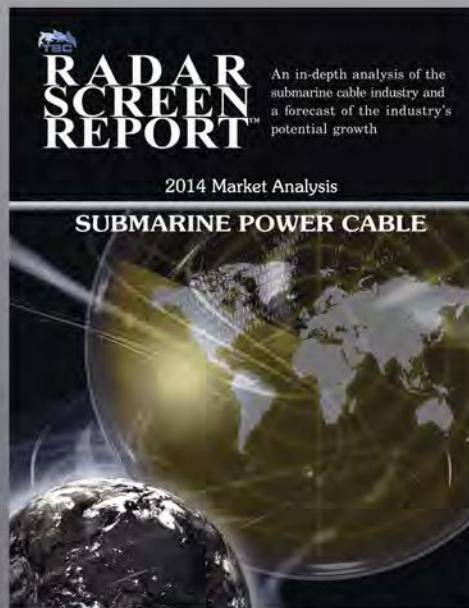
The 2014 Radar Screen Report™ is available January 2014 and includes a mid-year update.

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## The World of Submarine

# POWER CABLE

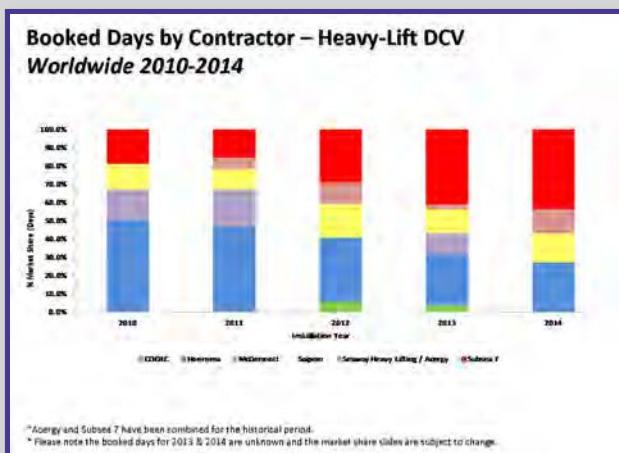
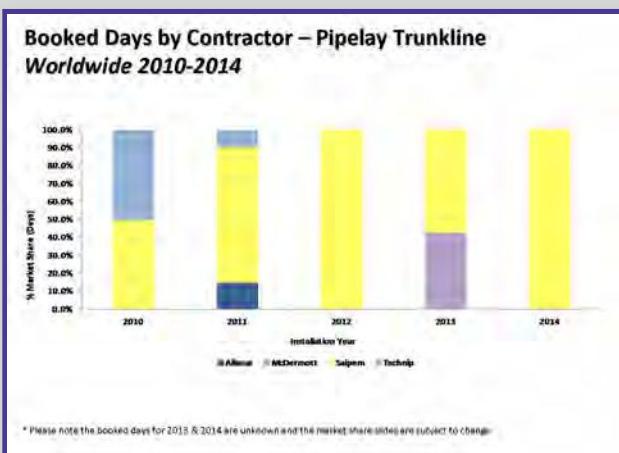
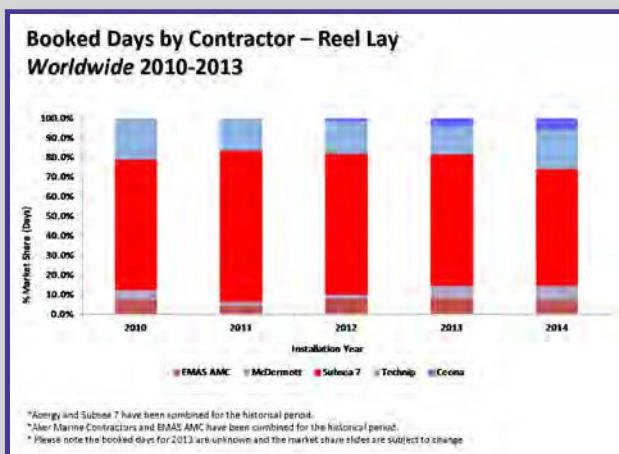
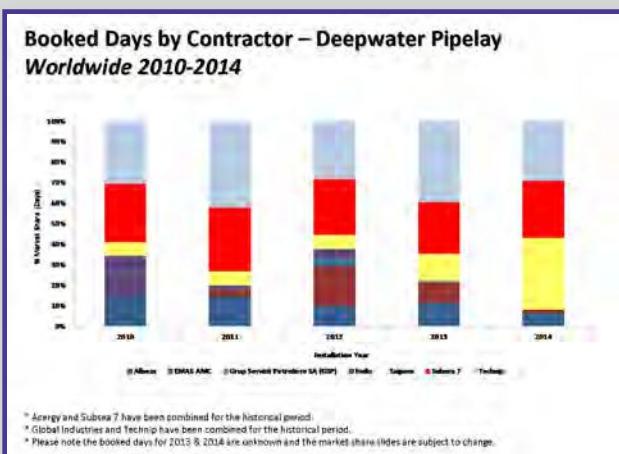
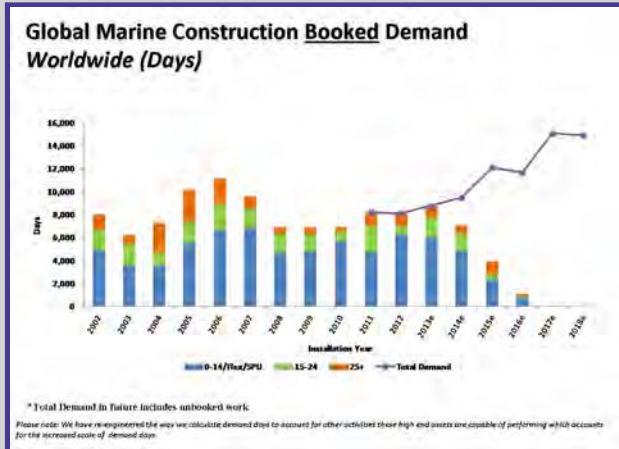
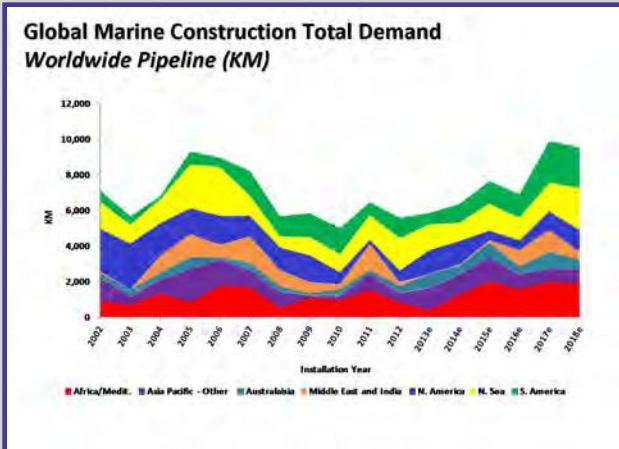
As the market expands to meet demand, contract opportunities for services and equipment grow with it. The 2014 Radar Screen Power Cable Report examines the factors influencing demand and provides insight for future development out to 2019.



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# Offshore At-A-Glance

## Quest Offshore Activity Report



FOR MORE DETAILED INFORMATION

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# Gulf of Mexico Data

## Current Deepwater Activity

Operator	Area	Block	OCS Lease	Rig Name	Prospect Name	Water Depth (ft)
Shell Offshore Inc.	WR	508	G17001	NOBLE JIM DAY	Stones	9,553
Shell Offshore Inc.	DC	843	G23540	NOBLE GLOBETROTTER	Swordfish	8,487
Marathon Oil Company	DC	757	G31570	ENSCO 8502	Madagascar	8,391
Petrobras America, Inc.	WR	206	G16965	ENSCO DS-5	Cascade	8,147
Shell Offshore Inc.	AC	857	G17561	H&P 205	Great White	7,819
Exxon Mobil Corp.	KC	964	G21451	T.O. DEEPWATER CHAMPION	Hadrian South	7,657
BP Exploration & Production, Inc.	GC	743	G15607	T.O. DEVELOPMENT DRILLER II	Atlantis	6,824
Anadarko Petroleum Corp.	KC	875	G21444	COIL TUBING UNIT	Lucius	6,809
Anadarko Petroleum Corp.	KC	875	G21444	ENSCO 8500	Lucius	6,809
Noble Energy, Inc.	MC	782	G33757	ENSCO 8501	Caterpillar	6,581
Chevron USA, Inc.	KC	829	G25814	T.O. DISCOVERER CLEAR LEADER	Buckskin	6,428
BP Exploration & Production, Inc.	MC	778	G14658	THUNDER HORSE PDQ	Thunder Horse North	6,040
Cobalt International Energy, LP	KC	163	G32606	ENSCO 8503	Koa	5,616
BP Exploration & Production, Inc.	GC	743	G15604	T.O. DEVELOPMENT III	Atlantis	5,414
BP Exploration & Production, Inc.	KC	93	G25780	SEADRILL WEST CAPRICORN	Gila	4,856
Noble Energy	VK	962	G15444	CAL-DIVE Q-4000	Swordfish	4,677
Anadarko Petroleum Corp.	GC	683	G16783	T.O. DISCOVERER SPIRIT	Caesar	4,485
BP Exploration & Production, Inc.	GC	782	G15610	MAD DOG SPAR RIG	Mad Dog Phase 2	4,428
Hess Corp.	MC	725	G22898	STENA FORTH	Tubular Bells	4,328
Apache Deepwater LLC	MC	983	G34468	ENSCO 8505		4,326
Chevron USA, Inc.	GC	640	G20082	T.O. DISCOVERER INSPIRATION	Tahiti 2	4,298
BHP Billiton Petroleum (GOM) Inc.	GC	653	G20084	GSF C.R. LUIGS	Shenzi development	4,235
BP Exploration & Production, Inc.	KC	57	G25777	SEADRILL WEST SIRIUS		4,065
Chevron USA, Inc.	GB	973	G32911	PACIFIC SANTA ANA		3,960
Shell Offshore, Inc.	MC	809	G09873	NOBLE DON TAYLOR	Princess	3,853
Shell Offshore, Inc.	MC	934	G07975	ATWOOD CONDOR	Europa	3,845
Anadarko Petroleum Corp.	EB	645	G32822	ENSCO 8506	Deep Nansen	3,798
Shell Offshore, Inc.	MC	894	G24122	NOBLE DANNY ADKINS		3,787
Shell Offshore, Inc.	GC	248	G15565	T.O. DEEPWATER NAUTILUS	Glider	3,233
Shell Offshore, Inc.	VK	956	G08475	COIL TUBING UNIT (N.O. DIST)	Ram-Powell	3,214
Shell Offshore, Inc.	VK	956	G08474	NABORS 202	Ram-Powell	3,214
Shell Offshore, Inc.	MC	762	G24112	NOBLE BULLY I	Deimos	3,144
Shell Offshore, Inc.	MC	807	G07963	H&P 201	Mars (Ursa/Princess)	2,945
W&T Energy VI, LLC	MC	243	G19931	HYDRAULIC WORKOVER UNIT NO	Matterhorn	2,816
Shell Offshore, Inc.	GB	427	G07493	NOBLE JIM THOMPSON	Cardamom	2,720
LLOG Exploration Offshore, LLC	MC	503	G27277	NOBLE AMOS RUNNER	WhoDat	2,648
Eni U.S. Operating Co. Inc.	MC	546	G25098	T.O. DEEPWATER PATHFINDER	Longhorn MC 502 546	2,599
Shell Offshore Inc.	GB	372	G17355	NOBLE DRILLER	Mount serrat	1,526
SandRidge Offshore, LLC	GC	65	G14668	H&P 206	Bullwinkle	1,353
Stone Energy Corp.	MC	26	G31474	DIAMOND OCEAN VICTORY	Supertramp	1,116
Chevron USA, Inc.	GB	189	G06358	HYDRAULIC WORKOVER UNIT (L)	Tick	718
SandRidge Offshore, LLC	EB	110	G02650	NABORS S.D. IV	Tequila	660

Deepwater prospects with drilling and workover activity: 42

Current Deepwater Activity as of Tuesday, 3 December 2013

### Activity by Water Depth

Water Depth (m)	Active Leases	Approved Applications	Active
0 to 200	1,571	35,287	2,569
201 to 400	116	1,117	20
401 to 800	293	864	10
801 to 1,000	373	576	9
1,000 & above	3,433	1,874	26

### Rig Activity Report 13 December 2013

Location	Week of 12/13	Week +/- Ago	Week +/- Ago	Year Ago
Land	1703	7	1696	-26
Inland Waters	20	2	18	-1
Offshore	59	-2	61	10
U.S. Total	1782	7	1775	-17
Gulf of Mexico	57	-2	59	10
Canada	426	24	402	8
N. America	2208	31	2177	-9
				2217

Activity by Water Depth Information current as of Tuesday, 3 December 2013

Maximum number of rigs operating in the deepwater Gulf of Mexico. The rig unit includes platform rigs operating on deepwater production facilities in addition to the MODU's. The numbers do not distinguish between rigs drilling and those in service for completion and workover operations.

Information provided courtesy of the U.S. Bureau of Ocean Energy Management

# Monthly Stock Figures & Composite Index

Industry Company Name	Symbol	Close(Mid) December	Close(Mid) November	Change	Change %	High	Low 52 week
<b>Diversified, Production Support and Equipment Companies</b>							
Baker Hughes, Inc.	BHI	53.03	58.15	-5.12	-8.8%	58.83	39.56
Cameron Intl. Corp.	CAM	57.48	55.65	1.83	3.3%	67.42	52.50
Drill-Quip, Inc.	DRQ	108.81	114.44	-5.63	-4.9%	121.97	69.51
Halliburton Company	HAL	49.90	56.15	-6.25	-11.1%	56.52	33.02
Tenaris SA	TS	43.39	45.65	-2.26	-5.0%	49.87	38.47
Newpark Resources, Inc.	NR	12.27	12.74	-0.47	-3.7%	13.64	7.61
Schlumberger Ltd.	SLB	86.54	92.81	-6.27	-6.8%	94.91	67.64
Superior Energy Services, Inc.	SPN	25.03	27.87	-2.84	-10.2%	29.22	19.77
Weatherford International, Inc.	WFT	14.74	16.93	-2.19	-12.9%	17.38	10.50
Deep Down, Inc.	DPDW	2.03	2.20	(0.17)	-7.7%	2.70	1.17
FMC Technologies	FTI	52.77	49.14	3.63	7.4%	59.79	40.24
<b>Total Diversified, Production, Support and Equipment.....</b>	<b>505.99</b>	<b>531.73</b>	<b>-25.74</b>	<b>-4.8%</b>	<b>572.25</b>	<b>379.99</b>	
<b>Geophysical / Reservoir Management</b>							
Dawson Geophysical Company	DWSN	31.54	30.74	0.80	2.6%	40.86	23.15
Mitcham Industries, Inc.	MIND	16.56	15.97	0.59	3.7%	18.41	12.12
Compagnie Gnrale de Gophysique-Veritas	CGV	19.86	21.02	-1.16	4.5%	31.12	19.37
<b>Total Geophysical / Reservoir Management.....</b>	<b>67.96</b>	<b>67.73</b>	<b>0.23</b>	<b>0.3%</b>	<b>90.39</b>	<b>54.64</b>	
<b>Offshore Drilling Companies</b>							
Atwood Oceanics, Inc.	ATW	51.70	57.77	-6.07	-10.5%	59.49	43.91
Diamond Offshore Drilling, Inc.	DO	55.94	61.34	-5.40	-8.8%	76.85	55.88
ENSCO International, Inc.	ESV	58.08	61.37	-3.29	-5.4%	65.82	51.01
Nabors Industries, Inc.	NBR	15.81	17.82	-2.01	-11.3%	18.33	13.50
Noble Drilling Corp.	NE	36.61	40.18	-3.57	-8.9%	42.34	33.68
Parker Drilling Company	PKD	7.81	8.19	-0.38	-4.6%	8.50	3.75
Rowan Companies, Inc.	RDC	33.90	37.26	-3.36	-9.0%	38.65	30.21
Transocean Offshore, Inc.	RIG	48.10	54.06	-5.96	-11.0%	59.50	43.74
<b>Total Offshore Drilling.....</b>	<b>307.95</b>	<b>337.99</b>	<b>-30.04</b>	<b>-8.9%</b>	<b>369.48</b>	<b>275.68</b>	
<b>Offshore Contractors, Services, and Support Companies</b>							
Helix Energy Solutions Group, Inc.	HLX	23.31	23.76	-0.45	-1.9%	27.58	18.92
Gulf Island Fabrication	GIFI	23.23	25.75	-2.52	-9.8%	26.82	18.76
McDermott International, Inc.	MDR	8.18	8.20	-0.02	-0.2%	13.48	6.68
Oceaneering International	OII	78.99	83.90	-4.91	-5.9%	87.64	51.60
Subsea 7 SA	SUBCY.PK	18.81	20.62	-1.81	-8.8%	25.48	17.05
Technip ADS	TKPPY.PK	24.11	26.46	-2.35	-8.9%	31.32	23.80
Tetra Technologies, Inc.	TTI	11.98	12.72	-0.74	-5.8%	13.41	7.14
Cal Dive International, Inc.	DVR	1.69	1.89	-0.20	-10.6%	1.51	2.38
<b>Total Offshore Contractors, Service, and Support.....</b>	<b>190.30</b>	<b>203.30</b>	<b>-13.00</b>	<b>-6.4%</b>	<b>227.24</b>	<b>146.33</b>	
<b>Offshore Transportation and Boat Companies</b>							
Seacor Holdings, Inc.	CKH	91.10	97.63	-6.53	-6.7%	99.00	63.59
Gulfmark Offshore, Inc.	GLF	46.32	51.25	-4.93	-9.6%	53.89	32.93
Bristow Group	BRS	76.08	82.76	-6.68	-8.1%	85.70	51.71
PHI, Inc.	PHII	37.21	37.54	-0.33	-0.9%	39.25	23.43
Tidewater, Inc.	TDW	56.01	61.99	-5.98	-9.6%	63.22	43.56
Trico Marine Services, Inc.	TRMAQ.PK	0.04	0.04	0.00	0.0%	0.11	0.01
Hornbeck Offshore	HOS	49.06	53.63	-4.57	-8.5%	59.93	33.45
<b>Total Offshore Transportation and Boat .....</b>	<b>355.82</b>	<b>384.84</b>	<b>-29.02</b>	<b>-7.5%</b>	<b>401.10</b>	<b>248.68</b>	

January 2014

Ocean News &amp; Technology

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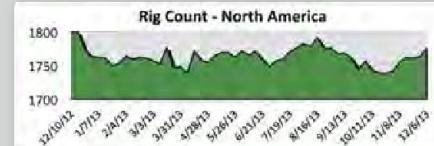
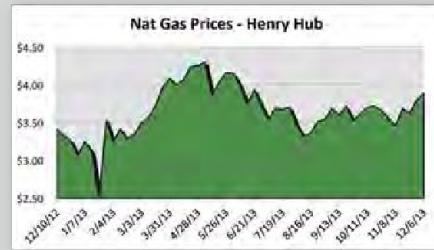
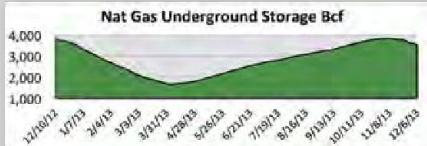
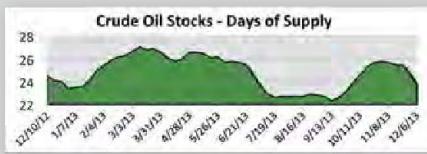
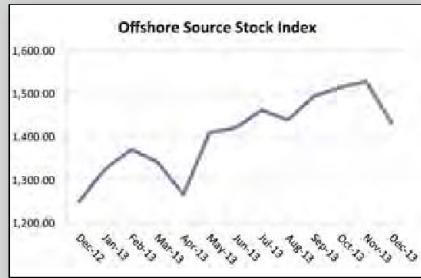
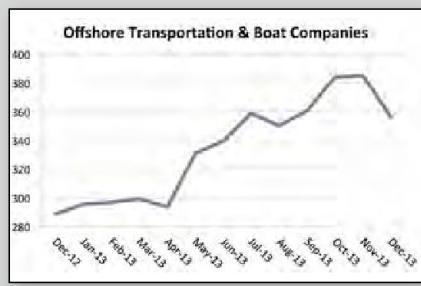
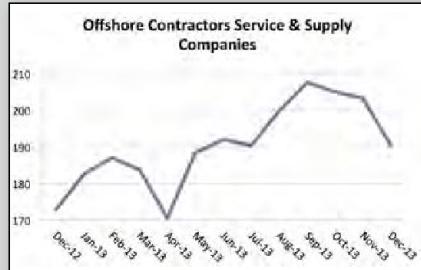
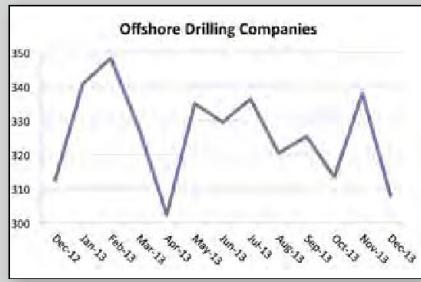
# Monthly Stock Figures & Composite Index

Industry	Close(Mid) December	Close(Mid) November	Change -25.74	Change -4.8%	High 572.25	Low 379.99
Diversified, Production Support & Equipment Companies	505.99	531.73	-25.74	-4.8%	572.25	379.99
Total Geophysical / Reservoir Management	67.96	67.73	0.23	0.3%	90.39	54.64
Total Offshore Drilling	307.95	337.99	-30.04	-8.9%	369.48	275.68
Total Offshore Contractors, Service and Support	190.30	203.30	-13.00	-6.4%	227.24	146.33
Total Offshore Transportation and Boat	355.82	384.84	-29.02	-7.5%	401.10	248.68
Total Offshore Source Index	1,428.02	1,525.59	-97.57	-6.4%	1,660.46	1,105.32

**DISCLAIMER**  
*The information on this page is provided for information and comparison purposes only and should not be used to make financial and business decisions and is accurate to the best of our knowledge for the period indicated.*

## Oil & Gas Industry Trends

**Monitoring the Pulse of the U.S. Offshore Oil & Gas Industry**



**Positive trend, at least 3 weeks**  
**Changing trend, less than 3 weeks**  
**Negative trend, at least 3 weeks**

## Oceanic Imaging Consultants introduces stand-alone mosaicking module (SAMM) for forward-look sonar

Oceanic Imaging Consultants, Inc. (OIC), of Honolulu, Hawaii, introduced the first Stand-Alone Mosaicking Module (SAMM) for forward-look sonar (FLS). SAMM is a plug-and-play add-on to forward-look sonar systems that automatically creates mosaics in real time from FLS data.

"SAMM works in real time reading live data from a socket. It can also be used for post-processing. It currently reads FLS data from Kongsberg Mesotech M3, Teledyne-BlueView 2D Multibeam Imaging Sonar, and Tritech's Gemini system," said Thomas Reed, president of OIC. "We introduced SAMM at the Oceans 2013 trade show, and our customers loved it. We already have commitments from several clients. We saw a need in the marketplace for an FLS mosaicking tool and are delighted to have been able to quickly meet the client's requirements."

### SAMM's Data Acquisition Features

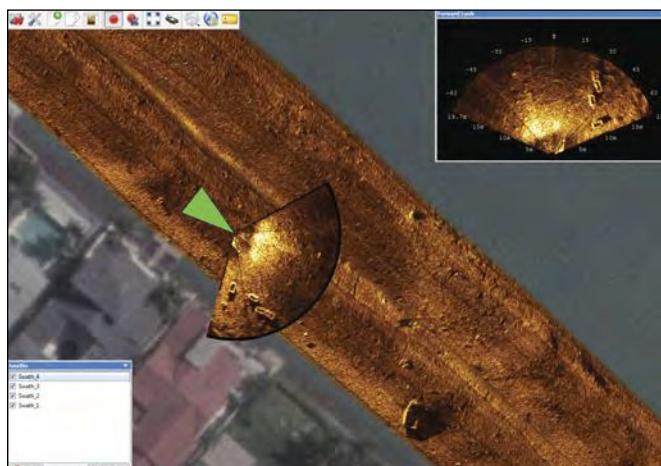
- Stand-alone module, seamlessly compatible with an existing FLS system
- Simultaneous mosaicking and logging of broadcast data
- Interactive control of track layering, processing and sensor offsets
- Pan, zoom, target marking and vessel track

### SAMM's Post-Acquisition Processing Features

- Sensor/navigation offset and bias corrections
- Navigation and heading filtering
- Instant reprocessing and editing of recorded data

- Layering of individual tracks for optimal mosaic composition
- Per-track adjustment of contrast/gamma/brightness
- Interactive image selection tools for cherry picking data
- Contact marking, measurement, classification and export
- 16-bit imagery support for optimum image resolution
- Background display of air photos, satellite imagery, raster, and vector charts
- Easy image export to GeoTIFF and Google Earth

For more information, visit [www.oicinc.com](http://www.oicinc.com).



## BioSonics announces major software release

BioSonics announced the release of VisAcq AutoTrack, a new software module for researchers who use hydroacoustics for fisheries stock assessment. "We believe this to be the most revolutionary fisheries software product in BioSonics' history," stated company president, Tim Acker. VisAcq AutoTrack works with BioSonics widely used data acquisition program, Visual Acquisition, as a real-time processing tool that automatically builds and records fish track lists. VisAcq AutoTrack calculates the sampled volume and fish density by depth strata. At the conclusion of a mobile hydro-

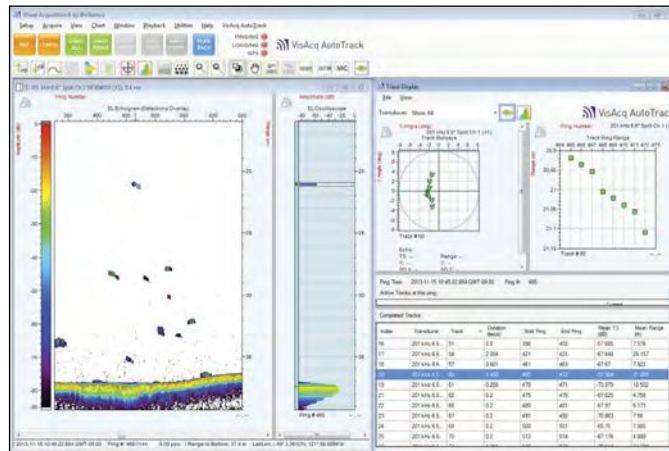
acoustic survey, data processing is essentially completed and the user need only export track lists to a CSV file. No further data processing or additional software is required to obtain usable information for fisheries management. Sorting the data from the automatically generated track lists provides the user with information that includes:

- Fish density by depth strata;
- Spatial distribution;
- Sizing distribution; and
- Total counts of detected fish.

Usability was a key consideration in the development of VisAcq AutoTrack. Before starting a survey, the user configures the single echo and fish track detection parameters and then collects their hydroacoustic data as usual. Fish tracks are recorded automatically, and the user can literally walk off the boat upon completion of a mobile survey with data processing essentially completed.

VisAcq AutoTrack is compatible with data files collected using a DT-X echosounder, and a reprocessing utility allows for creation of track lists from previously collected files. Conventional data processing methods can take hours of time to generate usable information, thus VisAcq AutoTrack offers a dramatic reduction in time and effort spent for users requiring basic fisheries information.

For more information, visit [www.biosonicsinc.com](http://www.biosonicsinc.com).



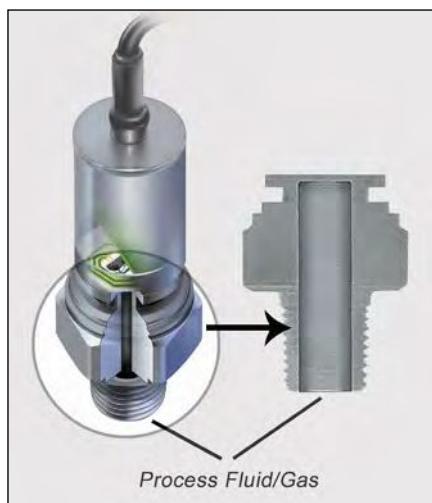
## exactEarth further expands its fleet of AIS satellites

exactEarth Ltd., a leading provider of Satellite AIS data services, announced the successful launch of an advanced AIS satellite that will extend its exactAIS® constellation and increase the capacity of its global vessel monitoring service. The spacecraft was built by SpaceQuest, Ltd. of Fairfax, Virginia and was launched from the Yasny launch base in Russia aboard a Dnepr rocket. The addition of this spacecraft will increase the exactEarth constellation to five satellites and further improve exactEarth's world-leading AIS message detection performance from space.

For more information, visit [www.exactearth.com](http://www.exactearth.com).

## Pressure sensors constructed with hastelloy materials

Measuring sea water pressure can be complicated as the presence of oxygen can increase corrosion of standard stainless steels commonly used in the construction of pressure sensors. Scaling from minerals can also lead to the long-term break down of standard stainless



steel pressure transducers while microbial organisms can grow within a system to clog openings and break down material. Higher pressures can also increase erosion and speed the process within a system.

American Sensor Technologies (AST) manufactures pressure transducers using Hastelloy C276 material for use with corrosive liquids and gases. Using the thickest Hastelloy diaphragm in the industry for a given pressure,

AST ensures long-term use of its sensors as well as the output signal. With the diaphragm being the thinnest and most critical piece of a pressure transducer, ensuring it will withstand a long-term installation is critical.

Utilizing its exclusive Krystal Bond Technology, AST designs its pressure sensors as a monolithic piece of material with no welds, O-rings, or fluid fills. Bulk silicon strain gauges are mounted directly to the top of the metal diaphragm using a special glass firing process. With high raw output signal, inorganic materials, and a thick diaphragm membrane, users benefit from complete isolation of the pressure to the fitting and long-term stability.

For more information, visit [www.astensors.com](http://www.astensors.com).

## Kongsberg unveils heading and GNSS surface position options for ebird-enabled seismic spreads

Kongsberg Seatex, a fully owned subsidiary of Kongsberg Maritime, has now given users of the sophisticated eBird® system the ability to equip SmartWing® instrumentation with two additional features — a compass and a

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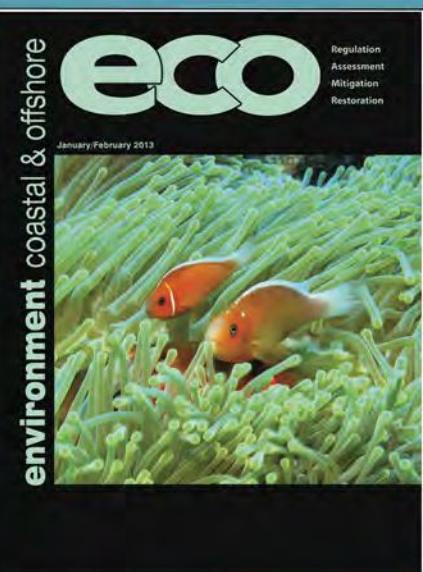
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## PRODUCT NEWS



GNSS receiver. eBird® is a novel bird concept for lateral, vertical and roll streamer control in marine seismic acquisition that enables fault-tolerant and efficient multi streamer steering by employing a wide range of innovative and patented technological solutions.

The innovative approach of placing a GNSS receiver in the wings opens new opportunities for improving the efficiency of an operation — in particular during launch and recovery but also when running lines.

The built-in GNSS receiver has been implemented based on Kongsberg Seatex' extensive competence within GNSS technology. Transmission of satellite data from the seismic vessel to eBird® reduces the time to first position fix considerably — giving eBird® a position with one wing semi-surfaced. The built-in compass has been developed based on Kongsberg Seatex' deep knowledge and experience within sensor technology and is fully integrated with SmartWing®. The compass provides heading information from a submerged eBird®.

For more information, visit [www.km.kongsberg.com](http://www.km.kongsberg.com).

### Garmin® introduces DownVü and SideVü scanning sonar

Garmin International Inc., a unit of Garmin Ltd., the global leader in satellite navigation, announced DownVü and SideVü, its down and side-scanning sonar technology that provides high-resolution imagery and excellent precision for what's in the water below and beside the boat.

Garmin DownVü is a high-frequency sonar that provides a near-picture quality representation of objects, structure, and fish that the boat is passing over. With a finer, concentrated sonar signal scanning a designated area, DownVü provides excellent resolution with great target separation in fresh and saltwater.

An updated line of echo fishfinders will now support DownVü. Whether it's a 4-in. grayscale echo unit or one with full color display, anglers can receive the same clear precision of DownVü on a dedicated fishfinder with a DownVü transducer. This updated echo series will also support a 50-kHz transducer, further expanding the functionality to saltwater anglers.

With the introduction of DownVü, Garmin will also release a new series of echoMAP units with built-in DownVü capability. The echoMAP 50dv and 70dv boast the same vibrant screens and capabilities as the previously released echoMAP series, but now add DownVü scanning technology.

Much like DownVü, SideVü is high-frequency sonar that gives a clear image of fish or structure that are located to the sides of the boat. This true-to-life picture of what's below the water's surface helps identify the most ideal spots and structures for fishing.

For more information, visit [www.garmin.com](http://www.garmin.com).

## Introducing the MacArtney MERMAC ROV winch series

The MacArtney Group is pleased to introduce the newly upgraded MERMAC R series of ROV winches. Featuring high-power and speed, minimal maintenance requirements, a rugged and compact design, Active Heave Compensation (AHC), and a unique Remote Diagnostics Tool, the MERMAC R series promises to deliver cutting-edge winch solutions for ROV systems and tasks of all types.



Selecting the right winch system for a specific vessel, ROV system and task portfolio is a complex matter. Drawing on its extensive experience as a global supplier of winch and handling solutions, MacArtney aims to facilitate this process by offering a comprehensive selection of standard and customized MERMAC ROV winch solutions — all featuring the latest within winch design, innovation, and technology. Employed for work class and inspection ROV systems alike, MERMAC R winches are available as standalone systems, as part of launch and recovery packages, or as part of complete vessel moon pool handling solutions.

MacArtney MERMAC R winches are designed to be highly dependable, versatile, and modular systems. Several components are standardized, making it easy for the client to select the required performance and capacity. Moreover, the modularity of MERMAC R winches make them easy to upgrade or reconfigure if their services are eventually required for handling other types of equipment. Another feature of the upgraded MERMAC R series is the dedicated focus on “intelligent compactness,” which is incorporated into all winch designs. While taking up less deck space, the design still allows for easy maintenance.

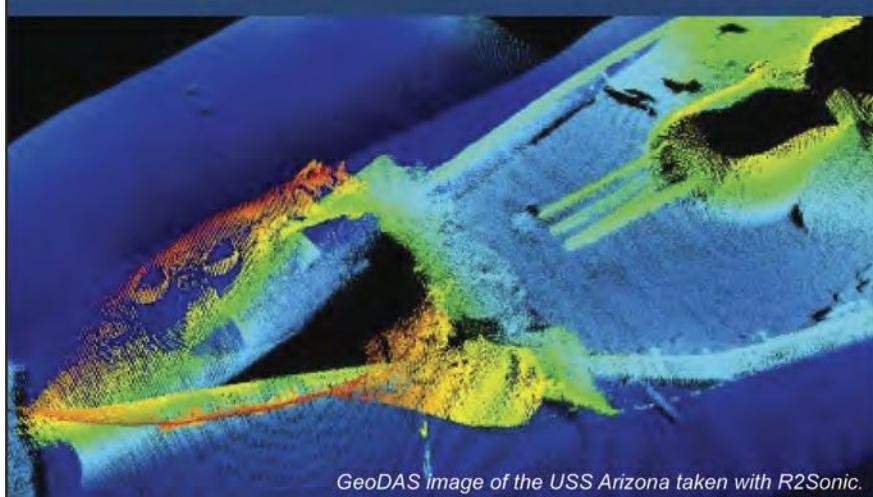
The MERMAC R series is empowered by AHC, which reduces weather-related down time and makes the launch, handling and recovery of tethered equipment easier and safer. Featuring a high-tech motion reference unit and advanced algorithms, MERMAC R AHC winches immediately stabilizes submerged equipment by compensating for vessel movement caused by waves — even in heavy seas.

For more information, visit [www.macartney.com](http://www.macartney.com).

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GeoDAS image of the USS Arizona taken with R2Sonic.

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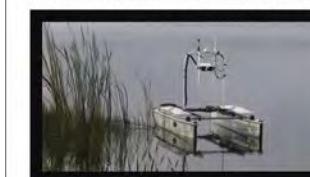
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## LVDT linear position sensors built to survive operation underwater

Subsea applications pose special challenges for reliable LVDT operation. Due to the presence of chemically hostile seawater that attacks common metals, linear position sensors constructed of stainless steel can become quickly corroded and pitted. Temperature, salt level and micro-organisms in seawater also can accelerate corrosion rates, leading to premature sensor failure.

To survive subsea environments, LVDT Linear Position Sensors must be housed in special alloys that support long-term operation in different elements. As a housing and core made from stainless steel will not survive well in many underwater applications, the LVDT casing must be composed of an alloy that provides chemical resistance to seawater and other corrosive acids to provide long-term reliable operations for many years. Reliability is of critically important due to the cost of replacing sub sea hardware.

Typically, either Inconel or Monel is used, depending upon ocean temperature and depth levels. In shallow warm waters, Monel is ideal as its metal composition resists sea life forming on it. In subsea applications with depths of 7500 ft. and external pressures surpassing 3500 psi, Inconel offers excellent protection against corrosion due to higher content of nickel, chromium and molybdenum. These superalloys enhance the already high-reliability of the LVDT assembly, ensuring that it can meet extended service life requirements, even if the device is fully exposed to seawater.

As Subsea LVDTs provide the same reliable performance as standard units but with more chemical resistance to seawater, they are replacing less reliable linear position technologies such as load cells, pots and magnetoresistive sensors for position measurement in underwater applications. Depending upon the temperature, salinity, oxygen levels and depths of applications, the LVDT, with its hermetic seal and non-contacting



operation, is often the only technology that can deliver accurate and reliable performance in subsea conditions.

For more information, visit [www.macrosensors.com](http://www.macrosensors.com).

## WASSP — multibeam technology ushers in the future of seafloor mapping

Furuno and Electronic Navigation Ltd. (ENL) are proud to introduce the Wide Angle Sonar Seafloor Profiler (WASSP) multibeam sonar, a groundbreaking new system that allows you to simultaneously view and record bathymetry and seafloor hardness, find fish targets, and utilize true multibeam sonar technology to discover wrecks and structures, all at very high-resolution.

WASSP gives you the power to really see what's below and around your boat in a way never before possible. It offers unparalleled accuracy, resolution and versatility in a cost-effective package suitable for a variety of vessels.

The system utilizes a unique combination of wide-angle, multibeam sonar and computer processing power to provide you with detailed information about the fishing environment with amazing resolution and clarity. The system processes 112 dynamic beams, with each beam sampling data from the water column and seafloor. From this wide, 120° port-starboard swath, WASSP allows you to find and georeference reefs and wrecks, fish schools, seafloor hardness changes, and foreign objects both in the water column and on the seafloor.

Sonar data are displayed in real-time, while giving you the ability to save seafloor profiles for future reference and to overlay these profiles on WASSP's own Navigator plotter using Navionics charts or on other existing plotting programs. Display options include real-time 3D view, 2D view, normal echosounder, sonar, and side-scan sonar views. Each of these views can be presented in full screen or in split screen to enable you to quickly and easily understand the detailed information generated.

For more information, visit [www.furunousa.com](http://www.furunousa.com).

## Ocean Signal introduces rescueME

Easy to use and 30% smaller than other personal locator beacons, the rescueME PLB1 is ideal for a range of applications in the commercial market. It has a unique mounting cradle that can be easily fitted to a life jacket or belt and will not impede any activity, while providing instant access to emergency services at the press of a button.

As reliability is critical, the PLB has been designed to withstand the harsh

marine environment. The PLB1 is waterproof up to a market-leading depth of 15 m, with an exceptional operating life of 30 hrs (typical), even at -20°C.

Once activated, the PLB1 provides three methods of communicating the location of a survivor to search and rescue services — the designated 406 MHz Cospas-Sarsat satellite system with position provided by a 66 channel GPS, a 121.5 MHz homing beacon, plus high intensity (1 candela) strobe light.

For more information, visit [www.oceansignal.com](http://www.oceansignal.com).



## New biodegradable lubricant tackles marine and offshore industry's eco-toxicity challenge

A new biodegradable lubricant from ROCOL has successfully addressed the dual challenge faced by lubricants used in marine environments.

"Lubricants used in marine environments are under constant pressure to be ecologically safe while functioning to a high standard in the most demanding operating conditions," product manager Gareth Procter explained.

"Our new 'readily biodegradable' WIRESHIELD™ lubricant for wire rope cables and armored umbilicals will enable the marine and offshore industries to meet much stricter environmental safety requirements without compromising on day-to-day operational performance."

Readily biodegradable is the top classification according to the OECD 306 test method, indicating that it is quickly broken down in the environment.

WIRESHIELD™ Biogen ROV has also been designed to have low eco-toxicity, confirmed through independent testing. Low eco-toxicity ensures that even at relatively high concentrations, impact to marine life is minimized.

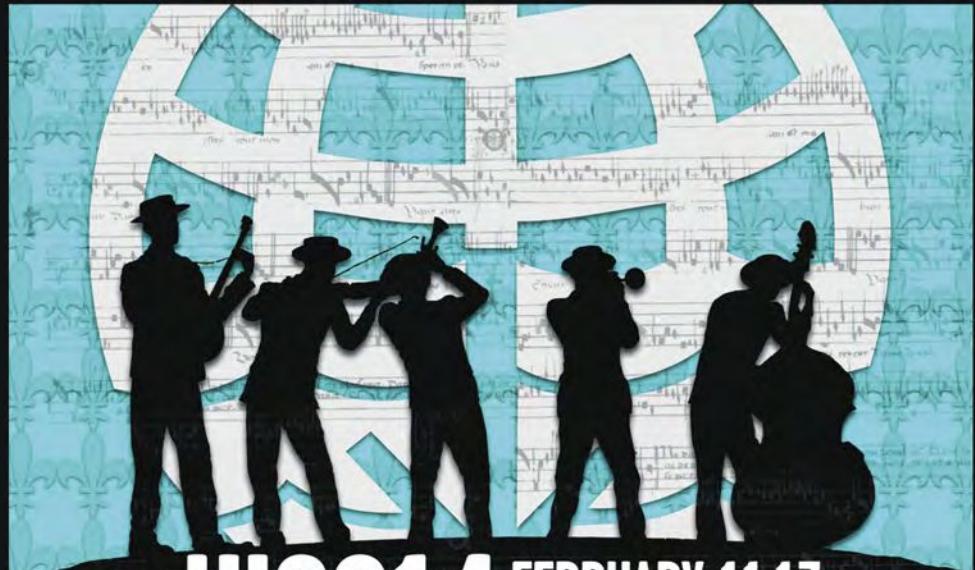
The lubricant's pseudoplastic rheology means that shear or agitation causes a reduction in dynamic viscosity, which allows maximum penetration into umbilicals and wire ropes as well as increasing pumpability during application to minimize blockages.

Corrosion resistance is assured, with zero galvanic reaction after 1,000 hrs in salt spray testing, and WIRESHIELD™ Biogen ROV also offers shear stability in the presence of salt water with little degradation in testing.

For more information, visit [www.rocol.com](http://www.rocol.com).

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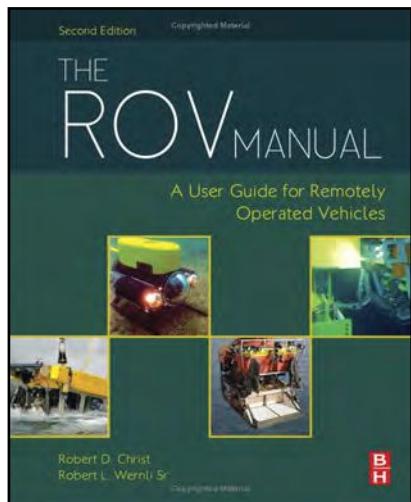
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By Robert D. Christ and Robert L. Wernli Sr.



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This new edition has been thoroughly revised and substantially expanded, with nine new chapters, increased coverage of mid-sized ROVs, and extensive information on subsystems and enabling technologies. Useful tips are included throughout to guide users in gaining the maximum benefit from ROV technology in deep-water applications.

Intended for marine and offshore engineers and technicians using ROVs, The ROV Manual, Second Edition is also suitable for use by ROV designers and project managers in client companies making use of ROV technology:

- A complete user guide to ROV technology and underwater deployment for industrial, commercial, scientific, and recreational tasks.
- Substantially expanded, with nearly 700 pages that include nine new chapters and a new five-part structure separating information on the industry, the vehicle, payload sensors, and other aspects.
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Butterworth-Heinemann; ISBN-10: 0080982883  
Hardcover, 712 pages, November 2013

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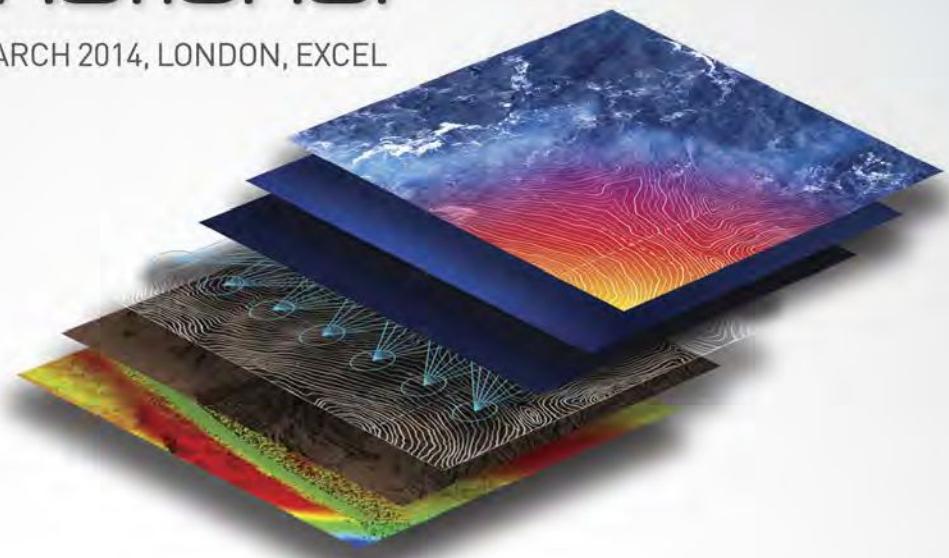
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ABS, a provider of maritime and offshore classification services, appointed **Richard Korpus** as chief scientist of computational fluid dynamics (CFD). In his role, Korpus will support the chief technology officer (CTO) and the organization through his focus on developing and applying CFD technology. The creation of the chief scientist position is the most recent step in the continuing process of technology investment at ABS. "The focus on technology is critical in today's rapidly changing operating environment," ABS CTO Todd Grove said. Korpus comes to ABS from Advanced Fluid Technologies, where he was the principal scientist since its founding in 2000. Prior to AFT, his positions included 12 years as a senior scientist with Science Applications International Corp. He holds multiple engineering degrees.

Parker Drilling said that **Robert (Bobby) L. Parker Jr.** was to retire as an employee of the company, effective 31 December 2013. He will continue to serve as chairman of the company's board of directors until the annual meeting of stockholders to be held in 2014, at which time **Gary G. Rich**, the company's chief executive officer, will be nominated to serve in that role and Parker will

be nominated to stand for re-election to the board for an additional 3-year term. Parker's retirement culminates a long career, including 18 years as president and chief executive officer of Parker Drilling. During his tenure, he established the company as a respected trailblazer and leader in responsibly accessing remote and challenging frontiers in energy exploration and development, the company said. Under his guidance, the company was instrumental in creating innovative new technologies and operational procedures that advanced the drilling profession and continue to benefit the global oil and gas industry today, the company added.

McDermott International, Inc. named **D. Bradley McWilliams** as non-executive chairman of McDermott's board of directors effective upon the retirement of **Stephen M. Johnson** as McDermott's chairman of the board on 31 December 2013. McWilliams will serve as non-executive chairman through the company's annual meeting on 6 May 2014. McWilliams has served as a member of



Parker

McDermott's board since 2003 and was appointed as lead director in 2011. He is chairman of the finance committee and serves on the audit committee. He also serves as a member of the board of the Babcock and Wilcox Co.

Environmental Drilling Solutions (EDS), a provider of drilling waste management, solids control and backyard management solutions to the oil and gas industry, has made two senior-level additions to its management team: **John Meckert** as chief executive officer and **John Marty III** as business development manager. Meckert joins EDS with 23 years of experience in the oil and gas industry, primarily in oilfield services and drilling. He has spent most of his career at various divisions of Nabors Industries. Marty joins EDS with more than 30 years of experience in the drilling fluid and solids control segment of the oil and gas industry. As the business development manager, Marty will focus on developing new business opportunities to generate corporate growth while enhancing business activities. Most recently, he served as U.S. general manager, solids control, for Strad Energy Services. Recently, he led the services and rentals division at Canrig Drilling Technology.



MADRID · 8 - 10 April 2014

*Co-Hosts Repsol & BP welcome you to one of the world's premier events, the 11th annual MCE Deepwater Development Conference & Exhibition*

BIRNS, Inc., an ISO 9001:2008 certified global leader in the design and manufacture of unique lines of high-performance lights, connectors, penetrators, and custom cable assemblies, has appointed **Jeff Hager** as its new mechanical design engineer. In answer to exponential sales increase and customer demand and as part of BIRNS' ongoing investment in its Engineering Department expansion, Hager was recruited to focus on the design and development of the company's wide range of innovative connector systems. Hager holds U.S. patents for eight complex connector products for applications ranging from the NASA space station and the Hubble telescope to missiles and naval surface ships. An industry veteran, he brings more than 30 years of experience to the table in advanced engineering principles, including finite element analysis, MIL-STD, and injection molding design. Prior to joining the team at BIRNS, Hager served in numerous leadership roles, such as senior mechanical engineer at Zebra Technologies, engineering manager at Electro Adapter, and senior project engineer at G & H Technology.

CSA Ocean Sciences Inc. is happy to welcome **Dr. Michele Halvorsen** to the science staff as the Ocean Sound and Marine Mammals Business Line manager. Halvorsen's areas of expertise include marine life and biotechnology; environmental acoustic ecology; and effects of intense anthropogenic sounds such as sonar, pile driving, seismic, noise, behavior, fish fitness/physiology, bioacoustics, and acoustic monitoring systems. She earned her undergraduate degree in zoology from Southern Illinois University and her Ph.D. in biological sciences from the University of Illinois at Chicago, where she received training in neurophysiology of the auditory system of mammals and fish and in neuroethology. Along with colleagues Drs. Woodley and Carlson, Halvorsen helped develop a Fish Index of Trauma (FIT) model that maps the exposure sound metrics with the fish's biological responses. She recently relocated from Washington state where she was a program manager at the Pacific Northwest National Laboratory in Sequim.

L-3 Klein Associates, Inc. announced the promotion of **Frank Cobis** to vice president and general manager. Mr. Cobis replaces John Cotumaccio, who has retired



Hager

from L-3 Klein after 7 years of service. Cobis has a strong background in program execution, engineering and operational management, along with outstanding customer focus and comprehensive knowledge of the marine technology marketplace. With more than 30 years of experience in the marine electronics industry, he is well positioned to lead L-3 Klein's continued business growth into the future. Cobis most recently served as the vice president of programs for L-3 Klein, managing numerous navigation, maritime security, and sonar projects for both domestic and international customers. Before joining L-3 Klein in 2004, he was the general manager of L-3 SeaBeam Instruments, a leading provider of ocean mapping sonar systems used in government, commercial and research applications. Cobis received a Bachelor of Science degree in business administration from Eastern Nazarene College.

DeepOcean UK, a subsidiary of DeepOcean Group Holding BV, announces the appointment of **Simon James** as operations director. James joins DeepOcean from GSP Offshore where he was also director of operations. With over 20 years experience in the Oil & Gas sector, James brings a wealth of operational, projects, and management experience and is a chartered manager and fellow of the CMI. Prior to GSP Offshore, he held executive and senior positions with Iremis (Harkand Group), Total & CNR as well as serving over 5 years on IMR / EPC Projects at Subsea 7.

Global Diving & Salvage, Inc. is pleased to announce the newest chapter in Global's history: **Devon Grennan**, president for the past 4 years, will now also take on the position of chief executive officer. Grennan began his tenure in 1995 as a marine environmental supervisor moving up the ranks to environmental division manager and by 2005 serving as the general manager. In 2009, Global formed its senior management team and Grennan was moved into the position of president. As CEO/president, his newest undertaking is to determine the overall strategic plan for the company and lead the senior management team and the board of directors in Global's mission



Cobis

to provide quality marine service and discover new opportunities to better serve the maritime industry. Grennan received a B.A. in political science from the University of Washington in 1995. He has served on the board of directors of the Seattle Chapter of the Propeller Club, board of directors for North Pacific Fishing Vessel Owners Association, and the Spill Control Association of America. He has been involved with the American Salvage Association as well as the Marine Insurance Association of Seattle.

Global Diving & Salvage, Inc. announces the hiring of **Anita McGillie** to lead the human resources group as the human resources manager. Based in Global's corporate headquarters in Seattle, Washington, she will direct Global Diving's human resources group in the development of HR policies and compliance, ongoing company-wide recruitment efforts, spearhead the EEO and diversity programs, as well as administer Global's employee benefit programs.

McGillie brings over 13 years of experience in all phases of human resources, including benefits, employee engagement, management training, performance management, and policy development. McGillie joins Global Diving from the media and commercial printing business, previously the HR director for a company that had up to 1,100 employees, operating in five states across the U.S.

One of the world's largest independent survey companies has announced a significant step forward in its ongoing growth with the opening of a new office in Jakarta, Indonesia. **UTEC Survey's** new entity — PT UTEC Survey Indonesia — will focus on providing quality survey support to challenging developments in the expanding Indonesia deepwater oil and gas sector.

**SEA CON** has opened a new encapsulating & molding facility in the West Houston area. The new workshop will specialize in short order needs of SEA CON's clients, both current and future. The new facility will also allow SEA CON to carry more stock of its most popular connectors to mainly benefit existing customers who do not necessarily need a molded assembly. Some of the product lines will include the Rubber Molded, WET-CON, ALL-WET, and 55/66 series assemblies.



McGillie

# CALENDAR & EVENTS

January 13th-16th, 2014

## HYPACK 2014 Training Event

Mobile, AL

[www.hypack.com/hypack/2014](http://www.hypack.com/hypack/2014)

January 26-29, 2014

## GOM Oil Spill & Ecosystem Science

Mobile, AL

[www.gulfofmexicoconference.org](http://www.gulfofmexicoconference.org)

February 5-6, 2014

## Subsea UK

Aberdeen, UK

[www.subseauk.com](http://www.subseauk.com)

February 10-12, 2014

## OTC Arctic Technology Conference

Houston, TX

[www.arctictechnologyconference.org](http://www.arctictechnologyconference.org)

February 11-13, 2014

## Underwater Intervention

New Orleans, LA

[www.ultra-intervention.com](http://www.ultra-intervention.com)

February 23-28, 2014

## Ocean Sciences Meeting

Honolulu, HI

[www.aslo.org/meetings/sessions](http://www.aslo.org/meetings/sessions)

March 3-6, 2014

## 10th ONR/MTS Buoy Workshop

San Diego, California

[jrizoli@whoi.edu](mailto:jrizoli@whoi.edu)

March 5-7, 2014

## Subsea Tiback

San Antonio, TX

[www.subseatibackforum.com](http://www.subseatibackforum.com)

March 9-13, 2014

## NACE Corrosion

San Antonio, TX

[www.nace.org](http://www.nace.org)

March 10-12, 2014

## Decommissioning & Abandonment

Summit

Houston, TX

[www.decomworld.com](http://www.decomworld.com)

March 11-13, 2014

## Oceanology International

London, UK

[www.oceanologyinternational.com](http://www.oceanologyinternational.com)

March 25-28, 2014

## OTC Asia

Kuala Lumpur, Malaysia

[www.otcasia.org](http://www.otcasia.org)

March 29-May 1, 2014

## IDGA Maritime Homeland Security

Baltimore, MD

[www.maritimehssummit.com](http://www.maritimehssummit.com)

April 7-10, 2014

## Oceans '14 Taipei

Taipei, Taiwan

[www.oceans14mtsieetaipei.org](http://www.oceans14mtsieetaipei.org)

April 8-10, 2014

## European Offshore & Energy

Birmingham, UK

[www.europeanoffshoreenergy-expo.com](http://www.europeanoffshoreenergy-expo.com)

April 15-17, 2014

## GMREC

Seattle, WA

[www.globalmarinerenewable.com](http://www.globalmarinerenewable.com)

April 28-30, 2014

## National Hydropower Association

Washington, D.C.

[www.nationalhydroconference.com](http://www.nationalhydroconference.com)

May 5-8, 2014

## Offshore Technology Conference

Houston, TX

[www.otcnet.org](http://www.otcnet.org)

January 2014

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Ocean News & Technology



## COMMERCIAL MARINE & WORKBOAT

ABP Port of Southampton • 10-12 June 2014

Seawork International is the biggest and fastest-growing UK event for the commercial marine and workboat sectors, attracting 520 international exhibitors and 7,300 high-calibre visitors from 70 countries

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- Marine Renewable Energy
- Port, Harbour & Marina Services
- Vessel Design, Build & Repair
- Maritime Security & Defence

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- Safety & Training
- Power & Propulsion Systems
- Innovations Showcase



For information about Seawork 2014, contact the Events Team on  
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[www.seawork.com](http://www.seawork.com)

EXHIBITION & CONFERENCE

# Ocean News & Technology 2014 EDITORIAL CALENDAR

## JANUARY

**Editorial:** Forecast: 2014 and Beyond; GIS/Mapping  
**Distribution:** GOM Oil Spill & Ecosystem; Subsea EXPO;

**Product & Services Focus:** Multibeam & Side Scan Sonars; Research & Development Services

## FEBRUARY

**Editorial:** Oceanology & Meteorology; Decom & Abandonment  
**Distribution:** NACE Corrosion; Decommissioning and Abandonment Summit; Oceanology International

**Product & Services Focus:** Buoys & Monitoring Instrumentation; Environmental Monitoring/Testing Services

## MARCH

**Editorial:** Subsea Fiber Optic Networks; Maritime Security

**Distribution:** GMREC; Offshore Well Intervention Conference

**Product & Services Focus:** Connectors, Cables & Umbilicals; Diver Detection Systems

## APRIL

**Editorial:** Offshore Technology; Ocean Mapping & Survey  
**Distribution:** OTC; AUVSI; Well Control and Containment Conference

**Product & Services Focus:** Subsea Tools & Manipulators; Offshore Risk Assessment; Training/Safety

## MAY

**Editorial:** UW Imaging & Processing; Marine Salvage/UW Archeology

**Distribution:** Energy Ocean; Seawork International: UDT

**Product & Services Focus:** Magnetometers; Water Dredges & Airlifts; Diving Services

## JUNE

**Editorial:** AUVs & Gliders; Defense & Naval Systems; *Industry in Action*

**Distribution:** TBD

**Product & Services Focus:** Tracking & Positioning Systems; Seismic Monitoring Equipment Leasing/Rental Services

## JULY

**Editorial:** Workclass ROVs; Deepwater Pipeline/Repair/Maintenance

**Distribution:** Offshore Northern Seas

**Product & Services Focus:** Cameras, Lights & Imaging Sonars; Oil Spill Clean-Up Services

## AUGUST

**Editorial:** Ocean Observing Systems; Subsea Telecom

**Distribution:** Oceans'14 MTS/IEEE

**Product & Services Focus:** Water Sampling Equipment; Cable Installation Services

## SEPTEMBER

**Editorial:** Ocean Engineering; Marine Construction; *Corporate Showcase*

**Distribution:** SPE ATCE; AWEA Offshore Windpower; Sea Tech Week; MTS Dynamic Positioning

**Product & Services Focus:** Navigation, Mapping & Signal Processing; Data Processing Services

## OCTOBER

**Editorial:** Offshore Communications; Subsea Inspection, Monitoring, Repair and Maintenance

**Distribution:** OilComm; North Sea Decommissioning

**Product & Services Focus:** Acoustic Modems, Releases & Transponders; Marine Communications; Survey & Exploration Services

## NOVEMBER

**Editorial:** Offshore Support, Supply & Emergency Vessels; Deep Sea Mining

**Distribution:** Clean Gulf; International Workboat

**Product & Services Focus:** Ship Protection Systems; Winches & Control Systems; Vessel Charter/Leasing Services

## DECEMBER

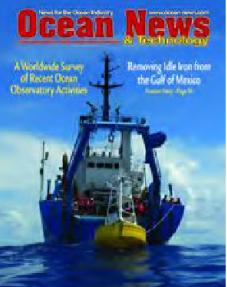
**Editorial:** Light Workclass ROVs; Commercial Diving; *Year in Review*

**Distribution:** Clean Pacific; Underwater Intervention

**Product & Services Focus:** Diving Equipment & Services; Buoyancy Materials; Construction & Repair Services

Serving the Ocean and Offshore industry, Ocean News & Technology has a long, rich history as the primary information resource executives around the world rely on.

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# Ocean News & Technology

# OCEAN INDUSTRY DIRECTORY



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Ocean Industry Directory is featured in every issue of Ocean News, and the industry knows this is the one source they can count on to provide them with up to date listing information for the products and companies they're looking for.

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E-mail: sales@falmat.com  
Website: www.falmat.com  
Contact: Shawn Amirehsani



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Website: www.teledyne-tss.com  
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Website: www.pmiind.com



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Fax: +1 310 762 1616  
E-mail: sales@ak-ind.com  
Website: www.ak-ind.com  
Contact: Allan Kidd



*AK Industries is an agile high tech manufacturer of rugged low cost underwater electrical connectors. The HydroVolt line of connectors is the most rugged and reliable low cost connector available. AK Industries is also ideally suited to provide unique solutions engineered to customer requirements.*

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Oxnard CA 93033-1863 USA  
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Fax: +1 805 487 0427  
USA: +1 888 BIRNS 88 (+1 888 247 6/88)  
E-mail: service@birns.com  
Website: www.birns.com  
Contact: Eric Birns



*BIRNS, Inc. is an ISO 9001:2008 certified global leader in the design and manufacturing of high performance connector and lighting solutions for the subsea industry. With more than half a century of expertise, BIRNS provides unmatched lead times and industry-leading exclusive features. Its world class molding facility is NAVSEA S9320-AM-PRO-020 certified, and the company specializes in sophisticated connector products and custom cable assemblies—with electrical, optical, electro-optical, electro-coax, and EOM (electro-opto-mechanical) connector lines. BIRNS leads the industry with high volume hydrostatic and helium pressure testing—its vast range of electrical penetrators is ABS Product Design Assessment (PDA) certified, with inclusive pricing and lead times for ABS/DNV witnessing. BIRNS is equally renowned for its lines of innovative LED and tungsten-halogen marine, chamber and commercial diving lights, and revolutionary MPI-NDT equipment.*

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Tel: +1 401 723 4242  
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E-mail: sales@birnsaquamate.com  
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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 connectors such as the 5500 Series, SC, MC, LP, FAWL/FAWM, Rubber Molded, etc. BIRNS Aquamate is the only underwater connector producer that guarantees compatibility with other manufacturers. Birns also specializes in fast turn-around for custom design of special connector solutions. Stocking dealers in the UK (Scorpion Oceanics), South Africa (Marine Solutions) Holland (Seascape) as well as dealers in Canada, Italy, Russia, China, and Brazil.*

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*The SEA CON® Group are world leaders in underwater connector technology and provide an extensive and diverse range of electrical, optical and hybrid connector assemblies, submersible switches and cable system solutions for many applications within the Oceanographic, Defense, Oil and Gas and Environmental markets. With locations in California, Texas and Rhode Island in the USA, Mexico, Brazil, the United Kingdom and Norway and a worldwide network of agencies and representatives, SEA CON® is able to supply very quick solutions to any requirements across the globe.*

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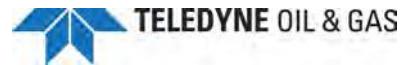
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Tel: +44 1752 55 80 80  
Fax: +44 1752 56 90 90  
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## FIBER OPTIC PRODUCTS

### **BGB Technology Inc.**

1060 Port Walthall Drive  
Colonial Heights, VA 23834  
Tel: +1 804 451 5211  
E-mail: sales@bgbtechnology.com  
Website: www.bgbtechnology.com and www.bgbengineering.com



*BGB is a manufacturer of fiber optic rotary joints (FORJ), media converters and wave division multiplexers used in the transmission of high speed data and video signals. The Optilinc FORJ is available with either ST or Deutsch RSC TM connectors. BGB can also supply integrated slip ring/FORJ assemblies if required*

### **Moog Components Group**

77 Frazee Avenue  
Dartmouth, Nova Scotia  
Canada B3B 1Z4  
Toll free: +1 800 361 2263 USA, Toll free: +1 888 302 2263 Canada  
Tel: +1 902 468 2263, Fax: +1 902 468 2249  
E-mail: mcg@moog.com  
Website: www.moog.com/marine  
Contact: John Purdy



*Moog Components Group now offers Focal™ and Prism™ marine products for demanding projects. Fiber Optic Rotary Joints (multi-channel, pressure compensated). Electrical slip rings (explosion proof, purged, oil filled, connectors, junction boxes). A wide range of multiplexers. Fluid rotary unions. Integrated units (electrical, fluid and fiber in one convenient package). Advanced CAD systems for rapid development of products. A leader in technology, performance and reliability.*

## SeaView Systems

7275 Joy Road, Suite A  
Dexter, MI 48130, USA  
Tel/Fax: +1 734 426 8978  
E-mail: info@seaviewsystems.com  
Website: www.seaviewsystems.com  
Contact: Matthew Cook



**SeaView Systems Fiber Optic Multiplexer:** PC-104 PCB assembly supports 3 channels SD video, 100mb Ethernet (onboard 2 port switch), 8 serial (RS-232 and RS-485 with onboard conversion) and two high speed trigger channels. **Easy:** Baud-rate tolerant circuitry. No DIP switches. **Flexible:** Options for HD-SDI and Gigabit Ethernet. **Reliable:** Robotically assembled and thoroughly tested. **Cost:** Affordable!

## **GYRO COMPASSES**

### iXBlue

Tel: +33 (0) 1 30 08 88 88  
Fax: +33 (0) 1 30 08 88 01  
Website: www.ixblue.com



### OCTANS, IMO-certified survey grade gyrocompass

- true North-seeking FOG unit
- complete motion sensor
- calibration and maintenance-free

*iXBlue provides a range of fine, high-technology equipment, systems and turn-key solutions in the areas of navigation and surveillance, underwater positioning and communication, seabed imaging and surveying.*

Acoustic Products – Advanced Components  
Inertial Products – Integrated Solutions – Marine Works  
Motion Systems – Sea Operations – Sonar Systems

## Teledyne TSS Ltd.

1 Blackmoor Lane  
Croxley Business Park  
Watford, Hertfordshire WD18 8GA  
Tel: +44 (0) 1923 216020  
Fax: +44 (0) 1923 216061  
E-mail: tsssales@teledyne.com  
Website: www.teledyne-tss.com  
Contact: Carolyn Jones



**USA Office:** 7701 West Little York, Suite 300  
Houston, TX 77040, Contact: Keith Pope  
Tel: +1 713 461 3030, Fax: +1 713 461 3099

*Supplier of the Meridian range of IMO, Wheelmark and High Speed Craft approved surface and subsea gyro compasses. Options include heave, roll and pitch and battery backup versions as well as a range of repeaters and ancillary products. TSS also continues to support the world-renowned range of SG Brown gyro compasses and marine equipment.*

## **INSURANCE**

### John W. Fisk Company

4833 Conti Street, Suite 200  
New Orleans, LA 70119  
Toll Free: +1 888 486 5411  
E-mail: insure@jwfisk.com  
Website: www.jwfisk.com



*Fisk Marine Insurance provides all types of insurance to any limit required for commercial diving, marine contractors, offshore oilfield and platforms, plug and abandonment (P&A) contractors, land based energy, ocean marine cargo and oceanographic research worldwide. Our coverages include Workers Compensation (USL&H & Jones Act, General Liability, Professional Liability, Hull P&I, Equipment, Bonds and International Packages for clients working outside of the USA. Contact us for more information: 1-888-486-5411 or insure@jwfisk.com. Visit our website: www.jwfisk.com*

## **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, ethyleneglycol, hydraulic fluids and chemical cleaning cocktails. Expedited deliveries are also available.*

## OCEAN INDUSTRY DIRECTORY

ON&T's Product & Service Directory

## **MAGNETOMETERS**

### Geometrics, Inc.

2190 Fortune Drive  
San Jose, CA 95131  
Tel: +1 408 954 0522  
Fax: +1 408 954 0902  
E-mail: sales@geometrics.com  
Website: www.geometrics.com  
Contact: Ross Johnson



*Geometrics, a member of OYO Corporation, manufactures, sells, and services portable geophysical instruments for land, marine, and air investigations of the subsurface.*

*Geometrics' product line includes proton precession and cesium magnetometers, high-resolution seismographs, and electrical conductivity imaging and resistivity systems.*

*Geometrics' instruments are used around the world for natural resource exploration, geotechnical and environmental assessments, ordnance detection, locating archeological and treasure sites, teaching and research.*

### Marine Magnetics Corp.

135 Spy Court  
Markham, Ontario,  
Canada L3R 5H6  
Tel: +1 905 479 9727 x232  
E-mail: info@marinemagnetics.com  
Website: www.marinemagnetics.com  
Contact: Rebecca Milian



*Designs and manufactures magnetometers using advanced Overhauser technology for high sensitivity and unmatched accuracy characteristics.*

*Products include:*

- *SeaSPY is a versatile and tough marine magnetometer that is suitable in any environment, from small zodiac-type boats to full-ocean survey vessels. It is adaptable with a large variety of options to suit many applications.*
- *Explorer is a miniature, lightweight magnetometer designed primarily for in-shore surveys in harbours, lakes, or rivers. It is ideal for small-boat applications where size and weight are most important.*
- *SeaQuest is a multi-sensor gradiometer. It is the most advanced magnetic search tool available - improving speed and accuracy in UXO and mine detection. Available auxiliary sensors include, tilt sensor, pressure sensor, altimeter, built-in GPS.*

## **MANUFACTURERS' REPRESENTATIVE**

### Ocean Marine Industries

2810 Hudson Street  
Chesapeake, VA 23324  
Tel: +1 757 382 7616  
Fax: +1 757 382 5012  
E-mail: info@oceanmarineinc.com  
Website: www.oceanmarineinc.com  
Contact: Jeanne Dorsey



*Ocean Marine Industries (OMI) specializes in strategic product distribution and sales representation with special emphasis on working with U.S. Federal and State Government Agencies, Scientific Research Institutes, Academia and commercial organizations. OMI's primary product line is multi-beam imaging sonars made by Sound Metrics of Bellevue, WA www.soundmetrics.com*

## **MARINE ENVIRONMENTAL CONSULTING SERVICES**

### ASRC Energy Services

3900 C Street, Suite 700  
Anchorage, AK 99503  
Tel: +1 907 339 6200  
Fax: +1 907 339 5475  
Email: Paul.Ramert@asrcenergy.com  
Website: www.asrcenergy.com  
Contact: Paul Ramert, Vice President/General Manager, Regulatory and Technical Services



*ASRC Energy Services provides marine environmental consulting services and compliance support for offshore projects. RTS has experience in public and private sectors and takes a multidisciplinary and strategic approach to regulatory permitting, environmental assessment, and integrated stakeholder engagement to support a complete range of projects.*

### CSA Ocean Sciences Inc.

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



*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.*

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## MOTION SENSING EQUIPMENT

### iXBlue

Tel: +33 (0) 1 30 08 88 88  
Fax: +33 (0) 1 30 08 88 01  
Website: [www.ixblue.com](http://www.ixblue.com)



- **PHINS**, Full Inertial Navigation System
- **PHINS 6000**, subsea INS
- **HYDRINS**, hydrographic INS
- **MARINS**, naval INS
- **ROVINS**, survey full-featured INS

*iXBlue provides a range of fine, high-technology equipment, systems and turn-key solutions in the areas of navigation and surveillance, underwater positioning and communication, seabed imaging and surveying.*

Acoustic Products – Advanced Components  
Inertial Products – Integrated Solutions – Marine Works  
Motion Systems – Sea Operations – Sonar Systems

### Kongsberg Seatex AS

Pirsenteret  
N-7462 Trondheim, Norway  
Tel: +47 73 54 55 00  
Fax: +47 73 51 50 20  
E-mail: km.seatex@kongsberg.com  
Website: [www.km.kongsberg.com/seatex](http://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*

### Teledyne TSS Ltd.

UK Office: 1 Blackmoor Lane  
Croxley Business Park  
Watford, Hertfordshire WD18 8GA  
Tel: +44 (0) 1923 216020  
Fax: +44 (0) 1923 216061  
E-mail: [tssales@teledyne.com](mailto:tssales@teledyne.com)  
Website: [www.teledyne-tss.com](http://www.teledyne-tss.com)  
Contact: Carolyn Jones



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USA Office: 7701 West Little York, Suite 300  
Houston, TX 77040, Contact: Keith Pope  
Tel: +1 713 461 3030, Fax: +1 713 461 3099

*Comprehensive family of motion sensors available; ranging from a heave sensor through to heave, pitch and roll, and at the top end of the range highly accurate position and heading systems.*

## OCEANOGRAPHIC INSTRUMENTS/SERVICES

### ASL Environmental Sciences, Inc.

#1-6703 Rajpur Place, Victoria  
BC, Canada V8M 1Z5  
Phone: +1 250 656 0177  
Fax: +1 250 656 2162  
Email: [asl@aslenv.com](mailto:asl@aslenv.com)  
Web: [www.aslenv.com](http://www.aslenv.com)



*ASL provides physical oceanographic consulting services and instruments. Services: flow measurement, ice studies, wave measurement and analysis, numerical modeling, and remote sensing. Products: Ice Profiler- measures ice-keel depths; Acoustic Zooplankton Fish Profiler- monitors the presence and location of zooplankton, fish or sediments; and the WERA NorthernRadar – measures surface currents and waves from shore up to 200km. ASL has a large lease pool of oceanographic instruments.*

### 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](mailto:info.instrumentation@nke.fr)  
Website: [www.nke-instrumentation.com](http://www.nke-instrumentation.com)



- Fresh and marine waters multiparameter probes: CTD, dissolved oxygen, turbidity, fluorescence, pH • Monitoring data loggers for atmospheric and marine corrosion, and cathodic protection • Dedicated and customized measurement and monitoring equipment for: sediment transport, underwater systems behaviour, fishing efforts and environmental parameters, intelligent networks...  
Contact : Valérie Le Pen - [vlepen@nke.fr](mailto:vlepen@nke.fr) or Goulven Prud'homme - [gprudhomme@nke.fr](mailto:gprudhomme@nke.fr)
- Provor and Arvor profiling subsurface floats (ARGO project), CTD, dissolved oxygen and optical sensors; Argos and Iridium transmission. • Drifting surface buoys with temperature and GPS receiver for Surface velocity project. • Carioca drifting buoy: sea water dissolved pCO<sub>2</sub>, chlorophyll, wind speed and salinity.  
Contact: Patrice Brault - [pbrault@nke.fr](mailto:pbrault@nke.fr)

### Nortek AS

Vangkroken 2  
1351 Rud, Norway  
Tel: +47 6717 4500  
E-mail: [inquiry@nortek.no](mailto:inquiry@nortek.no)



### NortekUSA

27 Drydock Avenue  
Boston, MA 02210  
Tel: +1 617 206 5750  
Email: [inquiry@nortekusa.com](mailto:inquiry@nortekusa.com)  
Website: [www.nortek-as.com](http://www.nortek-as.com)

*Nortek's products span from single point turbulence sensors to long range current profilers. Our customers are scientists, consulting engineers and professionals working in the offshore oil and gas industry. Nortek provides solutions measuring surface waves to currents 6000 m deep. Nortek is global, positioned to help you wherever your solution is needed.*

## RBR

95 Hines Road, Ottawa  
Ontario Canada K2K 2M5  
Tel: +1 613 599 8900  
Fax: +1 613 599 8929  
E-mail: [info@rbr-global.com](mailto:info@rbr-global.com)  
Website: [www.rbr-global.com](http://www.rbr-global.com)



*RBR designs and manufactures rugged submersible data loggers, recorders, sondes, controllers, and sensors for water quality measurement. Our standard data logging instruments range from one to 24 channels, configured as a CTD, or multi-parameter (sensor) recorders. Specialty loggers are available with specific sensors for harsh environments or unique applications like measuring tides and waves.*

### Sea-Bird Electronics, Inc.

13431 NE 20th St.  
Bellevue, WA 98005  
Tel: +1 425 643 9866  
Fax: +1 425 643 9954  
E-mail: [seabird@seabird.com](mailto:seabird@seabird.com)  
Website: [www.seabird.com](http://www.seabird.com)  
Contact: Calvin Lwin, Applications Engineering



*Sea-Bird is the leader in accurate, stable ocean instruments for measuring conductivity, temperature, pressure (salinity); oxygen; and related variables. Our CTD profilers, water samplers, moored CT recorders, wave/tide recorders, and DO sensors are used by research institutes, ocean observing programs, government agencies, and navies globally. Investments in engineering, metrology, calibration, software, and analysis make our products the best choice.*

### Star-Oddi

Skeidars 12, 210  
Gardabaer, Iceland  
Tel: +354 533 6060  
Fax: +354 533 6069  
E-mail: [baldur@star-oddi.com](mailto:baldur@star-oddi.com)  
Website: [www.star-oddi.com](http://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. Data is presented in the application software with a time-stamp for each measurement.*

### TDI Brooks

14391 South Dowling Road  
College Station, Texas 77845 USA  
Tel: +1 979 693 3446  
Fax: +1 979 693 6389  
Email: [Jimbrooks@tdi-bi.com](mailto:Jimbrooks@tdi-bi.com)  
Website: [www.tdi-bi.com](http://www.tdi-bi.com)  
Contact: Dr. Jim Brooks



*Scientific services with a focus on petroleum geochemistry, surface geochemical exploration, geotechnical coring and analysis, oil spill response, oceanographic surveys, hazard surveys, environmental chemistry and environmental assessments. Operating six research vessels and maintaining geochemical, geotechnical and environmental laboratory facilities.*

### Turner Designs

845 W Maude Avenue  
Sunnyvale, CA 94085  
Phone: +1 408 749 0994 x146  
Toll Free: +1 877 316 8049 x149  
Fax: +1 408 749 0998  
Contact: Tom Brumett, Sales Engineer  
E-mail: [sales@turnerdesigns.com](mailto:sales@turnerdesigns.com)  
Website: [www.turnerdesigns.com](http://www.turnerdesigns.com)



*Providing fluorescence-based solutions for research, water quality, and pollution control for over 40 years. Known for reliable and stable submersible, field, handheld, laboratory, and online fluorometers and turbidimeters. Customers rate us an average of 9, on a scale of 1-10, when asked how likely they would be to recommend us.*

## POWER SYSTEMS

### [SouthWest Electronic Energy](#)

823 Buffalo Run  
Missouri City, Texas 77489  
Tel: +1 281 240 4000  
Fax: +1 281 240 4535  
Email: [seasafe@swe.com](mailto:seasafe@swe.com)  
Website: [www.swe.com](http://www.swe.com)  
Contact: Leon Adams



*SouthWest Electronic Energy specializes in safe, high-quality battery solutions for industrial subsea applications, ranging from one bar Lithium-Ion to 10,000+ PSI tolerant Lithium-Ion polymer rechargeable battery solutions leveraging our patented battery management system. We safely deliver 4X the run time of Sealed Lead Acid with extended lifecycles for AUVs, ROVs, electronics and motors.*

## PROJECT CONSULTING/ADVISORY SERVICES

### [Ocean Specialists Inc.](#)

8502 SW Kansas Ave  
Stuart, FL 34997  
Tel: +1 772 219 3033  
Fax: +1 772 219 3010  
Email: [jbyous@oceanspecialists.com](mailto:jbyous@oceanspecialists.com)  
Website: [www.oceanspecialists.com](http://www.oceanspecialists.com)  
Contact: Jim Byous



*Ocean Specialists, Inc (OSI) provides a broad range of capabilities and services to the Offshore Oil & Gas, Submarine Telecom, Government and Scientific markets, including: Market analysis, project consulting, submarine fiber cable systems, subsea technology development, & corporate services.*

## SONAR SYSTEMS

### [iXBlue](#)

Tel: +33 (0) 1 30 08 88 88  
Fax: +33 (0) 1 30 08 88 01  
Website: [www.ixblue.com](http://www.ixblue.com)



### [SHADOWS SAMS](#)

- High-performance mapping sonar
- Synthetic Aperture Sonar processing
- Provides real time ortho-rectified and geo-referenced images
- No gap at nadir

*iXBlue provides a range of fine, high-technology equipment, systems and turn-key solutions in the areas of navigation and surveillance, underwater positioning and communication, seabed imaging and surveying.*

Acoustic Products – Advanced Components  
Inertial Products – Integrated Solutions – Marine Works  
Motion Systems – Sea Operations – Sonar Systems

### [Marine Sonic Technology, Ltd.](#)

P.O. Box 730  
White Marsh, VA 23183-0730  
Toll Free: +1 800 447 4804  
E-mail: [jdmille@marinesonic.com](mailto:jdmille@marinesonic.com)  
Website: [www.marinesonic.us](http://www.marinesonic.us)



*Marine Sonic Technology, Ltd. builds high quality, high resolution side scan sonar systems. Located in Gloucester, Virginia, Marine Sonic has been in business for more than 20 years. Our towed systems are rugged, easy to deploy and easy to operate. We also offer highly efficient embedded side scan systems for use in AUVs which occupy minimal space in the vessel and operate with minimal power consumption.*

### [Sound Metrics](#)

11010 Northup Way  
Bellevue, WA 98004  
Tel: +1 425 822 3001  
E-mail: [sales@soundmetrics.com](mailto:sales@soundmetrics.com)  
Website: [www.soundmetrics.com](http://www.soundmetrics.com)  
Contact: Jeanne Dorsey



*Sound Metrics manufacturers imaging sonars, capturing the clearest, most detailed video images in their class. Sound Metrics has built a reputation for support and for innovating solutions around their customers' applications. ARIS, the next generation of DIDSON, offers lower power consumption, smaller size, unprecedented clarity and resolution among other benefits.*

## SOUND VELOCITY PROBES/CTDS

### [SAIV A/S](#)

Nygardsviken 1, 5164  
Laksevag, Norway  
Tel: +47 56 11 30 66, Fax: +47 56 11 30 69  
E-mail: [info@saivas.no](mailto:info@saivas.no)  
Website: [www.saivas.no](http://www.saivas.no)  
Contact: Gunnar Sagstad

- STD/CTD, Sound Velocity probes/recorder with optional multi-parameter facilities; Turbidity, Fluorescence, Oxygen etc.
  - 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.*

## SUB-BOTTOM PROFILES

### [iXBlue](#)

Tel: +33 (0) 1 30 08 88 88  
Fax: +33 (0) 1 30 08 88 01  
Website: [www.ixblue.com](http://www.ixblue.com)



### [ECHOES](#)

- wide band
- flat spectrum
- from 500 Hz to 15 kHz
- fish, hull-mounted, pole-mounted, AUV-mounted
- shallow to 6000 m deep

*iXBlue provides a range of fine, high-technology equipment, systems and turn-key solutions in the areas of navigation and surveillance, underwater positioning and communication, seabed imaging and surveying.*

Acoustic Products – Advanced Components  
Inertial Products – Integrated Solutions – Marine Works  
Motion Systems – Sea Operations – Sonar Systems

## SUBSEA FABRICATION

### [New Industries](#)

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



*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 TOOLING

### [Seanic Ocean Systems](#)

8860 Fallbrook Drive  
Houston, TX 77064  
Tel: +1 713 934 3100  
E-mail: [info@seanicusa.com](mailto:info@seanicusa.com)  
Website: [www.seanicusa.com](http://www.seanicusa.com)  
Contact: Karen North



*Seanic was formed to address the growing demand for simple, rugged and reliable subsea tooling for remote intervention. Along with engineered solutions, Seanic also offers experience in the design, manufacturing, storage, repair & maintenance of subsea products. Seanic provides a worldwide standard product line of ROV tooling such as torque tools, FLOT's, hot stabs, manifolds, buckets and ROV interface panels.*

## SWITCHES

### [SEACON Advanced Products, LLC.](#)

1321 Neliaus Road  
P.O. Box 767  
Bellville, TX 77418 USA.  
Tel: +1 979 865 8846  
Fax: +1 979 865 8859  
E-mail: [sales@seacon-ap.com](mailto:sales@seacon-ap.com)  
Website: [www.seacon-ap.com](http://www.seacon-ap.com)



*SEACON Advanced Products, LLC., manufactures a wide variety of versatile and robust switches to suit a number of applications. These include Limit, Positive Action and Proximity switches in a range of materials including Titanium, Plastic and Stainless Steel which can be supplied in varying load capacities up to 7 amps and pressure rated to 10,000 psi. To further aid simplicity, our proven range of Modular Proximity Switches have been integrated with the Micro WET-CON electrical wet-mate connector making this switch a very modular component that is easily installed and replaced in the field, but without compromising reliability.*

# OCEAN INDUSTRY DIRECTORY

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## UNDERWATER VEHICLES/AUVs

### Exocetus Development LLC

1444 East 9th Avenue  
Anchorage, AK 99501  
Tel: 858-864-7775  
Fax: 907-569-0268  
Contact Ray Mahr  
Email: sales@exocetus.com  
Website: www.exocetus.com



The Exocetus Coastal Glider, designed for coastal waters where high currents and large variations in water densities occur, has a larger buoyancy engine than legacy gliders, enabling the glider to operate in 2+ knots of current, handling water densities from 7 - 37 ppt, operate for 60 days with a lithium battery and integrate additional sensors.

### Hydroid, Inc.

a subsidiary of Kongsberg Maritime

6 Benjamin Nye Circle  
Pocasset, MA 02559-4900 USA  
Tel: +1 508 563 6565  
Fax: +1 508 563 3445  
E-mail: glester@hydroid.com  
Website: www.hydroid.com  
Contact: Graham Lester



Hydroid, a subsidiary of Kongsberg Maritime, is the world leader in manufacturing advanced Autonomous Underwater Vehicles (AUVs). REMUS AUVs provide innovative and reliable systems for the marine research, defense, hydrographic and offshore/energy markets. Hydroid vehicles represent the most advanced, diversified and field-proven family of AUVs and support systems in the world.

## UNDERWATER VEHICLES/ROVs

### Deep Ocean Engineering Inc.

2528 Qume Drive, Suite 11  
San Jose, CA 95131 USA  
Tel: +1 408 436 1102  
Fax: +1 408 436 1108  
E-mail: sales@deepecean.com  
Website: www.deepecean.com  
Contact: Bill Charbonneau



Deep Ocean Engineering, Inc. provides remotely operated and unmanned surface vehicle (ROV / USV) solutions which are used by a broad range of industry applications - security, military, nuclear and hydroelectric power plants, inshore dams and lakes, oil and gas, scientific research, fisheries, salvage, search / recovery, and pipeline inspections.

### Delta SubSea LLC.

550 Club Drive, Suite 345  
Montgomery, TX 77316  
Tel: +1 936 582 7237  
Fax: +1 713 583 1369  
E-mail: sdngman@deltaussubsea-rov.com  
Website: www.DeltaSubSea-ROV.com  
Contact: Scott Dingman, President / CEO



Delta SubSea is a leading integrated independent provider of ROV services and solutions. With the industry's newest ROV fleet and a deeply experienced ROV operations team, as well as ROV tooling, engineering and CAD, Delta is the global offshore oil and gas industry's choice for Best-In-Class solutions and Maximum Uptime.

### i-Tech

22330 Merchants Way  
Katy, TX 77449  
Tel: +1 281 693 9403  
E-mail: Katarina.Tehlirian@Subsea7.com  
Website: www.interventiontechnology.com  
Contact: Katarina Tehlirian



i-Tech is a global division of Subsea 7 delivering world class remotely operated vehicle (ROV) and intervention tooling support services to the offshore energy industry, operating from four regional centers: Europe & Africa, Asia-Pacific the Americas and Brazil.

### Perry Slingsby

10642 West Little York, Suite 100  
Houston, TX 77041  
Tel: +1 713 329 8230  
Fax: +1 713 329 8299  
E-mail: perry.sales@f-e-t.com.com  
Website: www.f-e-t.com/Subsea



Perry Slingsby supplies deepwater work class ROVs, tooling solutions, burial systems, and control-system-based products to the oil, gas, and telecommunications industries. Providing the most advanced, robust and dependable ROVs and subsea products in the world, Forum's Subsea group has facilities in the US and UK and sales offices and agents around the world.

### Schilling Robotics, LLC

200 Couston Place  
Davis, CA 95618  
Tel: +1 530 753 6718  
Fax: +1 530 753 8092  
Contact: Peter MacInnes  
E-mail: peter.macinnes@fmcti.com  
Website: www.fmctechnologies.com



Schilling Robotics, a business unit of FMC Technologies, is a leading global producer of high-technology subsea systems, including remotely operated vehicles (ROVs), manipulators, and custom-engineered systems for subsea production. We bring nearly 30 years of technological expertise and innovation to the challenges facing customers in the subsea environments. www.fmctechnologies.com

### SeaBotix Inc.

2877 Historic Decatur Road, Suite 100  
San Diego, CA 92106 USA  
Tel: +1 619 450 4000  
Fax: +1 619 450 4001  
E-mail: Info@SeaBotix.com  
Website: www.SeaBotix.com



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### Sub-Atlantic

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Tel: +44 (0) 1224 798660  
Fax: +44 (0) 1224 798661



10642 West Little York, Suite 100  
Houston, TX, 77041-4014, USA  
Tel: +1 713 329 8730  
Fax: +1 713 329 8299  
E-mail: sub-atlantic.slaes@f-e-t.com  
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Fax: +1 610 458 3010  
E-mail: sales@videoray.com  
Website: www.videoray.com  
Contact: Brian Luzzi



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## UNDERWATER VIDEO EQUIPMENT

### Kongsberg Maritime Ltd.

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Fax: +44 (0) 1224 226598  
Email: km.camsales.uk@kongsberg.com  
Website: www.km.kongsberg.com/cameras  
Contact: Mark Esslemont



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Fax: +1 281 858 6363  
E-mail: sales@rovoco.com  
Website: www.rovoco.com  
Contact: Jessica Kenney



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**SIDUS Solutions, Inc.**

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**2 Describe your job function (circle 1):**

- |                    |                          |
|--------------------|--------------------------|
| 1. OWNER           | 5. BUYER                 |
| 2. MANAGER/PROF    | 6. SALES                 |
| 3. ENG'R/SCIENTIST | 7. OTHER (Specify) _____ |
| 4. TECH'N/OPERATOR |                          |

**3 Describe your organization (circle up to 4):**

- |                                    |                                  |
|------------------------------------|----------------------------------|
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*Photo by WorleyParsons, Perth, Australia*

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pH sensor



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SBE 16plus V2 SeaCAT CTDs with WET Labs ECO-NTU & ECO-PAR with Bio-wiper™



*Photo by Imbros*

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Satlantic SUNA & StorX with WET Labs Cycle-PO4, ECO-FL-NTU, & ECO-FLCD with Bio-wiper™



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