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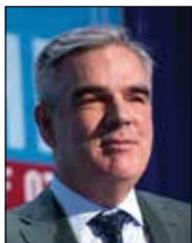
HART ENERGY

| THE OFFICIAL 2019 OFFSHORE TECHNOLOGY CONFERENCE NEWSPAPER | DAY 4

## Offshore Success in the Americas

- OTC panel discusses collaboration and technology as part of the winning formula.

BY VELDA ADDISON



Erik Oswald

With more than 100 Bboe in discovered resources and more potential, the Americas continue to attract players of all sizes looking for hydrocarbon riches whether in frontier, emerging or mature basins.

A group of energy executives shared their perspectives on operating in waters offshore during the “Coming to Americas” session on Wednesday, May 8, at OTC. The talk took place as the offshore industry continues to recover following a market-driven downturn. Companies are embracing technology, utilizing existing infrastructure and collaborating. They are finding and producing oil and gas from existing plays, while uncovering new ones.

But there are some prerequisites on the road to such prizes, according to Erik Oswald, vice president, Americas, for Exxon Mobil Exploration. These include having

acreage access, stable fiscal terms that are commensurate with risk and quality and an efficient regulatory framework, he said.

“Without having those pieces in the right places, it’s pretty hard to get people to go invest money” in areas, Oswald said. History shows the impact these variables have on a country’s ability to attract and maintain entrants, and he believes it also holds true for the future.

Oswald pointed out that only 6% of acreage offshore the U.S., for example, is available for drilling. He called it “a threat to the industry” that needs attention and noted the situation is not unique to the U.S. Small acreage or block sizes also can stymie growth, he added.

But that is where collaboration can prove beneficial.

The Gulf of Mexico (GoM) basin, like others across the world, knows no boundaries so collaboration is inevitable for many. Cindy Yielding, senior vice president for BP, spoke about how the GoM is a “collaboration playground.”

See **AMERICAS**  
continued on page 21

## Innovation Imperative

- Improved drilling efficiencies, reduced costs and faster times to first oil are critical for the offshore to become a viable competitor to shale.

BY JENNIFER PRESLEY



Jeremy Thigpen

With its combination of extreme challenges, long-term attractive returns and large reserves base, the offshore space is ripe for innovation, according to Jeremy Thigpen, president and CEO of Transocean Ltd.

“Now more than ever it is imperative that we in the offshore drilling space continue to focus on opportunities to innovate,” he said to a sold-out lunch crowd on Tuesday, May 7. The focus of Thigpen’s OTC presentation was on the future of drilling rigs.

Innovation in the offshore space is key to becoming a more viable competitor to shale, he said.

“Our customer base is under extreme pressure to stay within cash flows, to service debt and to return cash to shareholders through dividends and share buybacks. They have less capex to work with so they look to really prioritize where to spend their money,” he said. “Because they are under such pressure to return cash to shareholders and deleverage their balance sheet, they’re looking for quick cash-on-cash return, which exists in shale. It is simpler, it’s lower risk and it immediately generates cash, whereas offshore requires a longer investment horizon, is more expensive over the life of the project, but the size of the prize is so much bigger.”

Internally, the contractor’s focus has been on how to transform offshore drilling, to become an attractive piece in its customer’s portfolio, he said.

Offshore can become more economically viable so that it can attract net capital spend from its customers through safety, improvements in drilling efficiency, reduced costs and improved time to first oil for its customers, he added.

“Innovation has been going on in the industry for multiple years, ever since the downturn. It has been quite healthy for the industry,” he

See **INNOVATION** continued on page 21

## Shell Plans Offshore Mexico Drilling By December

- With up to \$6 billion in capex, Shell is also eyeing its deepwater blocks offshore Brazil.

BY DARREN BARBEE

Royal Dutch Shell intends to bookend two deepwater wells offshore Mexico—drilling one at the end of the year and another after its completion in January 2020—while also scoping out potentially massive wells offshore Brazil.

During a Tuesday presentation at OTC, Martin Stauble, Shell’s vice president of exploration for North America and Brazil, said the industry has made strides in Mexico and Brazil since 2015, when international oil companies weren’t actively invest-



Martin Stauble

ing in Mexico or Brazil’s presalt oil reservoirs.

Shell has made progress in both countries, aided by government policies that have stabilized regulations.

“In particular, in both countries, operatorship ... is now possible,” he said. “For Shell that made a big difference. A lot of investment flowed into the countries quite rapidly.”

See **DRILLING** continued on page 23

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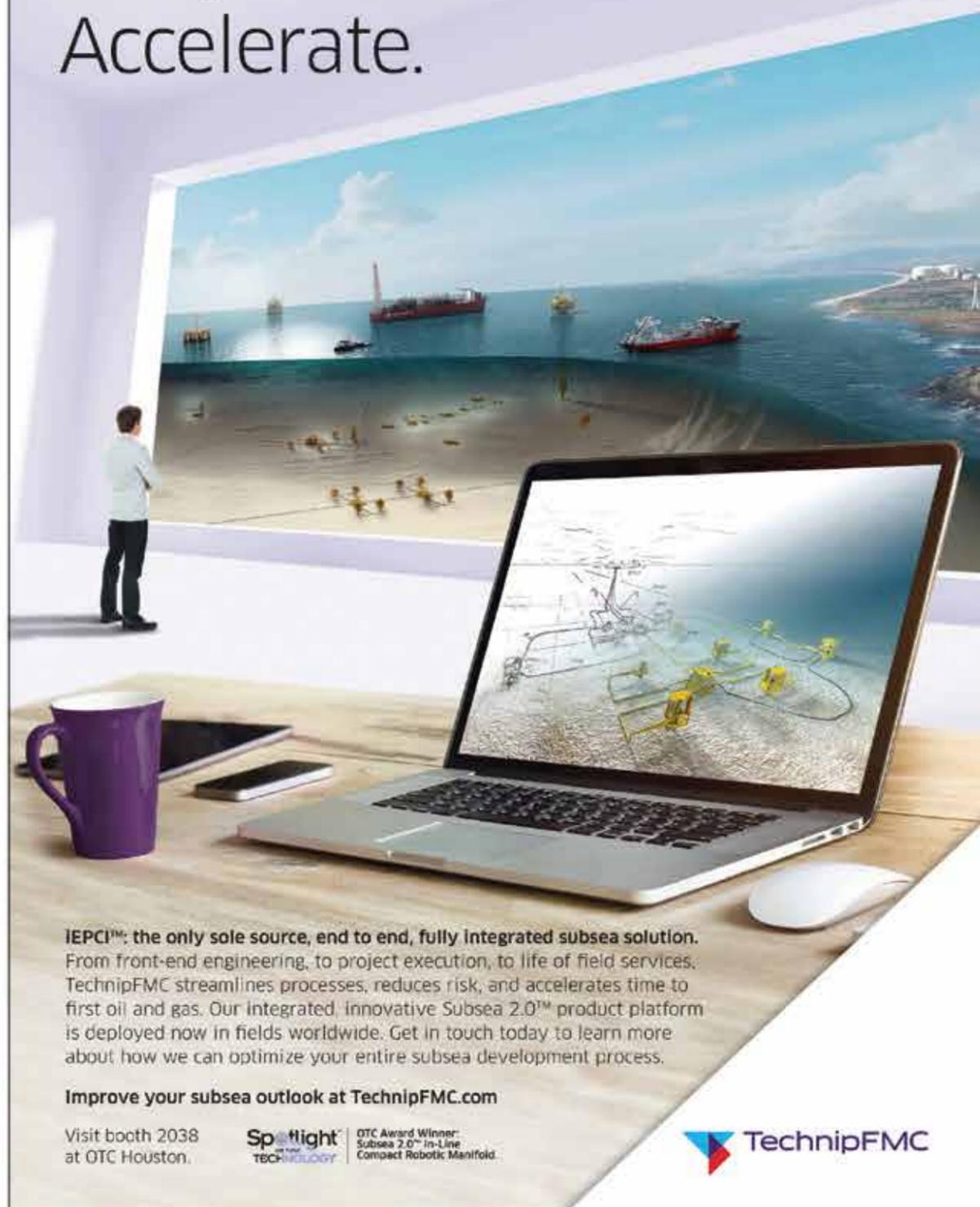
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Who Dat is located in Mississippi Canyon 503 in around 3,100 ft of water. The subsea pump station will be placed adjacent to the MC 503 E manifold to enable boosting of multiple wells selectively. It is expected to be completed in the second half of the year.

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CELEBRATING  
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**OTC2019**

**SCHEDULE OF EVENTS**

All events in conjunction with OTC 2019 will be held at NRG Park in Houston, Texas, unless noted otherwise.

**Thursday, May 9**

7:30 a.m. to 2 p.m.	Registration
7:30 a.m. to 9 a.m.	Topical Breakfasts
8 a.m. to 3 p.m.	Energy Education: Teacher Workshop
8:30 a.m. to 1:30 p.m.	Energy Education: High School STEM Event
9 a.m. to 10 a.m.	Coffee on Arena Exhibit Floor
9 a.m. to 2 p.m.	Exhibition
9 a.m. to 3 p.m.	1-on-1 Mock Interview Session
9:30 a.m. to 12 p.m.	Panel Discussions
9:30 a.m. to 12 p.m.	Technical Sessions
12:15 p.m. to 1:45 p.m.	Topical Luncheons
2 p.m. to 4:30 p.m.	Panel Discussion
2 p.m. to 4:30 p.m.	Technical Sessions

# Dan K. Adamson Honored Posthumously at OTC

■ Former SPE leader recognized with OTC Legacy Showcase.

BY LEIGH ANN RUNYAN, MANAGING DIRECTOR, OTC

Dan K. Adamson guided the Society of Petroleum Engineers (SPE) for more than two decades as its executive director and helped transform the organization into a leading international technical professional association. He also helped create the Offshore Technology Conference (OTC), which debuted in 1969 in Houston and remains one of the industry's major global conferences. Adamson died Dec. 26, 2015. He was 76.

Adamson joined SPE in 1965 as assistant to the executive secretary, the title of SPE's top position at the time, working in administration, student relations, continuing education and special assignments and became publications manager in 1967. He eventually moved up the ranks to become assistant executive director and general manager and became SPE's fourth executive director in 1979, after David Riley, who had held the position for 11 years, died suddenly at age 48.

Adamson would keep the top position until his retirement in 2001, establishing an indelible imprint on SPE. When Adamson joined SPE, it was a largely U.S.-based organization with membership totaling 15,000 and a staff of fewer than 50. When he stepped down 36 years later, SPE's membership had grown to 51,000 members from more than 50 countries and established offices in London and Kuala Lumpur as well as successful meetings around the world.

### Charting SPE's direction

The year Adamson became executive director was a critical one for both the oil and gas industry and SPE. A second "oil shock" had hit the U.S. as a result of decreased production during the Iranian revolution during the late 1970s. Oil prices rose sharply and long lines were common at U.S. gasoline stations. SPE was still under the umbrella of its parent organization, the American Institute of Mining, Metallurgical and Petroleum Engineers (AIME), but the oil industry, and SPE's membership, were becoming increasingly global. Some members of the SPE Board of Directors and officials at AIME wanted SPE to remain a primarily U.S.-focused organization and become more involved in politics. Adamson strongly disagreed.

### A friend to many

"So many people regarded Dan as one of their best friends," said Marvin Katz, 1980 SPE president. "When you talked to him, you had his undivided attention, and he was genuinely concerned about you both personally and professionally. He was a wonderful friend to have."

Lyn Arscott, who served on the SPE board as treasurer during the 1980s and was SPE president in 1988, said Adamson made any member he came into contact with feel welcomed in the association.

"He just cared for people. He would make the extra effort to talk to people, to solve problems and to follow up," he said. "If



Special guests at the OTC Legacy Showcase dedication to Dan Adamson included (left to right) Ed Stokes, Gordon Sterling, Dennis Gregg, Wafik Beydoun, Becca Schatzle, Amy Anderson and Sarah Kellar (Adamson's daughters), James Dailey, and Doug Ducate. The group is shown in front of the showcase which contains awards, accolades and proclamations honoring the Offshore Technology Conference. (Photo by CorporateEventImages.com)

the board learned of a problem in a local section, Dan would immediately be on the phone trying to resolve it."

### Significant achievements

Along with OTC, Adamson also was instrumental in SPE becoming involved in the Offshore Europe conference in Aberdeen and SPE's first conference in China (in Beijing in 1982). Adamson was initially assistant executive manager of OTC and later executive manager.

He also worked with the SPE Foundation to build SPE's headquarters building in 1984 in Richardson, Texas, as the staff had outgrown rented space in Dallas and oversaw the technological upgrade of SPE staff operations.

"He was the helmsman during SPE's technology upgrade," said Doug Ducate, former associate executive director of SPE.

Oil and gas companies had become "way out in front in the use of technology," he said, including the use of computers, data transfer and email.

"His drive to take SPE's technology to a higher level to meet the needs of members was a juggling act," Ducate said. "That whole shift in how we did business was a huge challenge for the staff."

After Adamson's retirement, SPE staff and board members tried several times to recognize his service to the association.

"We tried for years to honor him after he retired and he refused," said Dennis Gregg, 1986 SPE president and 1992-93 chairman of the OTC Board of Directors. "He said that SPE awards were for the members, not the staff."

On the 50th Anniversary of OTC, we honor Dan K. Adamson by dedicating the OTC Legacy Showcase to him. ■

# New York State Leading by Example in Offshore Wind Development

■ The Green New Deal proposal is a nation-leading requirement that New York install 9,000 MW of offshore wind by 2035.

BY TERRANCE HARRIS

While the federal government has certainly put forth initiatives to advance renewable projects, such as offshore wind, it is the individual states that really push their renewable agendas.

Doreen Harris, director of large-scale renewables for the New York State Energy Research and Development Authority (NYSERDA), said during OTC's "Offshore Wind Energy in the US: Dawn of an Industry" panel discussion on Tuesday, May 7, that New York is advancing some of the most aggressive energy policies in the nation.

Included in Gov. Andrew Cuomo's progressive Green New Deal proposal, which calls for the expansion of the state's clean energy standard to reach 70% renewable energy serving New Yorkers by 2030, is a nation-leading requirement that New York install 9,000 MW of offshore wind by 2035. That would power up to 6 million homes in New York.

"These two components of the governor's Green New Deal work together in the sense that it is because of offshore wind that these resources can serve our load at this scale," said Harris, who was part of the seven-member panel. "New York's goal is frankly the largest in the

nation by far, more than all other states combined. Particularly for offshore wind, that's important to recognize as we are advancing offshore wind at a scale that is unprecedented."

Harris said New York has been working on offshore development for quite some time and that the development began years ago with advancing the state's offshore master plan, a product of several years of analysis and engagement. The master plan was issued in January 2018 and looked at offshore wind development in a comprehensive way, Harris said.

The plan considered offshore development not just from a space aspect but also from the perspective of infrastructure development, ocean users and coastal communities as well as many other factors in advancing the offshore wind master plan.

"While the master plan was the product of a multi-agency—several years [of] effort—it serves now as a solid foundation for the state to actively pursue offshore wind as a resource toward our clean energy standard and offshore wind goals," Harris said. "To that end, the states play a critical role in advancing offshore wind development, while the Bureau of Ocean Energy Management identifies areas that are most suitable for offshore wind development."

"It is the states that are responsible for advancing the development of the resource from the perspective of committing to buy the energy produced by the projects and entering into long-term contracts with project developers to ensure the delivery of that energy."

As New York's master plan developed, Harris said so did the state's procurement and commitment to advance offshore wind. Last year New York moved forward with its first statewide solicitation for offshore wind to develop at least 800 MW.

"This is the first step toward the state achieving our 9,000-megawatt goal [and] is indicative of our commitment to its achievement," Harris said. "In fact, there are some really interesting aspects of this solicitation that I think we will be able to touch on in more detail as this panel advances."

"The state really thinks about offshore wind comprehensively, and to that end the solicitation that NYSERDA issued is the first of its kind in other regards as well. We did include certain requirements of the developers to ensure that not only were we receiving the most cost-effective bids from a multitude of developers but also that these projects were both viable from the perspective that projects can deliver on time and on budget but also those that can bring the most significant benefits to New York state." ■

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- 10:00 - 10:30 Improving Lifting Operations with Ship-to-Ship Motion Measurement
- 11:00 - 11:30 Optimizing Subsea Design Solutions through Digital Collaboration
- 13:00 - 13:30 Collaborative Project Delivery Utilizing Project Lifecycle Management

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# Renewables on the Rise

■ Fossil fuels aren't fading yet, but a Siemens Oil & Gas executive describes a wind- and solar-powered world.

BY JOSEPH MARKMAN

There is an inherent irony in certain efforts to reduce fossil fuel emissions by switching to natural gas, one not lost on Arja Talakar, CEO of Siemens Oil & Gas.

"Gas is seen as one of the key sources of energy," he said during an OTC luncheon presentation on Tuesday, May 7. "It's great and it's even better if you can transport it over distances. But it's like, 'I have an electrical vehicle but guess what? I charge it from the coal-fired power plant next door.'"

Producing LNG is a CO<sub>2</sub>-intensive activity because of methane leakage, which runs counter to its main selling point. It's up to the oil and gas industry to reduce its own carbon footprint, Talakar said.

Getting there involves the world's first all-electric-powered liquefaction facility in Hammerfest, Norway, the world's northernmost town. Sound like a fairy tale solution. That might be because the natural gas sourced for the Hammerfest plant comes in part from a field named Snow White (Snøhvit) in the Norwegian Sea.

"It is an LNG plant where, for the first time, we implemented a completely electric LNG solution," he said. "This has been a great success, reducing the CO<sub>2</sub> footprint tremendously, and it's basically one of the



Arja Talakar

first successful efforts of paying this forward."

Talakar also announced another Siemens initiative during his talk, the company's spin-off of its gas and power business. The move will create a new entity that would result in the creation of 10,000 new jobs worldwide. The new company will absorb Siemens' renewable

energy unit, SGRE.

"We are going to create the world's largest and strongest gas and power company," Talakar said. Siemens is looking to cut costs by \$2.5 billion by 2023. While the new company will add more than 20,000 jobs, cutbacks in other parts of Siemens will pull that number down to 10,000.

## Saudi Arabia

The global trailblazer for renewables is petroleum powerhouse Saudi Arabia, which plans to add 59 GW of renewable power generation by 2030. About 16 GW of that total will be wind power, Talakar said, and the remaining will be dedicated to solar, which offers plenty of opportunity on the Arabian peninsula.

"Then," he said, "they are going to get rid of their oil-fired power plants."

Saudi Arabia produces 10 MMbbl/d of oil, but as much as 25% of it burned in to provide air conditioning.

"They want to keep this precious resource and preserve it for the next generation, and they are going to go big time toward natural gas," he said.

That means LNG, both for domestic use and export. The Saudis are concerned about a lack of energy efficiency in their country.

"Right now the efficiency in Saudi Arabia is around 34% to 35%," Talakar said. "They want to increase it to 44% to 45%."

But while fossil fuel projects remain in the Kingdom's realm, development of renewable sources will be privatized.

In January two non-Saudi companies were selected to build the country's first utility-scale wind farm. EDF Renewables, headquartered in Paris with operations in North America, and Abu Dhabi-based Masdar, landed the 20-year contract, beating out competitors that included an Engie-led consortium.

The 400-MW Dumat Al Jandal plant is expected to help increase the share of renewables in the Kingdom's energy mix to 10%. ■

# Argentina's Oil Potential Boosted

■ A recent bidding round confirms the country's potential offshore, analyst says.

BY EMILY PATSY



Sebastian Borgarello

The potential in Argentina, already considered to have billions of barrels of oil reserves, just got bigger.

The South American country, home to the mammoth Vaca Muerta shale play, last month opened bidding in its first offshore bidding round in several decades. The auction, comprised of acreage in frontier basins, confirmed Argentina's offshore potential, according to Sebastian Borgarello, vice president and head of Americas-upstream at IHS Markit.

"The round was extremely successful," said Borgarello during OTC's morning session "Investing in Argentina's Unconventional & Offshore Development" on Wednesday, May 8. "One of the key elements of why we think it was successful is because it managed to attract some of the most key operators in exploration globally."

The Argentina government said April 16 that it received bids from 13 companies worth a total of \$995 million. Winners of acreage included top global oil and gas explorers such as Equinor ASA, Exxon Mobil Corp., Royal Dutch Shell Plc, Total SA, Eni SpA, BP Plc and Wintershall AG.

A total of 38 blocks were offered in the auction, which covered roughly 240,000 sq km (92,644.5 sq miles) in three frontier offshore areas including the Austral Basin, West Malvinas Basin and North Argentina.

Equinor, which already has stakes onshore Argentina, said it had submitted the winning bids for five blocks as operator. The Norwegian company was also a part in winning bids for one block to be operated by Argentina's YPF SA and another to be operated by Total.

Meanwhile, Exxon Mobil also added to its holdings in Argentina with the award of three offshore blocks located in the Malvinas Basin.

Exxon Mobil's existing Argentina holdings included 315,000 net acres spread over seven blocks in the onshore Neuquén Basin of the Vaca Muerta. The award added roughly 2.6 million net acres to Exxon Mobil's existing

holdings in Argentina, the company said in a release.

The bids were made in participation with an affiliate of Qatar Petroleum. Exxon Mobil will have a 70% stake in the blocks, all of which are located in the West Malvinas Basin. The Qatar Petroleum affiliate will hold the remaining interest.

The three basins in which blocks were awarded are each underexplored. Austral is the only basin in production offshore Argentina, where Total is the biggest player. The company started production of its Vega Pléyade project located in the basin in February 2016.

Borgarello said the West Malvinas Basin, where most of the blocks were awarded, was the clear winner of Argentina's bidding round. Despite being a frontier basin, he noted the West Malvinas Basin seems to offer the best risk-adjusted potential.

In total, Argentina received commitments for roughly \$700 million of future investments through the offshore bidding round, which Borgarello noted is also "very significant."

"Most of the commitments are in the frontier basins, and there's very little appetite right now in the world for frontier exploration," he said. "So, it's a very good sign that companies are collectively willing to invest \$700 million dollars in the next four years in those frontier basins."

In conclusion, Borgarello said the quality of the operators and the amount committed from the recent bidding round confirm the potential for offshore Argentina.

"How big—that is still a big question mark," he said.

Assuming commercial success, Borgarello believes first oil or gas from the awarded blocks is likely to take roughly a decade.

"In any case, that potential, it's in the future," he said. "It is, we think, at least 10 years until we see the first oil coming from these blocks."

Borgarello noted the "big difference" between Argentina's offshore and the Vaca Muerta, where production is expected to ramp up to 600,000 boe/d by 2030 from about 97,000 boe/d, according to estimates by Stratas Advisors.

"Vaca Muerta's potential is evident today and it's already happening. ... This is something that may benefit Argentina in 10 years," he said. ■

## Industry News

### DNV GL Develops Machine Learning Solution

DNV GL has developed a machine learning solution for faster, more accurate mooring line failure detection in offshore operations. The solution reduces the risk of offshore floating vessel mooring line failure going undetected by replacing physical sensors with a machine learning algorithm that accurately predicts line failure in real time.

Results from a numerical case study of a turret moored FPSO vessel with more than 4,000 test cases have demonstrated that DNV GL's Smart Mooring solution can accurately identify when a mooring line has failed. Multiple pilot studies will be conducted on other offshore floating vessel types over the remainder of this year.

In addition, DNV GL's Smart Mooring solution can be used instead of replacing failed sensors in brownfield offshore operations or as a complete alternative to implementing sensor technology in greenfield offshore oil and gas developments. DNV GL's experts developed the Smart Mooring solution by training a machine learning model to interpret the response of a vessel's mooring system to a set of environmental conditions and are then able to determine which mooring line has failed.

### Nexans Power Umbilical to Provide Production Boost for Vigdis Field

The key to maximizing the oil recovery from Equinor's Vigdis Field in the North Sea will be a new all-electric actuated multiphase subsea boosting station powered by a Nexans power umbilical.

Vigdis produces oil through the Snorre Field, and OneSubsea, a Schlumberger company, has been awarded the contract to provide a boosting station that will be connected to the pipeline to enhance the capacity between Vigdis and Snorre A, helping bring the wellstream from the subsea field up to the platform. The boosting station also will enable well-head pressure to be reduced, which further increases production. It is expected that the boosting station will increase the recovery rate from Vigdis from the

See **INDUSTRY NEWS** continued on page 20

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# Equinor, Service Providers Share Details on Aasta Hansteen

■ Spar facility is the largest in the world and first in the NCS.

BY BRIAN WALZEL

Representatives from Equinor and its team of service providers and construction companies provided a glimpse into the development of the Aasta Hansteen facility at an OTC technical session on Tuesday, May 7. The Aasta Hansteen gas field in the Norwegian Continental Shelf (NCS) began production on Dec. 18, 2018. The development features the large gas fields of Luva, Snefrid North, Snefrid South and Hakland, all of which will tie back to Aasta Hansteen.

The field's recoverable resources, according to the operator, are estimated at 55.6 billion standard cubic



Torolf Christensen

meters of gas and 0.6 million standard cubic meters of condensate (353 MMboe). Equinor is the primary partner and developer of the project, with partnerships from ConocoPhillips, Winterhall and OMV.

"This was a strategic development that opened a new gas region in the northern part of the Norwegian North Sea," said Torolf Christensen, the Aasta Hansteen project director for Equinor. "It brings more gas to the European market."

According to Equinor, Aasta Hansteen is the largest spar platform in the world, the first in the NCS and the first spar to include condensate storage in its hull.

Christensen explained that the project's designers initially considered a tension-leg platform, an FPSO design and circular FPSO design before finally settling on a spar design. He said that in addition to a spar that needed its own condensate storage, the project also required pipeline infrastructure and a gas plant at Nyhamna, Norway.

Aasta Hansteen's design also needed to account for the harsh conditions of the Norwegian North Sea and the short installation season of only three to four months during the summer, Christensen said.

"High waves we've seen before, [and] high currents we've seen before," he said. "But never a combination of the two."

Christensen said Aasta Hansteen was designed and constructed with the "digital field worker" in mind, meaning the facility features onboard Wi-Fi and workers equipped with Microsoft's HoloLens virtual reality headset and smartphones and tablets with built-in applications to problem solve and order spare and replacement parts for the facility.

Anil Sablok, chief engineer of offshore technology services for TechnipFMC, discussed the design concepts of the spar, including its four large condensate storage tanks within the hull and two sets of variable ballast tanks. In addition to storage and ballast tanks, the hull features an elevator and stairwell from the top of the platform to the bottom of the hull.

"This project featured an intermittently manned hull, which created its own challenges," he said.

Hyundai Heavy Industries was charged with fabricating the 4,500-tonne spar.

Dong Hyub Kim, subsea specialist at Hyundai Heavy Industries, compared fabricating the spar with the construction of a building. Kim said whereas buildings are constructed vertically from the ground up, much of the Aasta Hansteen spar needed to be built horizontally.

"Working in the spar was just like working in a coal mine," he said.

The spar was transported to its final location 299 km (186 miles) west of Sandnessjøen, Norway, by the *BOKA Vanguard*, the largest heavy transportation vessel in the world. The spar and topsides transport was headed up by Royal Boskalis Westminster.

Niels Vernes, project engineer for Royal Boskalis Westminster, explained how the topsides transport used a dual-barge transfer operation onboard the *MV White Marlen* and was floated from South Korea to the well location and floated onto the top of the spar—an operation that took 30 hours.

"Most of the effort [during transportation] was on the mating operation," Vernes said.

The subsea production system for Aasta Hansteen was designed and installed by Aker Solutions. Severin Lindseth, senior project manager for Aker Solutions, explained that the production systems were designed to withstand the harsh conditions of the development's particular location, which he said were, for most of the year, 40% to 50% worse compared to normal Norwegian North Sea conditions, and featured seabed temperatures of 29 F (-1.6 C).

Lindseth said the production system featured a rigid lockdown wellhead system, template with suction anchor and manifold, horizontal christmas tree, tie-in system, flow control module and subsea control system configuration. ■



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# Key Players Discuss Critical Energy Issues

■ French oil and gas companies tackle major developments of the offshore industry.

BY FAIZA RIZVI

Technical and economic issues facing the offshore market were the core topics discussed during OTC's "Around the World Series: France" panel discussion where leaders of France's oil services sector gathered on Tuesday, May 7. The session, which was divided into three panels, began with a welcome address by Michel Hourcard, president and CEO of Total E&P Americas. "I'm honored to be a part of the session at the 50th anniversary of OTC and proud to share our achievements in the industry," he said.

"With the advent of new technologies, we have decided to pass all our data to the cloud," said Olivier Peyret, president of Schlumberger France, speaking at the panel focused on exploration and discovery. "We see



Olivier Peyret

this innovation as a fundamental change and an opportunity for us to better serve our customers."

He also pointed out that to attract the next generation of talent, R&D in areas of technological innovation is extremely important. "While digital transformation is an opportunity for some, it could be a risk for others," Peyret said. "For

example, if Schlumberger opens its artificial intelligence research center in Paris, it's a fantastic opportunity to develop human resources. On the other hand, it could be a risk for others if the transition is disrupted and the workforce is not reskilled or trained to adapt to the advanced technologies."

Sophie Zurqiyah, CEO of CGG, highlighted the need to adopt digital technologies in the field of exploration. "Due to the oil and gas downturn, our clients are constantly looking for efficiency, reduction in cycle time to develop offshore fields and improve the outcome of exploration," she said.

"It's not sufficient to collect data but it's equally important to look at the physics behind the data using technologies such as artificial intelligence and machine learning," said Daniel Averbuch, senior program manager at IFPEN. He added that his company is also using technologies to mitigate climate change such as using efficient wave technology contributing to the development of offshore wind energy.

The panelists of the second session, which focused on oil and gas development, discussed the importance of identifying local content while working across international borders. "It's important to acknowledge the fact that local content is important to reduce costs of development because it eliminates the need to carry assets and inventories. In this area, one of the key points is having the shortest supply chain possible," said Nicolas de Coignac, senior vice president of North America at Vallourec.

"Several technological inventions that are impacting the oil and gas industry today were developed in France with strategic partnerships," said Dominique Bouvier, chairman of Evolen, speaking at the last panel session, which focused on future developments of the offshore industry.

Evolen's main goals includes development of inter-professional networks and to support the international expansion of its corporate members, notably small and medium-sized enterprises. "We are convinced that hydrocarbon services companies will play a major role in the ecological transition and almost 50% of our companies are investing in clean energies to reduce the carbon footprint and reduce emissions. The future of the industry will focus on reducing the carbon footprint and to develop gas, which will be a key element in fighting climate change," Bouvier said. ■

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The NRG Convention Center halls have been full during OTC 2019, as attendees arrived daily to view exhibits of leading-edge technology for offshore drilling, exploration, production and environmental protection. (Photo by CorporateEventImages.com)

# Produced Water Discussion Takes Center Stage

■ OTC breakfast panelists discussed the technology gaps in the subsea treatment of produced water.

BY JENNIFER PRESLEY

There is little debate that the oil and gas industry is pretty good at producing hydrocarbons from a variety of challenging reservoirs and locales. Along with that oil production comes water, adding one more operational challenge to the puzzle.

For every one barrel of oil, about six to 10 barrels of water also are produced. Just as onshore operators and service companies are coming to terms with managing the volumes of produced water from the below the ancient seafloor that is now the Permian Basin, so too is the offshore industry.

What to do with that produced water over the life of the well was the focus of OTC's "Life Cycle Water Management: Addressing Effective Technologies and Gaps" breakfast panel on Wednesday, May 8. The session, moderated by Phaneendra Kondapi, professor of subsea engineering at the University of Houston (UH) and assistant dean of engineering programs at UH Katy, focused on the current challenges involved in produced water treatment at the seabed.

"The last 10 years, the focus has been on subsea processing and the next 10 will be on water treatment," said Kondapi in his opening remarks.

Currently, produced water is treated primarily at the topsides as subsea separation systems do not meet the requirements to discharge the water back into reservoir. New technologies that address potential gaps and that are effective for subsea application were discussed.



Donald Underwood

Donald Underwood, vice president of sales and marketing for Dril-Quip Inc., began his presentation with a look at the well-known water challenges that onshore operators face, noting that the handling of produced water comprises an estimated 25% of operating expenses.

"Produced water must be treated and processed," Underwood said. "You've got to do something with it."

He added that the subsea challenge of produced water was best described to him by an oil company executive as "madness," in that "water is produced, then transported to a distant topside facility for treatment and processing only to then be transported back to the wellhead for re-injection downhole."

The benefit of treating and processing produced water subsea eliminates that madness. Moving the process to the seafloor minimizes that distance and flow assurance issues. There also is a reduced use of treatment chemicals as well as an energy savings and improved economics, according to Underwood.

The challenge, however, lies in becoming much better at handling the water. For example, there is a bias toward non-chemical treatment that means improvements in subsea physical treatment techniques for salts, metals and other inorganics and microbial organisms are needed.

"The ability to accurately and continuously measure the quality of treated water subsea as well as advances in both reliability and availability of systems that treat and inject water are needed," said Underwood.

Torbjørn Hegdal, business development manager, completions and production solutions for National Oilwell Varco (NOV),

noted in his presentation the importance of thinking strategically when developing new fields. Planning for subsea water treatment in advance provides flexibility and ability to design for reliability, to minimize maintenance.

"With subsea water treatment, we are treating the water as close to the wellhead as possible and by doing that, you save energy and simplify the whole process," Hegdal said.

One technology option currently available is the Seabox system offered by NOV. The system enables water treatment to be done directly at the seabed and water to be pumped straight into the injection well, he added.

Hegdal sees a steep increase in water injection moving forward and also an increase in produced water volumes, adding that over the next 10-plus years, it is going to triple.

"We have a lot of water to handle now and will have far more to handle into the future," he said. ■

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# 'Tired' UKCS Still Huge Prolific Playground

■ The activity of private equity, renewable opportunities and an abundance of cash adds a glimmer of hope to the UKCS' future.

BY MARY HOLCOMB



Stuart Payne

The U.K. Continental Shelf (UKCS) continues to be a basin of investment opportunity despite being regarded as past its prime. While the UKCS has experienced many challenges with appraisal and exploration, performance has still been strong and consistent in bringing capital and interest to the area, according to Stuart Payne, the

Oil and Gas Authority's (OGA) director of HR and supply chain.

"We have to do a better job at talking up what is a fantastic province and investment opportunity," said Payne, a speaker at OTC's "Around the World Series: United Kingdom" panel on Wednesday, May 8. "So I'm confident that we have a strong performance basin to work from."

Payne provided promising insight into the basin's future, which he said would be riddled with ongoing private equity, 20 Bboe to be produced from new exploration plays and the maximization of brownfield recovery.

"We're looking to increase by around 6 billion barrels by 2050. If we were to achieve that, we would

generate revenue for the U.K. of about 450 billion pounds [about US\$585 billion]," he said, based on the OGA's projections.

He said that supply chain anchored in the U.K. is critical to achieve maximum economic recovery, adding that it would rely heavily on global support.

"We've set the challenge for the industry, and we understand how well we stack up as a competitor. We have about 3.7% of the world's export market and in sub-sea we have near 4% of the market, so the challenge is to double exports to get to 7.4% by 2035," he added.

If achieved, Payne said, "The U.K. would have the opportunity to generate 500 billion pounds [about US\$650 billion] for the U.K. economy, and if globally embarked, [it] would mean vision 2035 represents almost a trillion pound opportunity for a 'tired, dusty old basin.'"

To achieve that goal, Payne said there will have to be an energy transition "in real life," which would require a focus on renewables—namely wind, solar, wave and "other technologies where we have phenomenal supply chain capability to go and deliver energy around the world from a slightly different sector."

He added, "It's a transition. It takes a system."

The U.K. has a lot of smaller infrastructure in its Southern North Sea ideal for wind farms, he noted, potentially

powering things like hydrolysis, which would release a carbon-free hydrogen gas that could be repurposed into old pipelines in the UKCS. It would essentially leave a carbon-free footprint, according to Payne, further showcasing the basins potential.

"The energy transition shouldn't be feared by the industry; there's a huge opportunity there for all of us," he said.

The influx of new capital, including private capital, is a real catalyst in the conversations concerning moving the U.K.'s business forward, he said.

Private equity, a relatively new thing for the UKCS, has been embraced and supported in the basin, according to Payne. For example, Baker Hughes, a GE company, and U.K. oil and gas independent Chrysaor's recent partnership signified a major private-equity entrance, he noted.

The aged basin also is expected to see new technological developments, including the digital twin set to collect images around the platform for aspects like inspection, a regulatory compliance application where an artificial intelligence (AI) system will read the regulations and determine the company's compliance, AI-assisted reservoir modeling and AI viewing pipeline inspection aiding in safety by replacing workers that perform that task, according to Ian Phillips, chief executive at the UK Oil & Gas Innovation Centre. ■

# Brazil's Lula Presalt Oil Field Nears Oil Production Milestone

■ Petrobras and partners have invested roughly US\$30 billion in the exploration and development of the field.

BY BRUNNO BRAGA

The Lula Field, the first presalt oil field to enter operations offshore Brazil, could hit 1 MMboe/d less than one decade after it began producing oil in 2010.

The field is producing about 900,000 boe/d as operator Petrobras moves deeper into the field's last phase of development. The company began pumping first oil from the last FPSO installed at the field in February, moving closer to the 1 MMboe/d production mark.

Named FPSO *P-67*, the 353,000-ton vessel can produce up to 150,000 boe/d and process 6 million cubic meters of gas per day, according to Petrobras, which partnered with Royal Dutch Shell (20%) and the Portuguese oil company Galp (10%) to develop resources from Lula.

Shell Brazil CEO Andre Araújo considers the field one of the world's most prolific assets.

"We continue to see a great future for the Lula Field. Every day we learn more in this partnership (with Petrobras and Galp)," Araújo said. "With the advance of the project, we periodically discuss priorities with partners, with great respect and collaboration."

The success of Brazil's E&P activities over the past two decades is largely due to the presalt layer, which has attracted supermajors such as Exxon Mobil Corp., Royal Dutch Shell and Chevron among others. Most of this success relies on output from the giant Lula Field.

Discovered in the early 2000s, Lula was the first of many discoveries in the Brazilian presalt layer located in the Santos and Campos basins at a depth of 7,000 m.

Since 2006, more than 20 drilling rigs have been used in the construction of wells in the Lula Field and nine FPSOs are currently operating in the field.

The partners have invested roughly US\$30 billion in the exploration and development of the field, according to Petrobras. But their efforts have come with challenges, including geological ones considering

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See **BRAZIL** continued on page 15



THE RBIDZ SPECIAL ECONOMIC ZONE - KEY INVESTMENT DESTINATION IN KWAZULU-NATAL, SOUTH AFRICA - CALLS FOR BUSINESS ACTION

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## ABOUT RBIDZ

The Richards Bay Industrial Development Zone – Special Economic Zone (RBIDZ - SEZ) is a purpose-built and secure industrial estate on the North-Eastern coast of KwaZulu-Natal, linked to the international deep-water port of Richards Bay.

It is tailored for manufacturing of goods and production of services to boost beneficiation, investment, economic growth and the development of skills and employment. The RBIDZ, is a Special Economic Zone (SEZ), that aims to encourage international competitiveness through world-class infrastructure as well as tax, VAT and duty free incentives to qualifying companies.

South Africa as a country is taking a turnabout on issues relating to energy and the diversification of its energy base and this stature is supported by its strong hold as the continent's leading power player, with more than 45,000 MW of installed capacity and several new projects under development. Remarkably, there are prospects in the projects in the upstream, midstream, downstream and power segments.

## RBIDZ BRIEF OVERVIEW

The RBIDZ focuses on the following sectors: **Metals Beneficiation** (Aluminium, Iron Ore & Titanium), **Marine Industry Development** (Ship Building & Repair, Oil Refinery, Oil & Gas), **Renewable Energy** (Solar, Fuel Cells Biomass), **ICT** (Techno-parks, Innovations Hub) and **Agro-processing**.

The RBIDZ Special Economic Zone has been identified and announced as the host of 2000MW Gas-to-Power plant to be developed in the country. In response to this development, the KwaZulu-Natal Province is in the process of exploring gas opportunities in the province, and the RBIDZ has taken lead in the process. The identified 65 Hectares of land has been set-aside for the Oil and Gas hub, and a further 600-1200 Hectares of land is proposed for the Oil Refinery in this SEZ.

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# Improving RSS Operations

■ System reduces torsional vibration and stick/slip, enhances directional control and increases borehole quality.

CONTRIBUTED BY NOV

The oil and gas industry constantly seeks new technologies that help increase efficiencies as it sets to drill more high-value prospects and achieve higher production levels. Geosteering plays an important role in maximizing recovery by helping find the well's sweet spot. While a rotary steerable system (RSS) drills more accurate wellbores, meeting all objectives when using just this technology is not always possible. Adding an NOV Agitator tool to the drilling system provides increased drilling performance benefits such as better steerability, improved wellbore quality and reduced downhole vibration.

Drilling continuously without slowing down or stopping to change direction allows uninterrupted forward power with consistent weight on bit (WOB). When using an RSS, wellbore profiles do not typically show the transition areas that result from switches between sliding and rotation with a conventional system. While the RSS provides cleaner, faster and more accurate wellbore placement to maximize well productivity, sometimes it is not without its own challenges.

When using just an RSS, there is a constant and unavoidable loss of energy to the formation in all directional applications, including possible impact damage to the drillbit's cutting structure due to inconsistent weight transfer and consequent reactive torque. It has been repeatedly reported that bottomhole assemblies (BHAs) relying on an RSS alone will sometimes have weight transfer challenges and difficulty reaching total depth targets on long laterals and complex 3-D wells. Due to the challenging nature of wellbores where an RSS would be used, the risk of damaging BHA components is more common, and the repair costs for an RSS, MWD and/or LWD systems are high.

The addition of an Agitator system creates a gentle and consistent axial oscillation motion to the drill-string keeping the entire system on a dynamic state. This helps reduce friction and improve weight transfer to the bit. Pairing an Agitator with an RSS brings together the strengths of both tools. The addition of an Agitator to an RSS BHA improves directional control while reducing stick/slip and torsional vibration. It also enables consistent WOB, which improves drilling efficiency and reduces pipe/BHA component wear. Along with enhancing RSS performance and drilling parameter control, the addition of the Agitator extends overall downhole tool life and mean-time-

between-failure metrics.

Recently a customer in North America was having challenges with torque and drag along with performance limitations with their RSS BHA. After working with NOV, the company decided to pair a 5-in. Agitator tool with a 4¾-in. RSS in its BHA. The first two lateral runs from 3,658 m to 4,570 m (12,000 ft to 14,993 ft) MD and 4,570 m to 5,221 m (14,993 to 17,130 ft) MD were drilled at 27 m/hr (88 ft/hr) and 34 m/hr (111 ft/hr) terminating both on expensive downhole tool failures, respectively. The customer then added an Agitator system to the BHA on its third and deepest run drilled from 5,221 m to 6,800 m (17,130 ft to 22,310 ft) MD at 31 m/hr (103 ft/hr).

When using the BHA with the Agitator and RSS they were able to drill over 60% more footage than the previous BHAs on the most challenging section of the lateral. The addition of the Agitator improved drilling efficiency and operational response across many metrics such as differential pressure, weight transfer, and torque and drag. The combination BHA provided improved directional control by decreasing the number of downlinks from 54 m and 50 m (176 ft and 164 ft) on the first two runs to every 72 m (235 ft) on the last run.

The ROP breakout on the run with the Agitator has a lower WOB of 13,000 lb to 15,000 lb versus a WOB of 19,000 lb to 20,000 lb on the previous run, which is a reduction of about 25% to 30%. The combination BHA delivered 60% more footage than the conventional BHA, at a comparable ROP, using 15% less



Adding an Agitator to the string in an RSS BHA is a simple, efficient and effective way to enhance directional control and increase borehole quality. In turn, operators can improve their completion operations and maximize well productivity and overall economics. (Source: NOV)

weight, 15% less RPM and 30% fewer downlinks. This happened on the deepest, most complex section of the lateral, and no downhole tool failures were reported. ■

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**OTC 2020**  
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# Answers for Offshore Drilling

■ A volatile decade is seeing the evolution of a new type of rig service.

BY JOHNNY BENOIT, LLOYD'S REGISTER

Phases of boom and bust, and somewhere in between, have shaped the offshore drilling business over the last 10 years. As the market remains fragile and unpredictability is the norm, lessons have been learned to help the industry with its future challenges.

As the fragile market recovers, increasing numbers of drilling rigs are coming back to operations. Facing a shortage of “hot rigs” (fully crewed, maintained and compliant), operators are contracting nonoperational rigs that require reactivation from either a warm- or cold-stacked condition.

Stacking conditions matter, bringing a set of different challenges around rig reactivation and crew recruitment. For warm-stacked assets, the main maintenance system will have been suspended, all the other systems left nonoperational and the crew reduced. Cold-stacked rigs and equipment will show no state of readiness; critical equipment and components will simply be preserved to protect them.

For either option, operators have no leeway to get rig intake wrong, calling for more than a standard equipment inspection or tick-box exercise. When the cost pressures are extreme, issues with rig equipment or the competency of the crew on board will

quickly put a drilling project over budget. Even in a subdued market where drilling assets are cheaper to procure and the total daily costs to drill a well (spread rates) are less eye-watering, operators simply cannot afford hundreds of thousands of dollars because of project delays, nonproductive time (NPT) or unexpected costs.

## New opportunities

Using a PSE methodology to understand the efficiency of drilling operations and streamline inspections is proven to reduce NPT, improve performance and enhance the safety of assets, personnel and the environment. Such an approach should encompass four phases:

- Data collection and analysis to identify what the problems are, why they are happening and how to prevent them from reoccurring; understand the

possible variables, which can contribute to risk; and enhance operational integrity;

- Benchmarking against defined key performance indicators, enabling continuous monitoring and measurement of drilling operation performance;
- Developing an optimization plan by identifying the key correlations between factors that drive drilling operational efficiency (across people, systems and equipment); and
- Monitoring these correlations on a regular basis for continuous improvement, providing measurable results in terms of both technical and operational performance and values to calculate exact savings.

For more information, visit Lloyd's Register at booth 761 or go to [lr.org](http://lr.org). ■

## BRAZIL

(continued from page 12)

Petrobras called the field complex with peculiar rocks.

## Innovative technologies

Of Brazil's presalt fields, the largest collection of geological data such as rock samples, 3-D seismic, electrical profiles, petrophysical analysis and dynamic data have been amassed for Lula.

“This information is crucial for the geological understanding of the field. The integrated analysis of these data allowed the company to understand the main process controls involved in the origin of the reservoir rocks and how they are distributed along the Lula Field,” Petrobras said in a statement. “Also, this process allows Petrobras to understand the variations of the main properties that affect the fluid dynamics in the reservoir and feed three-dimensional numerical models that serve as the basis for proposing a robust development plan for the field.”

The Brazilian operator also said that nine innovative technology procedures were implemented in the field. A set of these technologies received the Offshore Technology Conference's Distinguished Achievement Award in 2015.

“The application of these technologies in the Lula Field represented a major milestone in the development of presalt, given the unprecedented nature of these technologies in the offshore industry,” the Brazilian major said.

The technologies included first buoy supporting risers, steel catenary risers with lined pipes installed using the reel lay method and application of flexible risers with integrated monitoring system for traction wires. Presalt technological achievements also included having the deepest underwater gas injection well

See **BRAZIL** continued on page 22

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# How IIoT Innovations Are Empowering Today's Digital Workforce

■ Connected systems help optimize asset performance and drive efficiencies.

CONTRIBUTED BY EMERSON AUTOMATION SOLUTIONS

Like businesses in other industries that rely heavily on technology to stay competitive, oil and gas operators understand the need to transform their operations by extending the Industrial Internet of Things (IIoT) and other digital automation innovations across a wider range of possibilities. What some may not know, however, is how to bring these breakthroughs to bear on what will always be a mission-critical asset—their people.

## Transform business

Only when companies link their technology and personnel strategies to their business objectives, embed expertise into their work processes and optimize their operations using real-time data does achieving lasting gains in safety and performance become possible.

Operations are growing increasingly complex, making it necessary for personnel to sift through an enormous amount of process data every day. And as a generation of seasoned experts retire, jobs are going unfilled because of a fundamental mismatch between the available labor force and the skills necessary to do the work. A 2018 study by Deloitte found that 2.4 million positions are vacant due to skills shortages in U.S. manufacturing.

To help close this gap and digitally empower both current and future staff, oil and gas producers can transform their operations with IIoT-based automation solutions that do two things:

1. Deploy scalable analytics that translates data into meaningful information and distributes those data so action can be taken; and
2. Enable experts to remotely monitor equipment and processes to optimize performance.

## Deploying scalable analytics

One of the keys to better operational decision-making is getting timely, relevant information to the right people so they can prioritize and focus more on critical issues like reliability, production optimization and safety. Integrated asset management platforms are now available that aggregate data from field-based wireless sensors and deliver information across dedicated multilayer networks to desktop PCs, laptops, tablets and smartphones. Being able to receive alerts in a secure environment



IIoT-based automation systems deploy analytics that translates data into information and distribute it so action can be taken while enabling experts to remotely monitor equipment and processes to optimize performance. (Source: Emerson Automation Solutions)

ensures that the entire organization stays aware of asset health at all times.

Tools like these make it possible to move from reactive data management to a more proactive operational approach thanks to predictive analytics that provides each user with a targeted list of problem assets, allowing them to make the real-time, informed decisions necessary to maximize availability and reduce unexpected interruptions.

Another benefit of asset performance platforms is that they allow knowledge and skills to be shared among

workers across the plant, which helps to institutionalize best practices and facilitate collaboration, reducing the time needed to identify and solve problems and increasing the visibility of key performance indicators for both operators and senior management.

## Enabling expert remote monitoring

Remote monitoring is another ideal way for oil and gas companies to empower their personnel, especially for organizations that cannot afford unplanned outages and have some level of digital infrastructure, but do not have the in-house manpower to continually analyze asset performance.

IIoT-powered condition monitoring programs allow offsite experts to connect via secure networks, either directly or through the cloud, to a wide variety of sensors mounted on equipment in the field, from heat exchangers and pumps to cooling towers and valves, which they can monitor using predictive analytics software. Specialists are then able to extract value from pressure, temperature, vibration and level data that help customers make informed decisions about how to address issues before they lead to failures.

These solutions not only reduce the need for manual maintenance rounds that can put personnel in harm's way and distract them from more critical tasks, but they also make it possible to significantly optimize asset performance and drive efficiencies. Scalability is another upside; companies can start small in a single unit, realize return on investment and then expand to other more complex applications for even greater gains.

To learn more about asset performance platforms and remote monitoring technologies, visit booth 2261 in the OTC exhibit hall where Emerson will demonstrate these and other applications designed to improve safety, efficiency and reliability in the oil and gas industry. ■

An advertisement for Pro-face Extreme SP5000X Series outdoor HMI. The background shows an oil pumpjack against a cloudy sky. In the foreground, a laptop displays a control interface with various gauges and data points. To the right of the laptop is a physical HMI unit. The text 'Sunlight Readable Outdoor HMI for Extreme Conditions' is prominently displayed. The 'EXTREME SP5000X Series' logo is in the upper right. At the bottom left, it says 'Pro-face by Schneider Electric' and '800-289-9266 | PROFACEAMERICA.COM'. A circular badge in the bottom center says 'VISIT BOOTH #6328 FOR A DEMO'. Certifications like IECEx, UL, and Class 1 Div 2 are listed in the bottom left.

# One Year Later: A Look at McDermott's Combination with CB&I

■ Merger brings together global upstream EPCI facilities.

CONTRIBUTED BY MCDERMOTT

A couple of the bigger challenges that occur when combining two companies are a smooth integration itself and leading the way forward with the right culture for the new organization. When McDermott International Inc. completed its combination with CB&I in May of last year, executive leadership made each of these challenges a top priority.

The combination brought together global upstream engineering, procurement, construction and installation (EPCI) facilities and a subsea company with an established downstream provider of petrochemical, refining, gasification and gas processing technologies and solutions to create a company that spans the entire value chain from concept to commissioning—offshore and onshore, upstream and downstream.

Each company complemented the other, such as legacy McDermott's modularization abilities and CB&I's proprietary technologies. Consequently, McDermott is stronger and far more capable than ever before. A key measure of success was to realize the synergies of combining the two companies. For example, McDermott is nearing full implementation with \$444 million of the targeted \$475 million of annualized cost synergies as of Dec. 31, 2018, under its Combination Profitability Initiative (CPI).

"Fundamentally, McDermott is a different company today—we are a larger, technology-led integrated company with a formidable presence in the offshore and onshore energy markets," said David Dickson, McDermott's president and CEO. "We are confident in our future as a combined company and that confidence continues to be validated by the solid performance of the vast majority of our offshore and onshore portfolio and a rebounding market that we believe will allow our company to grow. As a result of our transformation, the company more than doubled its 2018 backlog, revenue and new orders to \$10.9 billion, \$6.7 billion and \$5.6 billion, respectively, as compared to 2017."

To get the company culture, vision and values correct, McDermott held five cultural summits last year around the world, plus a final action summit in the fourth quarter. The purpose of the summits was to allow employees from all over the world to help shape the culture, provide feedback and recommendations on what McDermott should be as a company. It was a bottoms-up, rather than a top-down, approach.

Today, McDermott operates in more than 54 countries, with approximately 32,000 employees, a diversified fleet of specialty marine construction vessels and fabrication facilities around the world. The combination with CB&I also has helped McDermott position itself as a vertically integrated provider of technology-led EPCI solutions.

"We have worked successfully to integrate our two companies and fully define the new McDermott culture," Dickson said. "As we closed the book on 2018 where integration was the theme, 2019's focus is aimed at optimizing and executing the McDermott Playbook to lead us to significant growth in 2020 and beyond."

The playbook is a part of what is called the One McDermott Way, which drives consistency in systems, processes, execution and culture across the globe, through

all areas, functions and assets, driving value for customers and shareholders.

The integration is focused on five elements: culture, work process, revenue synergies, IT systems and CPI.

"With the integration being largely complete, the management team is redirecting its undivided attention to the McDermott Playbook to ensure that operating performance across the entire portfolio meets such a standard of excellence and execution," Dickson said. "The McDermott Playbook consists of the fundamental building blocks that were used in the company's original transformation in the 2013 to 2016 period, and it includes identifying and stemming losses of focus projects, repairing and strengthening customer and

partner relationships, maintaining a standardized industry-leading approach to project execution, applying discipline bidding and risk-management processes, adhering to rigorous cost control and operating under one common culture."

Customer confidence in McDermott is as strong as it has ever been, as demonstrated by the 16% sequential-quarter increase in the company's revenue opportunity pipeline in the fourth quarter of 2018, to approximately \$93 billion, which is a record level. That momentum has continued early into this year, with order intake of approximately \$5.5 billion of bookings in the first two months of the year, including the Golden Pass LNG megaproject.

For more information, visit McDermott at booth 2463. ■



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# IIoT Software for Offshore Operations

■ Trained models can identify process patterns to detect problems early on.

CONTRIBUTED BY BAKER HUGHES, A GE COMPANY

The offshore oil and gas industry is progressing from the first wave of digital transformation to exploring the power of predictive insights. However, as offshore operators move to Industrial Internet of Things (IIoT) software powered by artificial intelligence (AI), successful digital transformations will need to pass two significant hurdles: data and the people who use those data.

In the case of a single offshore platform, sensors generate hundreds of millions of operational datapoints. The data handoff can go from a process engineer accessing the data to modeling the data in an installed software or spreadsheet, and then passing information to an operations engineer days or weeks later. The delay in information from data to operations, the effort required to model the data, extract insights and then scale that information presents opportunity for a multitude of problems.

Digital is presented as the solution to these challenges. Technologies such as AI and machine learning (ML) are essential for data analysis at scale and delivering real-time, actionable insights. However, the formula is not that simple. Even the most digitally mature operators are dealing with unexpected issues related to data quality and conventions as well as a workforce that is resistant to adopting new solutions. In addition, they often struggle with effectively formulating the outcomes they wish to solve at the beginning, making the question of which data to gather even more elusive.

Baker Hughes, a GE company (BHGE), believes digital for offshore requires an approach that considers the complexity of the industry's data and takes seriously the importance of change management across an enterprise.

## Crawl, walk, run

IIoT software leveraging advances in AI and ML takes advantage of the technology momentum the industry has been developing for the past several decades. Oil and gas operators are not new to understanding the importance of data analysis, but the approach and the tools available have evolved substantially over time.

The notable advancement in recent years has been moving from cloud-based software that uses large amounts of

data to diagnose and describe operational occurrences to more complex, "Industrial IoT software" that can predict what will happen and prescribe how to mitigate problems. The difference does not lie in the amount of data analyzed, but rather how the analysis is done.

In the offshore example, cloud-based software can drive improved asset reliability by identifying equipment problems and alerting operators. In this case, live datasets can be run against static operating condition requirements that impact reliability. This kind of use case can appear simple, but delivering the information more than 100,000 times per second and with extreme accuracy is complex and can deliver significant value. And that's just the start: scaling that kind of project across different regions only adds to the complexity.

IIoT software for offshore platforms enables operators to explore progressively more complicated use cases. Rather than comparing data to static conditions, the advanced analytics used in IIoT solutions allows operators to analyze multiple datasets and compare against other data. Anomaly detection can deliver predictive insights into individual assets and take into account how multiple processing systems relate and cause downtime. Mitigating these potential issues can positively impact production across platforms.

The "crawl, walk, run" approach to digital implementations can benefit operators who can take the time and resources dedicated to initial cloud-based software solutions (and build on the investment) to begin moving toward predictive use cases, like anomaly detection.

Often, data present a challenge early on in the process. Turning analog systems into digital systems is not an easy transformation. Data often differ in quality because of the sensor hardware; naming conventions lack consistency because operational culture can differ from platform to platform, and accessibility is hindered due to organizational siloes. Addressing the data question early on in the journey enables every step of the progression from descriptive and diagnostic to predictive.

## Change management

Digital projects also require an approach that prioritizes not just the technology, but the people and processes



Technologies such as AI and ML are essential for data analysis at scale and delivering real-time, actionable insights. (Source: BHGE)

involved in everyday operations. The best technology without adoption will not produce results, so adoption is a key metric to track. End users of new software need to understand what to expect and what they will get from a deployment; otherwise, the result is a frustrated user base.

Accounting for cultural differences in a global user base also will mitigate adoption problems. In the case of predictive analytics, for instance, understanding what operators in different regions want to predict can shape a deployment and best serve the end user. In some cases, offshore process engineers in one region have different priorities than process engineers across the globe. If the use case isn't relevant, the new software is abandoned for the spreadsheet that the engineer has relied on for decades.

## Learn more

BHGE's IIoT software uses AI and ML so that its models are consistently trained from operational data and can quickly identify upsets in operational and process patterns, which means problems are detected earlier, maintenance is conducted based on actual performance and, with asset health in mind, unnecessary human intervention can be eliminated and high-risk operations can be de-manned.

For more information, visit BHGE at booth 2827. ■

# Lundin Submits Plan for Solveig Field Offshore Norway

■ The Lundin Norway-operated Solveig will be developed with five wells tied to the Edvard Grieg platform in the North Sea.

BY VELDA ADDISON

Lundin Petroleum and partners Wintershall Norge AS and OMV Norge AS have submitted plans to develop the \$810 million Solveig Field as a subsea tieback to the Lundin-operated Edvard Grieg platform in the North Sea offshore Norway.

"With first oil scheduled for early 2021, Solveig will be the first subsea tieback development in the Greater Edvard Grieg Area and is a realization of our strategy of tying back high margin barrels to our operated facilities, as we focus on extending the plateau at Edvard Grieg beyond 2021," Lundin Petroleum CEO Alex Schneider said in a company statement.

The development, formerly called Luno II, is one of several in the Utsira High area of the North Sea. The mature province has been resurrected in recent years with play concepts targeting basement rocks and Jurassic reservoirs. The area is home to the Equinor-operated Johan Sverdrup Field, Lundin's Edvard Grieg, Aker BP's Ivar Aasen and Equinor's Lille Prinsen farther north.

Lundin subsidiary Lundin Norway is the operator of Solveig, which was proved in 2013.

Plans for the first phase of development for the field, located in production license 359, include drilling three horizontal oil production wells and two water injection wells.

From the Edvard Grieg platform, oil will travel via pipeline to the Sture terminal in Hordaland County, while gas will be exported to the U.K., according to the Norwegian Petroleum Directorate.

The partners are targeting some 57 MMboe of proved plus probable reserves, according to Lundin. The company put the breakeven cost for the project at less than \$30/boe.

"The potential for further phases of development, which will capture the upside potential in the discovered resources, will be de-risked by production performance from Phase 1," Lundin said in the release.

The company plans to carry out the Rolvsnes extended well test project. The Rolvsnes discovery, located about 3 km south of the Edvard Grieg platform on the Utsira

High, has estimated gross resources between 14 MMboe and 79 MMboe.

In January, when Lundin announced an agreement to purchase all of Lime Petroleum's Utsira High assets, Lundin said it would conduct the Rolvsnes test in 2021 to improve its understanding of the reservoir.

By implementing Solveig and the Rolvsnes test together, Lundin hopes to benefit from contracting and implementation synergies, the company said.

A contract for the Solveig project has been awarded to Rosenberg WorleyParsons for modification of the Edvard Grieg field facilities. Currently, the Edvard Grieg platform processes hydrocarbons from its own field and Ivar Aasen. The contract will enable the platform to handle resources from the Solveig and Rolvsnes fields.

TechnipFMC also landed a lump sum engineering, procurement, construction and installation contract for the development's subsea system. Lundin said it will use the West Bollsta semisubmersible rig to carry out drilling work. ■

# Aker Energy Delivers \$4.4 Billion Plan for Deepwater Field Offshore Ghana

■ Plans call for a subsea production system with 26 subsea wells and an FPSO to process and export crude from the field.

BY VELDA ADDISON

Fresh off marking successful drilling results from its latest Pecan Field well offshore Ghana, Aker Energy and partners have submitted to Ghanaian authorities a \$4.4 billion development plan for the Deepwater Tano/Cape Three Points Block.

Taking a phased development concept route, the operator—Aker—will first tackle development of the Pecan Field, which is the largest of several discoveries on the offshore block. Plans call for a subsea production system with 26 subsea wells and an FPSO to process and export crude from the field, the company said in a news release.

If Ghana gives the development a green light, partners will begin the final investment decision (FID) process with first oil from the Pecan Field coming about 35 months after FID, the company said.

“The plan will, once approved, ensure an efficient development and production of the Pecan Field and further optimization of the DWT/CTP petroleum resources in a way that will deliver value to the people of Ghana and to us and our partners,” Aker Energy CEO Jan Arve Haugan said in a company statement.

Planned investment for the ultradeepwater development, which has a water depth of up to 2,700 m, does not include the charter rate for the FPSO.

Aker and partners Ghana National Petroleum Corp., Lukoil Overseas Ghana Tano Ltd. and Fueltrade Ltd. are targeting an estimated 334 MMBbl of reserves at the Pecan Field.

Of the planned 26 subsea wells, 14 will be advanced horizontal oil producers and the rest will be injectors with alternating water and gas injection, the company said. Plans also include using multiphase pumps to help maximize oil production throughout the fields, which have a life expectancy of more than 25 years.

If all goes as planned, plateau production is expected to be about 110,000 bbl/d.

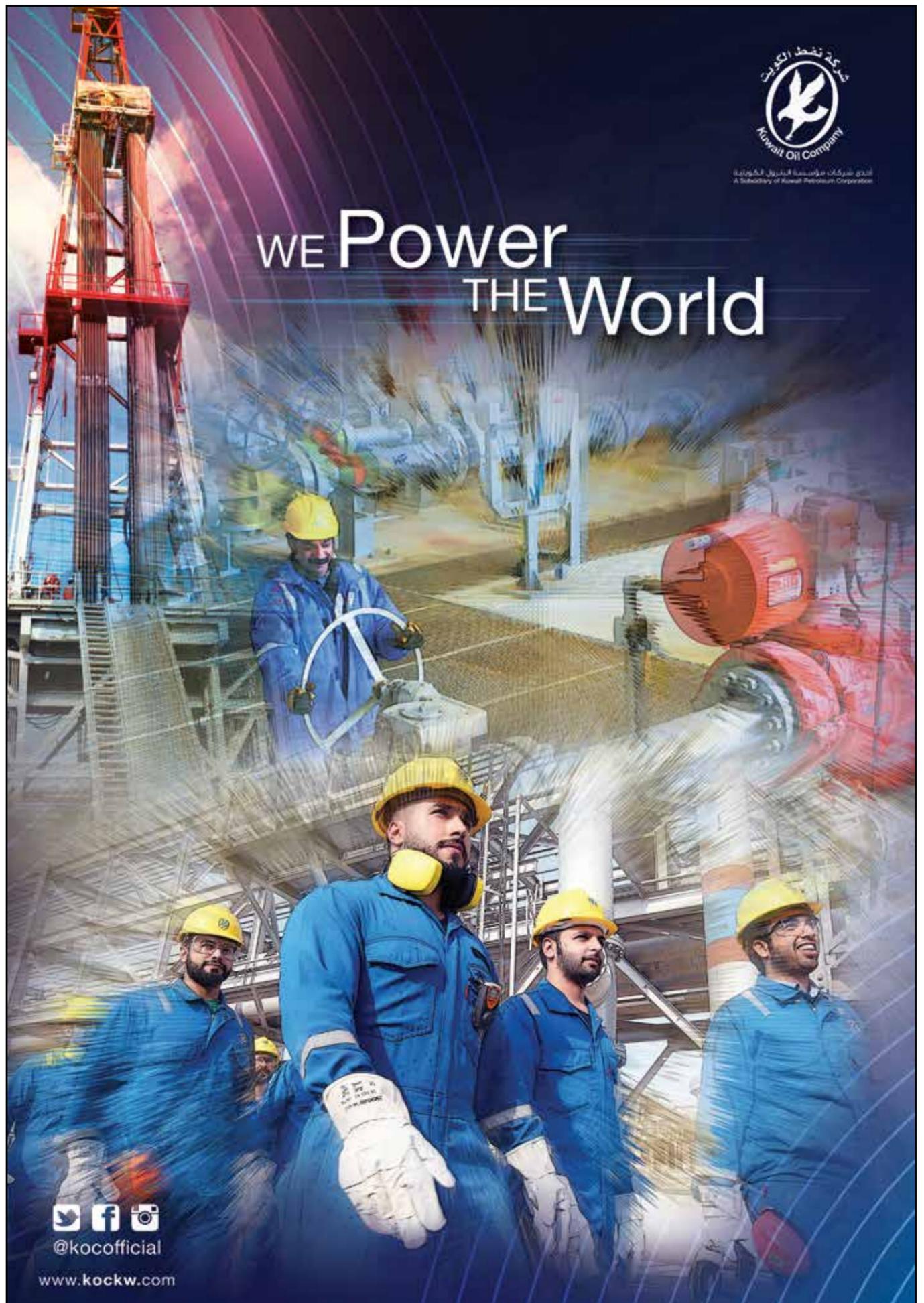
The Pecan Field area is believed to hold between 110 and 210 MMboe in contingent resources, which could be developed in additional phases. But more appraisal drilling could lift the current estimated volume base of about 450 MMboe to 550 MMboe to between 600 MMboe and 1 Bboe, the company said.

“In addition to the FPSO for the Pecan Field development, Aker Energy has entered into an option agreement with Ocean Yield ASA for a second FPSO, *Dhirubai-1*,” Haugan said in the release. “If the option is exercised,

*Dhirubai-1* could either be used to accelerate production or for other potential developments dependent on volumes and geographical distribution of these.”

Earlier this month, Aker Energy said the company hit oil in the Pecan South-1A well, which was drilled south of the main Pecan Field. At the time, the company planned to drill a sidetrack well in Pecan South and drill a third well in Pecan South East.

The Oslo-listed investment firm Aker, owned by Norwegian billionaire Kjell Inge Roekke, has also said Aker Energy could launch an IPO after summer 2019, Reuters reported. ■



## OTC Partnership Fights Human Trafficking

OTC continues its partnership with United Against Human Trafficking to increase awareness of human trafficking. During OTC 2019 delegates could confer with United Against Human Trafficking representatives in Lobby D of NRG Center to learn more about their mission and initiatives. (Photo by Genaro Cibrián)

# Electrified Pressure Pumping Supports Hydraulic Fracturing of Tight Resources

■ The electrification of pressure pumping operations with high-density power solutions can boost efficiency and lower emissions and total life-cycle costs.

BY SHANE MCELROY, SIEMENS UNCONVENTIONAL OIL AND GAS SOLUTIONS

Multiwell pads, zipper fracking and longer laterals, often stacked, have become the norm. Supported by greater automation to improve efficiencies, flexibility and speed, these trends are making unconventional much more conventional. Since fracked wells produce most of their oil and gas in just 18 months, E&P operators must drill faster and faster to keep pace.

However, two key challenges threaten to slow industry growth. One challenge is the limited horsepower available on current pumping trucks and the associated high maintenance costs. The second challenge is the regulatory limits on the flaring of produced gas, which is flared because remote production wells lack the gathering pipeline infrastructure to get the gas to market.

To address these challenges, Siemens developed its SEAM portfolio to provide more hydraulic pump horsepower in a smaller operational footprint by using powerful gas turbines to electrify modular microgrids. These highly mobile, compact, gas turbine-based drive trains are truck-borne or available on skids and can safely and economically support hydraulic fracturing of tight oil and gas resources.

The drive packages from the SEAM portfolio feature rugged, severe-duty, outdoor-rated Siemens traction motors and drives that have been operating reliably in the mobile mining industry for nearly 20 years. They are used on massive mining trucks and excavators the size of large buildings, often operating in harsh conditions.



Truck-borne or available on skids, the SEAM systems provide cost-effective drive trains for electrification of pressure pumping at unconventional E&P well sites. (Source: Siemens)

These drives are operating in Western Australia, where ambient temperatures are oven-hot and penetrating dust is a constant threat. They also are deployed in Siberian mining operations, where winter operations consistently subject them to sub-zero Arctic cold.

The equipment is subjected to high levels of vibration and shock during operation, lending themselves well to an oilfield operating environment.

Current diesel and gas-hybrid reciprocating engine drivers, which require complex transmissions, fall short of the 3,000-plus shaft horsepower (SHP) that will be needed to drive next-generation pumps because bigger diesel or gas-hybrid engine drivers are simply too large to fit on a mobile trailer. In contrast, Siemens SEAM systems use compact, truck-mounted electric drives and motors that can generate up to 6,000 SHP per pump. Each electric pumping trailer system is combined with extremely quiet, clean-burning mobile gas turbine generator units with the electrical distribution switchgear integrated onboard.

Transformers and other associated components such as e-houses are also available. Digital portfolio systems, including wireless monitoring, controls and diagnostic technology, can further increase equipment availability and provide dynamic lifetime information for the equipment, reduce maintenance costs and minimize nonproductive time.

Each mobile gas turbine generator unit can be rigged quickly, both up and down, in just a couple of hours and commissioning features ensure the customer is pumping stages quickly. In a typical configuration, a single mobile power unit can supply between 7,500 and 10,500 SHP to the electric pump trains. The SEAM system is flexible and scalable, providing operational flexibility to respond to changes for deployed hydraulic power requirements and to optimize capital asset utilization.

When compared to diesel-engine solutions, Siemens SEAM systems can significantly cut onsite power-generation fuel costs; if wellhead gas is used as fuel, flaring can be reduced or eliminated. The maintenance costs of a gas turbine-driven electric spread are significantly lower, with lifetimes of up to 20 years for motors and drives and more than 30 years for gas turbines.

The electrification of pressure pumping operations with high-density power solutions—like that offered with the SEAM portfolio—can boost efficiency and lower emissions and total life-cycle costs to help improve productivity, agility and contribution margin from operations in unconventional oil and gas pressure pumping operations. ■

## INDUSTRY NEWS

(continued from page 6)

current 45% to 54%, adding about an extra 11 MMboe at a highly competitive price.

The boosting station will be provided with a high-voltage supply from Snorre B platform via the Nexans power umbilical that combines electric power, control and communications functions in a single cable cross-section.

The two-year contract for the power umbilical is valued at about 10 million Euros (US\$11.1 million). The complete umbilical system will be developed, manufactured and tested at Nexans Norway plant in Halden, Norway, with loadout and installation in 2020.

### Well-Safe Solutions Makes Multimillion Investment in P&A Asset

Well-Safe Solutions has agreed to acquire the Ocean Guardian semisubmersible drilling unit, sparking another jobs boost for the company.

The asset, currently owned by Diamond Offshore, has been a stalwart in the North Sea, drilling hundreds of wells since entering service in 1985.

Upon delivery, Well-Safe will start work immediately on an upgrade of the semisubmersible, which will be renamed the Well-Safe Guardian, converting the asset into a bespoke plug and abandonment (P&A) unit.

Well-Safe will invest in the region of \$100 million dollars on upgrades to deliver a truly bespoke P&A unit. This will include installing a dive system and the capability to deploy a subsea intervention lubricator, which is nearing completion of the design and engineering phase, supported by the Oil and Gas Technology Centre.

Well-Safe confirmed that the acquisition would bring a further 90 jobs to the North Sea over the course of the next year, adding to the company's current 40 employees.

### Digital Radiography Solution to Provide Significant Cost Savings

Oceaneering International Inc. has released a new digital radiography solution for the oil and gas sector, the Trip Avoidance X-ray Inspection (TAXI) system, aimed at reducing the number of unplanned shutdowns. The system represents a step change in industrial radiography operations. Typically, radiography uses gamma radiation emitting isotopes. This upsets nucleonic level control instrumentation on pressure vessels and equipment, causing "trips" that result in costly unplanned plant shutdowns and associated process safety risks.

The TAXI system enables Oceaneering's technicians to digitally radiograph pressure piping and infrastructure associated on or around equipment fitted with nucleonic detectors. The work can be carried out while the plant is in service, using a specialized system that delivers pulsed X-rays. The field-proven process provides the optimal nondestructive testing solution to detect corrosion, pipe thinning and potential loss of integrity.

### Offshore Has Tremendous Room for Growth

Rystad Energy has analyzed the historic investments and oil-field service purchases of the world's 50,000 oil and gas fields.

"Total greenfield project sanctioning, summed up to the present day, only accounts for 40% of estimated volumes of offshore projects ever being sanctioned. Likewise, the brownfield market has only begun, with total historical expenditures accounting for only about 20% of estimated brownfield spend over the projects lifetime, leaving 80% of brownfield spending to the future. And the decommissioning market is still in its nascent form," said Audun Martinsen, head of oilfield services research at Rystad Energy.

### Exxon Mobil to Invest \$100 Million on Low-emissions R&D

Exxon Mobil announced May 8 it will invest up to \$100 million over 10 years to research and develop advanced lower-emissions technologies with the U.S. Department

of Energy's National Renewable Energy Laboratory and National Energy Technology Laboratory.

The agreement will support research and collaboration into ways to bring biofuels and carbon capture and storage to commercial scale.

The partnership will work to develop technologies related to energy efficiency and greenhouse gas mitigation. The joint research also will focus on reducing emissions from fuels and petrochemicals production. The agreement will stimulate collaborative projects between Exxon Mobil and the two laboratories and facilitate work with other national laboratories, such as the Idaho National Lab.

### Topaz Adopts IoT with BHGE's VitalyX Lubricant Monitoring System

Topaz Energy and Marine signed an agreement with Baker Hughes, a GE company (BHGE), on May 8 to collaborate on deploying BHGE's lubricant condition monitoring system, VitalyX. The system enhances the maintenance and upkeep and increases the field time of Topaz's fleet of vessels. VitalyX is expected to be deployed on the entire module carrying vessel fleet for Topaz later this year and is the largest single collaboration with the technology since being first unveiled by BHGE in January.

Utilizing the Internet of Things (IoT) by combining the latest sensor hardware with condition monitoring software, the real-time data produced from VitalyX will provide Topaz with vital technical information on the condition of its vessels and the maintenance required to achieve optimal performance. Sensors will be deployed in onboard equipment, such as the engine, thrusters and genset, which will monitor the lube oil for contaminants.

### Kvaerner to Recycle Statfjord A Platform

Kvaerner has been awarded a contract from Allseas for dismantling and recycling the topside at Equinor's Statfjord A platform in the North Sea. The Statfjord A

See **INDUSTRY NEWS** continued on page 23

## INNOVATION

(continued from page 1)

said. “It has forced innovation across the industry. We have been innovating, whether it has been reorganizing our business so we’re more efficient, streamlining automation and processes or changing commercial models.”

The impact innovation has had on the offshore industry is reflected in two areas: breakeven costs and the number of final investment decisions (FIDs).

“You go back to 2016 and the average breakeven cost per barrel of oil for an offshore project was \$65,” he said. “Today, we’ve worked that number down to almost \$40 per barrel, and there are many projects out there with much lower breakevens than that. We’ve taken offshore, from a cost standpoint, and made it competitive with shale.”

The attractiveness of offshore to investment also is visible in the number of FIDs, he noted, with the number

almost tripling in a span of four years—from 44 in 2016 to 119 expected in 2019.

Innovation needs a process, a means to take an idea from start to commercialization. Transocean accomplishes this through its innovation team, which identifies and pushes forward those ideas to take them to the next level.

“The innovation team is a fairly small, but very diverse team with clear time lines, milestones and objectives,” he said. “The executive team gets together every month to review the status of the projects. It is how we keep the process going because just working on the design doesn’t help us. We’ve got to get a prototype to market, to test it, to prove it and communicate its value to our customers.”

Thigpen highlighted several of the innovation development projects underway at Transocean, including well control and the industry’s first 20K drillship.

“The well control package is our social license to operate; it is something we must get right,” he said. “Any technology that we can introduce that pro-

vides further safeguards and give ourselves further confidence that we have everything we need in place to mitigate the possibility of a well control event is certainly something that we focus on and invest in.”

The company is working on an enhanced kick detection system that can quickly identify an influx in the wellbore.

The offshore industry stepped closer to more advanced operations in December 2018 with the announcement by Transocean and Chevron of the signing of a contract for the first 20K-rated drillship.

“For those that have been in the industry for a long time, this has been a discussion for 15 years, and many people thought it would never get to the finish line,” he said. “This eighth-generation drilling rig has a 20,000-psi-rated well control package, a 3-million-pound hook load and a 10,000-psi-rated mud system. It has all the bells and whistles and will give our customers the opportunity to access reserves they never thought possible.” ■

## AMERICAS

(continued from page 1)

With 3-mile-by-3-mile block sizes, competitive bidding rounds in the U.S. create natural partnerships. A company might only acquire part of a prospect when it acquires a lease, she said.

These natural partnerships force collaboration, but it can be challenging, Yielding said, comparing such relationships to “frenemies.” However, collaboration leads to better opportunity sets, reduces risks and brings in different viewpoints or experiences, she added, noting that is good for maturing projects.

That’s something Chevron can relate to, having forged partnerships across the world.

“The key to Chevron is long-term presence and long-term partnerships. We’ve been in places like the United States, Mexico and Brazil for over a 100 years,” said Elizabeth Schwarze, vice president, global exploration for Chevron Corp. She believes long-term relationships help “sustain the business through all of the changes that happen in any one country” and through business cycles.

Technology also plays a key role in sustaining business in the Americas, she added. “We can deliver more value from our assets, and we can make more challenging assets commercial with the advent of new technology,” Schwarze said, acknowledging the importance of technology partnerships operators have with service companies and their relationships with local governments.

She highlighted deepwater technologies underway such as 20k-psi technology, in-well artificial lift and multiphase sea-floor pumps. “In the Americas we are very advantaged by good rocks. ... Having proximity to some of the big technology centers in the United States and Brazil, those two things together, [along with] great rock, great people and technology in the region, has led to the advantages that we see here,” Schwarze added.

Meanwhile, the offshore industry continues to bring costs under control. Chris Golden, senior vice president for Equinor, spoke about strides that have been made by the industry in the last three years or so. He pointed out how breakeven prices in the U.S. GoM, for example, have fallen into the \$30s compared to \$40s and \$50s seen during times of higher oil prices.

This “cost reset” is sustainable by simplification, standardization and digitalization, according to Golden.

Other panelists included Carlos Portela, president of Ecopetrol America, and Talos Energy CEO Tim Duncan, who respectively shared their perspectives on being part of a national oil company and an independent in the Americas. ■

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# Offshore Production Systems: A Year for Modec?

■ Leased FPSOs will drive the award forecast for the next 24 months, with more than 20 contracts anticipated.

BY CATARINA PODEVYN, WOOD MACKENZIE

This year will be a peak year for floating production storage (FPS), with leased FPSO vessels to make up more than 80% of awards. So far the year has been all about Modec. The Japanese-based contractor has been awarded, or actively bidding for, at least seven FPSOs. Will this aggressive bid strategy pay off? If so, will the contractor have the capacity to deliver?

While the core of opportunities lie in the Brazilian market, Wood Mackenzie also sees Modec's interest elsewhere. The lease contract for Woodside's SNE development, Senegal, has recently been confirmed. At the same time, Modec is undertaking a FEED study for the *Barossa* FPSO offshore Australia as part of a design competition against the partnership of TechnipFMC and Samsung.

Eni's *Mizton-Amoca* FPSO offshore Mexico also will be a Modec-leased facility, with China's Cosco to convert a Suezmax tanker for the project.

Modec holds a strong relationship with Cosco, so Wood Mackenzie expects more conversion subcontracts to be awarded to the manufacturer over the next two years. But here arises the question of capacity: If Modec is awarded multiple contracts it also needs to look to other yards to meet its delivery deadlines.

For SBM, the focus remains on Guyana, re-establishing itself within the Brazilian market, and the expansion of the Fast4Ward concept. SBM is the frontrunner for the Mero-2 award against rival Modec, while the first quarter of 2019 has seen the contractor select yards for two more of its Fast4Ward FPSOs. Constructing these units on a speculative basis, SBM clearly has confidence

in its concept and will target opportunities offshore Guyana and Brazil.

While Modec and SBM are to dominate the market, opportunities still exist for smaller players. BW Offshore will supply the FPSO for Premier Oil's Sea Lion, with award to follow FEED and the project's final investment decision. Malaysian contractor Bumi Armada is favored for the *Neon (ex Echidna)* FPSO, while the contractor, alongside partner Shapoorji Pallonji Oil and Gas, is the sole bidder ONGC's *KG-DWN-98/2* FPSO. Malaysian competitor Yinson has seen strong growth over recent years and is hoping to enter the Brazilian market with its bids for the *Marlim Revitalisation* FPSOs. Yinson also was awarded the *Anyala-Madu* FPSO contract from Independent First E&P earlier this year, and it is in the running for Petronas' *Limbayong* FPSO.

As operators remain focused on cost discipline, the leased FPSO concept will continue to drive the award forecast over the longer term. Offering reduced risk and shorter lead times, Wood Mackenzie expects 50% of FPS awards to 2023 to be leased FPSOs. ■

## BRAZIL

(continued from page 15)

with CO<sub>2</sub> (in water depth of 2,220 m) and intensive use of intelligent completion in ultradeep waters in the satellite wells among other accomplishments.

## Overcoming challenges

Petrobras said the partnership has successfully overcome challenges such as numerical simulation of giant and complex fields throughout the years. They have also reduced the time to obtain results from days to hours through work in partnership with software vendors and continuous investment in hardware.

They have also made use of digitalization at Lula.

"As tools of instrumentation, we have pressure and temperature meters installed in the production column and in the christmas tree of each well, which send data in real time, helping decision-making and making room for machine learning tools with identification of gain in production," Petrobras explained. "In addition, we have several software developed internally that are the state of the art for the development and management of reservoirs."

But the company said more challenges must be overcome in the near future.

"Among the challenges to overcome, we can highlight the use of 4-D seismic as an optimization tool aiming at a greater recovery factor as well as the continuity of the management of the integrity of the equipment in extremely severe conditions," the company said.

Petrobras also pointed out the importance of the Integrated Operation Center (COI), which conducts real-time monitoring and supports the crew 24 hours a day. COI also provides an integrated monitoring system for flexible riser traction wires and the integrated operation of the gas drainage networks. ■

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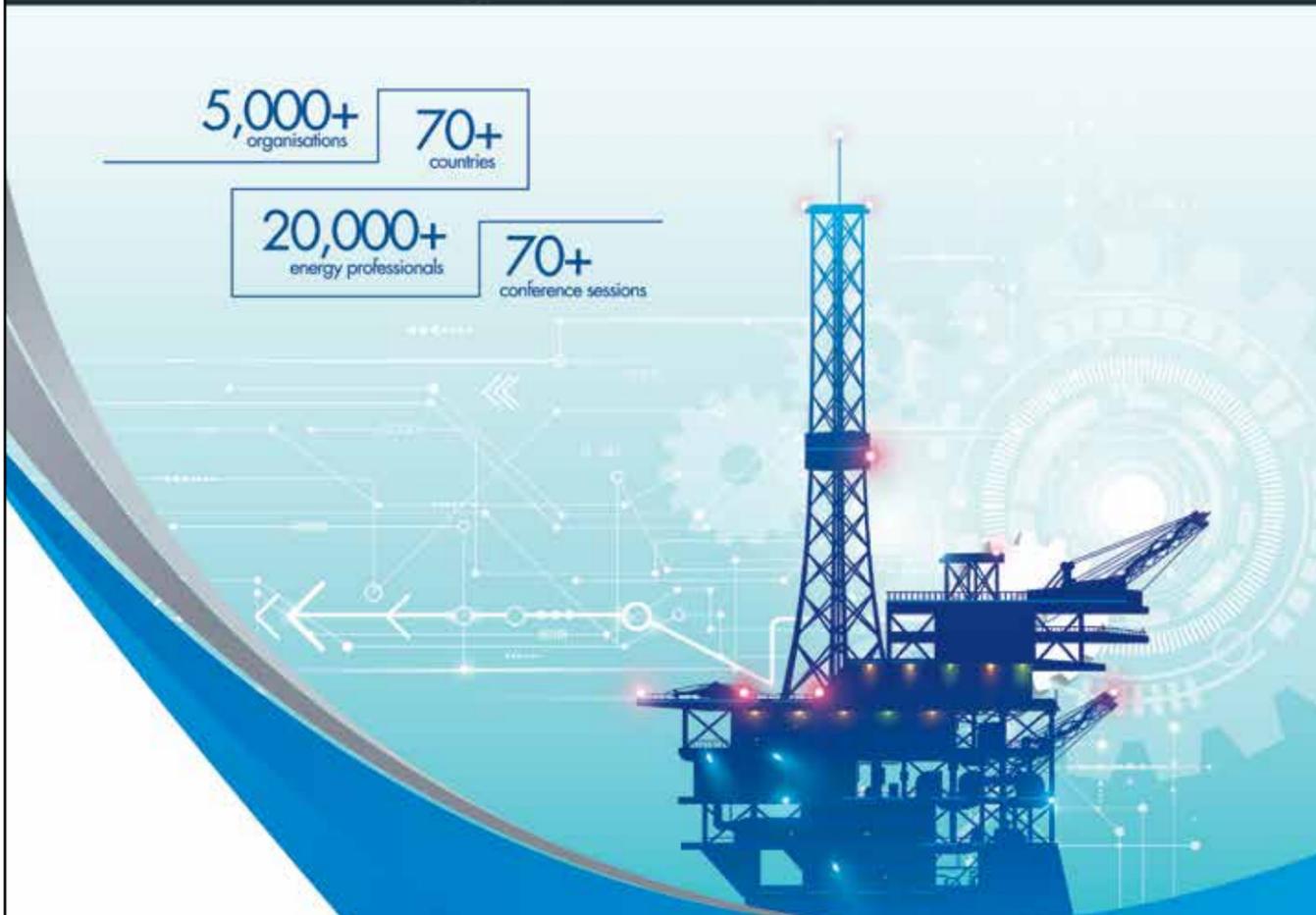
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## DRILLING

(continued from page 1)

Shell plans to invest between \$5 billion and \$6 billion per year through 2020 into its deepwater projects—a watery empire that also includes the U.S. Gulf of Mexico, Nigeria and Malaysia.

But its newest additions in Mexico and Brazil have opened up new opportunities for the company, and Shell has been aggressive in lease sales and bid rounds.

Stauble expects more lease sales to occur in Brazil, but he said he is less certain about Mexico's plans. Mexico's stance on foreign investment in its energy sector the past few years has tilted more nationalistic since President Andrés Manuel López Obrador took office in December 2018.

"We hope that Mexico goes back to regular bid rounds as well. At the moment, those are not really in sight," Stauble said.

Stauble said Shell is moving ahead with first offshore Mexico wells, which will be spud in December in the Perdido Basin. Drilling is projected to finish in January 2020, with Shell following with a second well afterward.

"We're looking at an additional two to three wells, perhaps even more, in the Perdido," he said, noting that the company is examining seismic data.

Shell still has work to do securing various permits and approvals from the Mexican government.

"The main challenge we have at the moment is do we get all the required regulatory bits and pieces together by Dec. 1 to actually then spud the well? That's the wild card in all of this," he said. "We've gotten good cooperation from the government."

Shell launched its offshore Mexico efforts in early 2018 with successful bids for nine deepwater blocks in early 2018 with a commitment to drill 12 wells.

Brazil's regulatory environment and the industry operating there are further along than Mexico, Stauble said.

Brazil is the main driver for capex now, he said. However, the country still poses some challenges.

"It is still quite difficult to get seismic permits," he said. "That holds us up quite often."

Shell's position offshore Brazil was initially part of BG Group, which Shell acquired in 2016 for \$53 billion. Shell has since increased its presence to 18 offshore blocks through deepwater auctions. In March 2018, the company paid \$70 million in lease bonuses for four blocks, including one it secured without partners.

Among Brazil, Mexico and the U.S. Gulf of Mexico, Stauble said he didn't have a favorite area.

Brazil's geology is an outlier with the potential for high rate of return, high-yield wells. Mexico offers undrilled areas, he said.

"What I like is having all three to play with. [It] allows us to balance the risk and look at very different geological systems, and hopefully some of these will pan out," he said. "I think it's good to have all three." ■

## INDUSTRY NEWS

(continued from page 20)

facility was originally built at Kvaerner's specialized facility at Stord, Norway.

Forty two years after the tow-out to the field, it is now clear that the platform will return to Stord to finalize its life cycle.

The ambition is to recycle more than 98% of the materials for new purposes.

The platform consists of a concrete gravity based structure standing on the seabed and carrying about 48,000 tonnes topside. Both the concrete substructure and the topside were delivered by Kvaerner in the 1970s. Statfjord A has contributed to major parts of Norway's oil and gas production since the start in November 1979.

The platform was the initial installation at the Statfjord Field, which has been Norway's most producing oil field.

Equinor has selected Allseas to perform all engineering, preparation, removal and disposal work for the topside of the Statfjord A platform.

## Kongsberg Introduces New GeoPulse USV

Kongsberg Maritime has released the GeoPulse USV, a flexible new unmanned surface vehicle (USV). It features GeoPulse Compact, Kongsberg's newest cost-effective and lightweight sub-bottom profiler. The GeoPulse USV can map environments beyond the limits of conventional platforms, fully autonomously or remote-controlled up to a range of 2 km (1.2 miles).

The GeoPulse USV's electric motors provide 6 hours of endurance at a survey speed of 6 knots. Its compact form factor and class-leading agility enables coverage of areas inaccessible by more conventional launches. With more than 100 dB of noise-free dynamic range, the GeoPulse Compact provides repeatable, high-quality data without needing user-controlled analogue preprocessing.

GeoPulse Compact consumes only 11% of the power requirements of earlier GeoPulse systems and a data rate exceeding 100 Mbps. Its adaptable digital processing and waveform selection technology (2-18 Khz) ensures that the optimal power signature, pulse shape and configuration can be chosen to suit a broad range of specific survey tasks. ■

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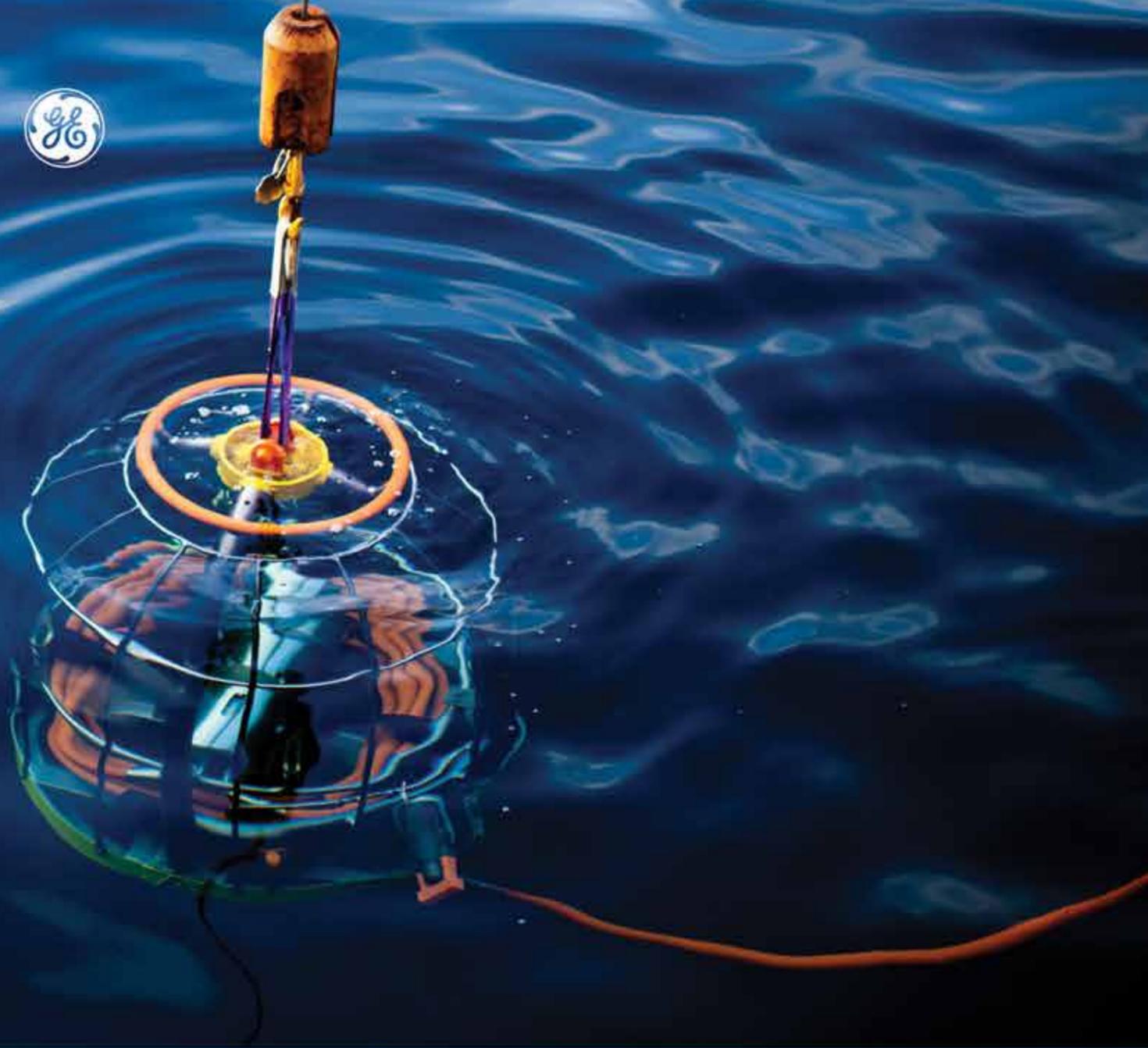
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Visit the South Africa National Pavilion at the Main Hall Reliant Center - Booth 4649



The Monday, May 6, networking event, "Alternative Energy: Will It Be Your Future Career?" was well attended, as OTC delegates learned about future opportunities from a variety of speakers and colleagues. (Photos by CorporateEventImages.com)

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### DAILY TECH TALKS AT BHGE BOOTH #2827

#### Thursday, May 9

- 9:30 am NextStream: a Strategic Path to Market for Advanced Technology
- 9:45 am Using Data-driven Decision-making & TOTEX Savings for Subsea Blowout Preventers
- 10:15 am Explore Advanced Developments in Autonomous Subsea Pipeline Pre-commissioning
- 10:45 am Discover BHGE's Innovative Commercial Models for Project Success
- 11:15 am Spotlight on New Technology Award Winner NovaLT16: Maximizing Production and Minimizing Offshore and Onshore Risk
- 11:45 am Learn How io oil and gas consulting Partners with McDermott and BHGE on Integrated Project Management for Improved Economics
- 12:15 pm Improving Production Outcomes with AI
- 12:45 pm Improving Mature-well Recovery Rates with Fast, Effective Chemical Treatments