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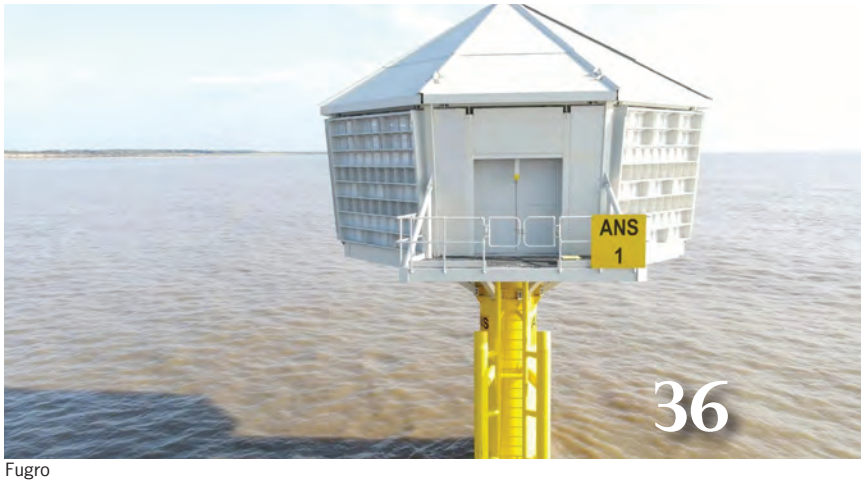

Fugro

Wärtsilä

While "Top 10" lists have evolved into little more than online SEO click bait fodder, the end of the calendar year is that traditional time of reflecting and projecting, so we asked several of our expert contributors to weigh in with their thoughts on the markets that drive your business. Looking big picture is my job, and per usual looking across the offshore energy landscape that are generous mixes of both opportunity and challenge. From all that we've heard, read and written this year, find here our list – in no particular order, and as I generally eschew the trite, find here a 'Top 8' List – on some key business and tech drivers heading in to 2026.

Brownfield Optimization: Operators have, and will continue to lean harder into maximizing output from existing assets —debottlenecking, tie-backs, and secondary recovery — with the benefits of speed, reduced risk and lower environmental impact. it's faster, lower-risk, and often lower-carbon than greenfield. Recent Gulf of Mexico moves highlight renewed emphasis on life extension + enhanced recovery.

Deepwater = a Growth Engine: Offshore deepwater is still a major slice of global supply and is projected to keep growing into 2026, but project sanctioning is more selective, with "only-the-best" economics and execution readiness required, according to Clarkson's.

Hard Barrels & Complex Wells: Easy barrels are far from gone, but mostly spoken for reports the Houston Chronicle. More developments are pushing into higher-pressure, higher-temperature and more complex drilling environments, lifting demand for advanced well design, managed-pressure drilling, high-end BOP stacks, and tighter well integrity programs.

The Subsea Workhorse: Subsea architectures increasingly favor standardized trees, manifolds, controls and templates, plus "factory-like" project execution to reduce schedule risk and cost blowouts. *[Read here on "The Ormen Lange Moon Landing"]*. That's paired with heavier use of tie-backs and phased developments.

FPSOs and Floating Production: After several years of strong growth, 2025 was unbalanced in award activity in some basins, but the medium-term picture remains positive.

The Digital (R)evolution: "AI" is quickly gaining trite status, but the move to digitalization is real and gaining speed. Using AI is one thing, effectively harnessing the power of AI to cut maintenance costs and boost efficiency is another. Operators continue to explore digitally enabled operations: condition monitoring, predictive maintenance, digital twins, automation of routine reporting and better logistics/crew planning.

The Supply-Chain: The supply chain story is not just cost, it's as importantly schedule integrity. Whether it's fabrication slot availability, labor or OSV availability de-risking the supply chain is a priority.

Regulation: Last, but certainly not least, is regulatory pressures. While at home the regulatory chains have been loosened, globally emissions pressure continues to expand.

In short, in 2026 expect to see more segmentation: premium assets (modern floaters, high-spec subsea, proven FPSO execution houses) do fine; marginal projects and older equipment could struggle. While finding hydrocarbons is perpetually core, the next bottleneck is more about predictable schedules, predictable costs and tightening carbon scrutiny.

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Kathleen Gammack is Senior Rig Analyst at Westwood Global Energy. Kath joined Westwood Global Energy in 2020 as a Rig Market Analyst. As part of the RigLogix team, she is responsible for tracking the offshore rig market, predominantly the European region. For the 18 years prior to this role, she worked for Diamond Offshore and ended her career there as the Contracts Manager responsible for tendering and negotiating drilling contracts.

Wendy Laursen has 20 years of experience as a journalist. In that time, she has written news and features for a range of maritime, engineering and science publications. She has completed a Master of Science research degree in marine ecology as well as diplomas in journalism, communication and subediting.

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Erik Milito is the president of the National Ocean Industries Association (NOIA), representing the interests of the offshore oil, gas, wind, carbon capture, and ocean mineral industries.

Jesper Skjong is a senior market analyst at shipbrokerage Fearnley Offshore Supply covering the offshore support vessel market, including O&G and offshore renewables.

Josefine Spiro is an award-winning journalist with nearly 20 years of experience, specializing in feature journalism, business, technology, and innovation. She is based in the heart of the Norwegian maritime cluster.


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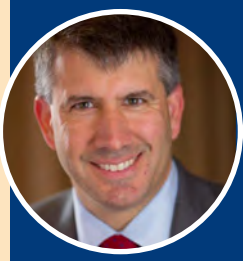
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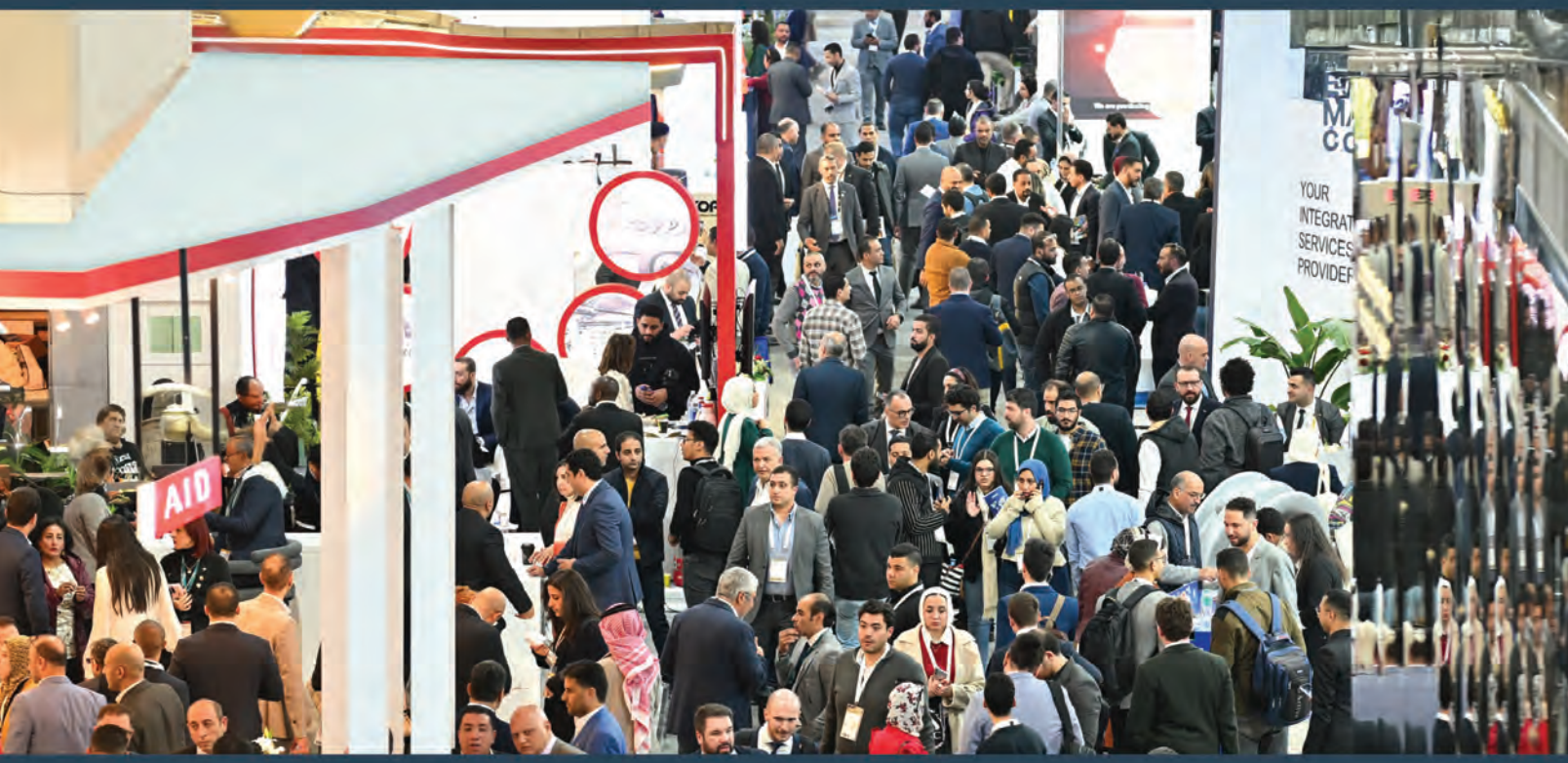

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New RP 75 Training Supports a Safer Offshore Future

A production supervisor on an offshore platform reviews a contractor's job plan and pauses. The plan relies on a checklist the contractor has used for several years, a tool that worked well enough under earlier, more prescriptive expectations. But the operator's Safety and Environmental Management System (SEMS), updated to incorporate the 4th Edition of API Recommended Practice 75, requires controls tailored to the specific risks and operating conditions of that asset.

The supervisor knows the checklist isn't inherently wrong, but it isn't sufficient for a performance-based system built around their operations. The contractor's crew, accustomed to relying on the checklist at other facilities, is surprised when the supervisor asks for a more tailored approach.

The conflict reveals an emerging industry challenge: implementing the 4th Edition of API Recommended Practice 75 requires training the workforce to understand and apply a performance-based SEMS.

The Role of SEMS in Offshore Safety

SEMS has long served as a foundational system for offshore safety, with its comprehensive framework designed to help protect personnel, safeguard the environment, and prevent incidents. At the heart of this effort is *API Recommended Practice 75 (RP 75), Recommended Practice for a Safety and Environmental Management System for Offshore Operations and Assets*, which defines the structure and expectations for an effective SEMS.

First introduced in 1993, the 3rd Edition (2004) was later incorporated into U.S. regulations by the Bureau of Safety and Environmental Enforcement (BSEE), establishing the document as a critical benchmark for safety on the Outer Continental Shelf (OCS). However, the growing complexity of offshore operations, along with advancements in technology and the expanding global reach of offshore projects, prompted an update of the standard: API RP 75, 4th edition, published in 2019.

The 4th edition introduces significant changes from its predecessor, emphasizing a performance-based framework designed to achieve measurable safety and environmental outcomes. This change requires operators to adapt their approach to SEMS implementation, developing systems customized to their unique operations. Doing so effectively requires training that aligns the workforce with the 4th Edition's performance-based expectations.

Training Designed for Today's SEMS Expectations

To support that need, the **Center for Offshore Safety (COS)** has developed a comprehensive training series that focuses on the performance-based outcomes required by the 4th.

The training program builds on more than a decade of COS leadership in fostering a culture of safety across the offshore industry, providing operators with the guidance needed to meet the evolving demands of SEMS.

Launched with the support of the **American Petroleum Institute (API)**, the RP 75 training series emphasizes how SEMS functions as an integrated, performance-based management system, one that depends on leadership engagement to coordinate safety and environmental programs across contractors, co-owners, and partners.

The three-part curriculum reflects this approach. Module one, a computer-based training, introduces the history, principles, and structure of the 4th Edition, clarifying how its four core principles and thirteen elements work together. Module two, also computer-based, focuses on planning SEMS audits, helping participants understand how to define scope, evaluate operational context, and develop audit strategies that lead to meaningful findings. Module three will launch in 2026 and will be delivered through hands-on, onsite training, teaching participants how to conduct management-system audits that look beyond individual deficiencies to identify the systemic factors that shape safety performance.

Together, these courses provide a structured pathway for building the competencies required under the 4th Edition, ensuring that workforce personnel keep pace with the performance-based expectations of modern SEMS.

A Foundation for Stronger Offshore Performance

And these training programs couldn't come at a more opportune time. The need for consistent, structured SEMS training is growing rapidly as offshore operations evolve. Today's projects involve complex supply chains, integrated technologies, and sprawling teams operating across diverse geographies. The RP 75 training series keeps pace with this shift, equipping today's workforce with the knowledge, context, and practical skills needed to implement a modern, performance-based management system.

And by strengthening SEMS competency across the workforce, the industry reinforces its commitment to safe, reliablem, and sustainable offshore operations.

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www. centerforoffshoresafety.org/rp-75-training-modules

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LONG-TERM OUTLOOK FOR SUBSEA VESSEL MARKET REMAINS ROBUST

Throughout 2025 we have seen the subsea vessel market transitioning from a period of record highs towards a more cautious, but still fundamentally strong, outlook. While short-term activity and rates have softened in the latter part of the year, long-term demand - driven by deepwater projects and global energy infrastructure- remains robust. The market is watching closely how the influx of newbuilds and ongoing corporate consolidation will shape competition and vessel availability in the coming years – with several key developments expected to impact the market already in 2026.

By Jesper Skjong, Senior Market Analyst at Fearnley Offshore Supply

For the first half of 2025 the subsea vessel market experienced a favorable balance, with high dayrates for both 150-ton and 250-ton SWL AHC crane vessels, often exceeding $60,000 and $80,000 per day respectively. For reference, these levels are back to, and even beyond previous peak fixtures.

It is worth noting that a significant portion of the high-specification vessels are now controlled by contractors, however, rather than being available directly from shipowners, which in turn led to more fixtures occurring between contractors instead of through direct charters.

Moreover, charters continue to favor short-term fixtures for these vessel segments. While this makes sense in a project-oriented perspective, it also opens the door to tremendous dayrate volatility. In fact, when looking at the fixture spread during the last 12 months, we find that while there is a limited delta for long-term contracts, short-term, project, and spot fixtures vary almost four-fold from top to bottom!

Additionally, we believe that the predominantly project focused fixing environment is somewhat of a remnant of the low-activity cycle still fresh in everyone's mind. In light of the record-high and still growing EPC orderbook volumes we firmly believe that the market will revert to more long-term fixtures in 2026.

Short-Term Softening Amid Dayrate Volatility and Supply Growth

Another significant development in the industry is the proposed merger between Subsea 7 and Saipem to form Saipem7, a move designed to achieve substantial cost synergies to the tune of $350 million per year, and increase market dominance, though it will also present integration challenges. Expected to be finalized in the second half of 2026, the combined company will see its combined revenue, EBITDA, and backlog all reach new heights, positioning itself and its capacities as the clear market leading EPC contractor.

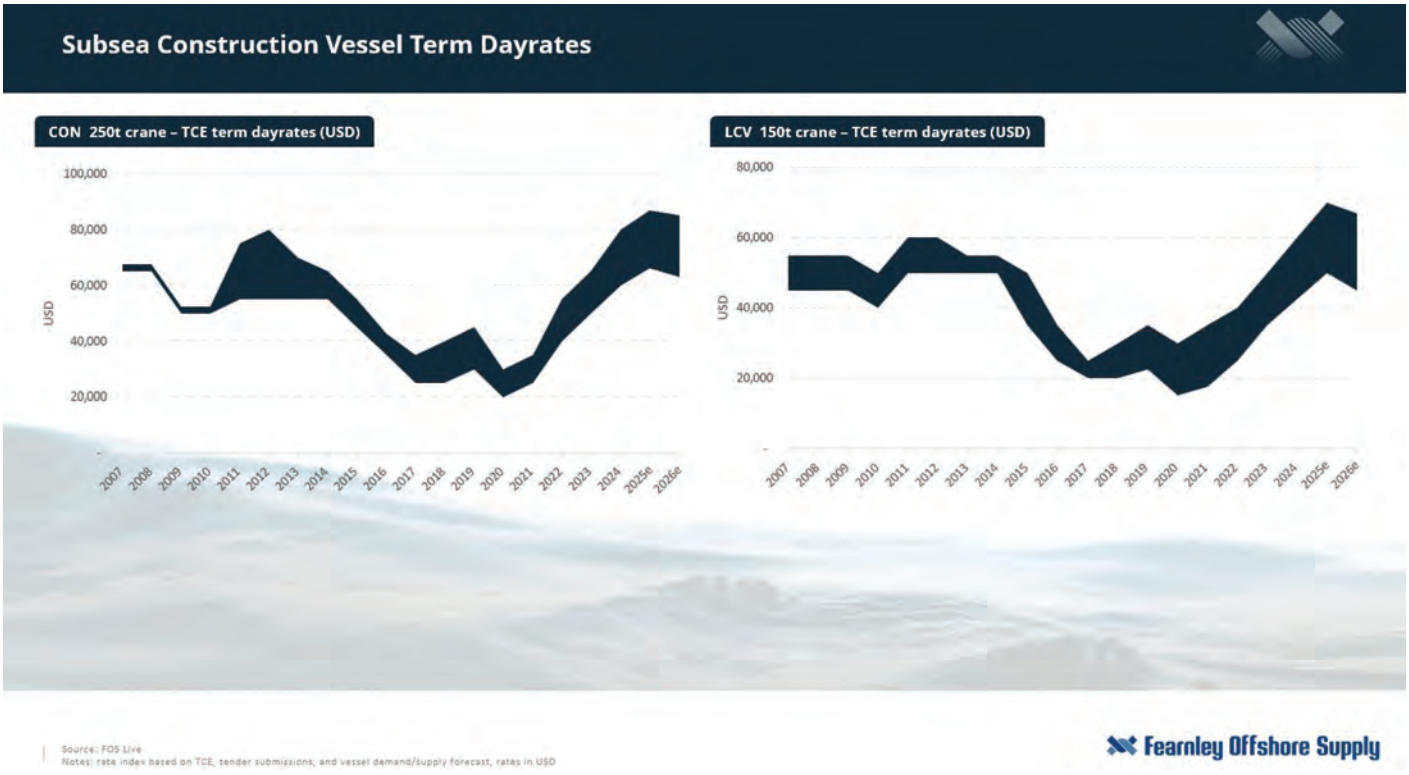
Contracting activity remained strong throughout 2025, with the Tier1 EPCs, Subsea 7, TechnipFMC, and Saipem, securing significant projects across Europe, South America, West Africa, and the Middle East. South America, particularly Brazil, stands out as a key growth region, with Petrobras beyond likely to drive long-term demand.

In light of this, the market is also shifting more toward deep- and ultradeep-water projects and more advanced vessels, supported by a strong pipeline of projects expected to drive demand through 2026 and beyond. As a result, close to all job types typically associated with subsea construction assets are expected to continue positive momentum next year. This is especially true for the installation of new subsea trees and other subsea production infrastructure installations, which we expect will see the largest growth in 2026.

Newbuild Supply, Consolidation and the Path to Rebalancing

On the supply side, there is a significant increase in newbuild orders since our forward-looking article at the same time last year. This is especially true for 150- and 250-ton SWL AHC crane vessels, with around 30 firm units currently in the orderbook for these asset types.

Furthermore, when we look at the orderbook compared to the current active fleet, these figures constitute in excess of 20% orderbook ratio, which, in comparison, is roughly the same relative volume of newbuilds seen between 2008 and 2015. A notable shift since the previous market cycle



peak however, is that most of these vessels are being constructed in China as opposed to Norway.

Moreover, almost all of these newbuilds are ordered on a speculative basis and with few exceptions remain uncommitted at the time of writing. That having been said, the market does not anticipate a collapse in dayrates. Instead, a wider spread in achievable dayrates based on vessel age and specification is likely to materialize to a significant degree starting in 2026.

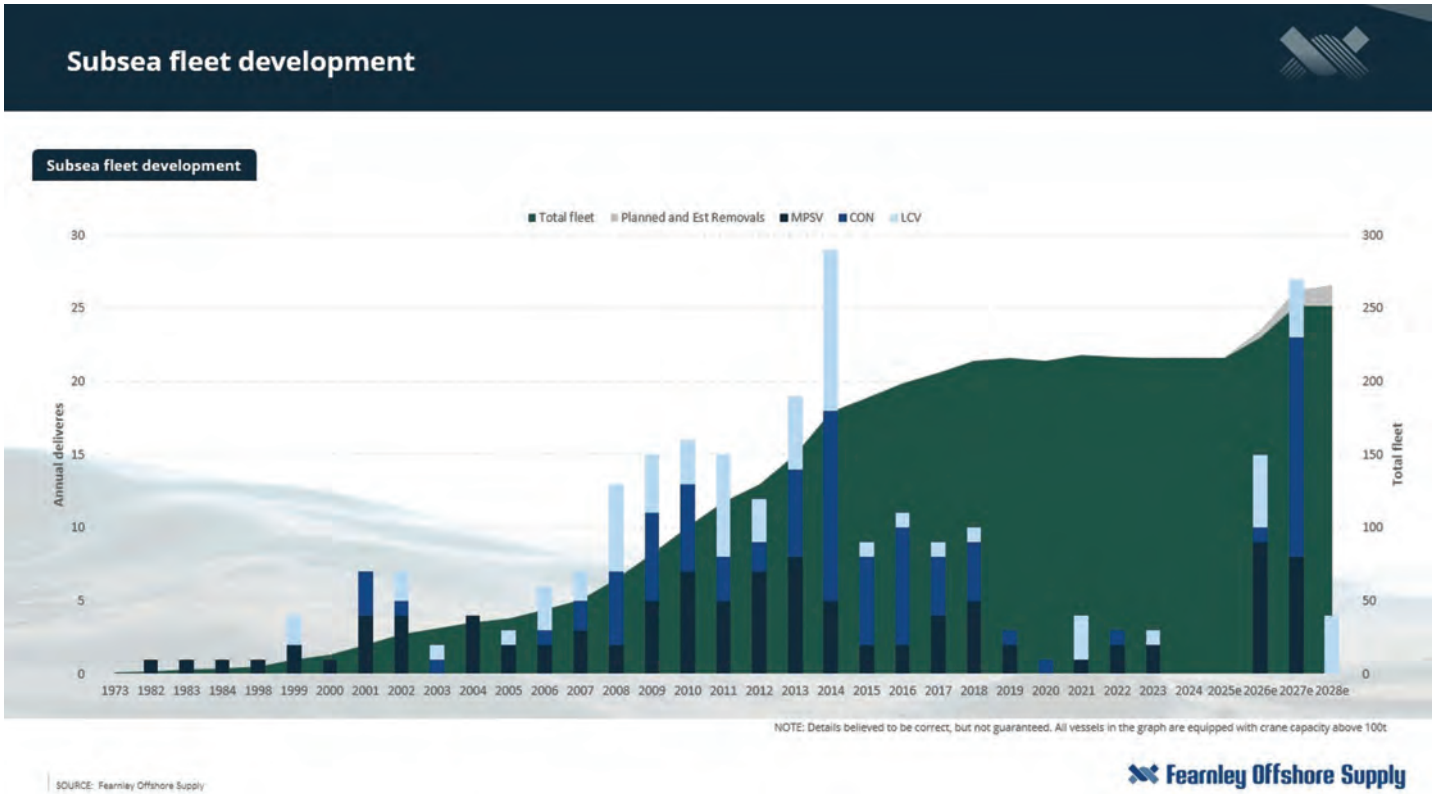
Even now, at the latter part of the year, the market has softened compared to last summer, with both fewer fixtures and somewhat downward pressure on dayrates, especially for less advanced or older vessels. Major contractors are also showing caution, focusing on improving margins and aligning vessel intake with planned project activity.

The fact of the matter is that, even with growing demand for subsea services, the supply side is currently growing even faster. Despite this, however, long-term fundamentals remain strong, with a continued shift toward deepwater and subsea infrastructure.

More to the point, market leading shipowners such as Sea1 Offshore, DOF, and Solstad Offshore are reporting strong EBITDA margins, and these are expected to remain healthy due in the prevailing market environment. In fact, another point to note is that dividend distributions are expected to increase among leading vessel owners, reflecting strong cash flow.

In summary, it is difficult to get around the impending influx of speculative newbuilds which will likely soften the market balance and thus dayrates and utilization levels, especially if demand does not keep pace. Additionally, we note that project delays along with conservative behavior from EPCs are also contributing to a potential near-term market softness.

However, a significant backlog and robust tender pipeline suggest a likely uptick in activity and vessel intake from 2026 to 2027. In conclusion therefore, while short-term activity and dayrate expectations have softened, the long-term outlook for the subsea vessel market remains robust, driven by deepwater projects and global energy infrastructure.



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CHALLENGING 2025 FADES AS OFFSHORE RIG OUTLOOK BRIGHTENS

The 2025 offshore rig market has been anything but boring, with increased attrition and M&A activity, as well as demand challenges from continued high supply chain costs combined with low oil prices impacting operators' project schedules, rig suspensions/terminations in Mexico and Saudi Arabia, and geopolitical sanctions to name but a few. It's not all doom and gloom though - there are signs that the market will look brighter from late 2026 onwards; however, next year will not be without its challenges.

By Kathleen Gammack, Senior Rig Market Analyst, Westwood Global Energy

Main Events of 2025

One of the biggest talking points of 2024 and 2025 was Saudi Aramco's suspension of 36 jackups from April 2024, but by 3Q 2025 21 units had been re-deployed into other regions of the world. Fast forward to today, the national oil company (NOC) has confirmed it will restart work with eight of the remaining suspended rigs in early 2026. It has also approached the market with two solicitations of interest for nine jackups to begin working later in 2026 meaning a brighter outlook for the Middle East market next year.

Mexico also had its challenges, with the NOC Pemex placing rigs under suspension, while trying to catch up with late payments. Furthermore, Borr Drilling terminated two jackup contracts in Mexico following international sanctions against Lukoil – Russia's largest privately-owned, publicly-traded company.

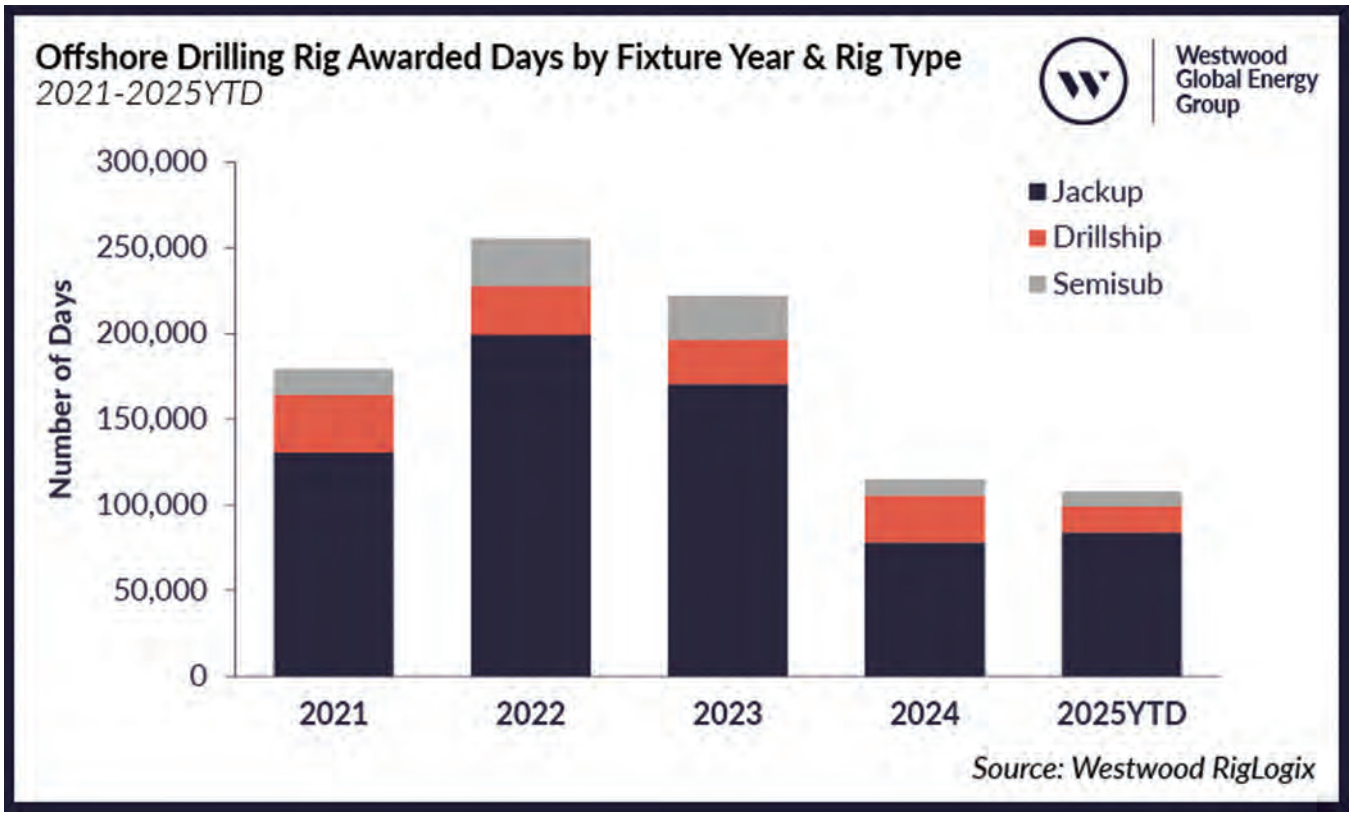
Another casualty of these sanctions was Vantage Drilling's drillship Platinum Explorer, which was due to start a Black Sea campaign for Lukoil in 1Q 2026. The charter was cancelled before mobilisation to the region began.

In the UK North Sea, the Energy Profits Levy (EPL) continued to erode offshore rig demand as the overall tax rate of 78% provided little incentive for investment in new campaigns. No new exploration wells were spudded in UK waters during 2025 (a phenomenon not witnessed since 1964) and considering the UK Autumn Budget announcement to keep the EPL until March 2030, future demand looks set to be driven by decommissioning (plug and abandonment) operations.

Petrobras' Brazilian rig charter awards for drillships in 2025 has been near non-existent with less than one year of work being awarded in total – a decline of 96% and circa 93% in comparison to 2023 and 2024, respectively – mainly due to open tenders not yet being awarded and potentially rolling into next year. The NOC also recently announced a revised five-year strategy due to a lower oil price forecast with an expected reduced floating rig count for the next few years.

Meanwhile, a major M&A transaction involved ADES International completing its cash merger with Shelf Drilling Ltd, valued at approximately $400 million, in late November. The acquisition boosts ADES' fleet to 83 offshore units and 40 onshore rigs spread across 19 countries.

As of early December 2025, award activity for offshore rigs is sitting at around 295.9 years, which is a 6% decrease



versus the full year figure for 2024. Jackup awards are up 7.3% but semisub awards are down 6.9%, while drillships are down a whopping 44.2% – though this may be remedied somewhat in December if Petrobras awards some highly anticipated drillship contracts. However, Westwood still anticipates awarded days for 2025 will finish in line or slightly higher than last year due to several evergreen contracts in markets such as Mainland China and India, where extensions are typically firmed up at year-end.

Global marketed supply of jackups, drillships and semisubs stands at around 439, 89 and 73 units, which is down by five, seven and two units respectively, when compared to the end of 2024. Due to the noticeable slowdown in demand since peaks in 2022 and 2023, an uptick in rig attrition has been recorded. For 2025 so far, 22 units have been retired from the fleet consisting of eight drillships, eight jackups and six semisubs – the most recorded since 2021.

What's to Come in 2026?

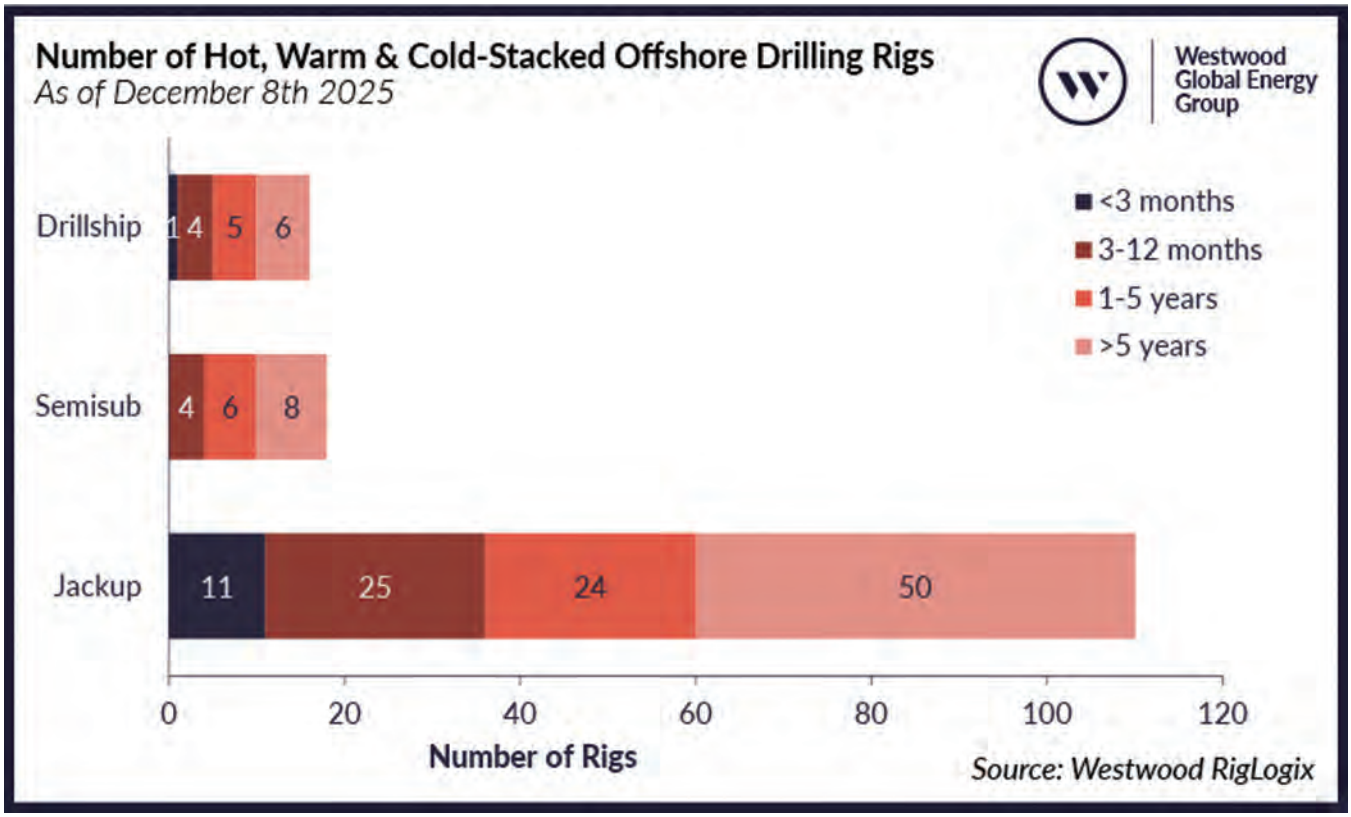
Traditionally, and as is the case for 2025, when the rig market is experiencing lower utilisation, attrition and cold stacking rises while deliveries from shipyards tend to decline.

Of the 172 idle units tracked by Westwood's RigLogix, 28 units have future commitments – 14 jackups, six semisubs and eight drillships. Currently, 50 jackups, eight semisubs and six drillships have been stacked for five years or more, making it extremely challenging to re-enter the market, if at all.

The recent acquisition of Shelf Drilling by ADES could lead to further streamlining of the combined fleet, with the retirement of lower specification jackups – without future work in place – likely to be potential candidates. Furthermore, with 74 jackups idle for one year or more, it is possible that we will see some more retirements and sales in this segment during 2026.

Some Utilization Recovery Expected

Westwood records 355 rig years in awarded demand for 2026 starts. A total of 42 unawarded tenders starting in 2026 have a combined duration verging on 67 years across all three main rig types – drillships (~9.2 years), semisubs (~14.6



years) and jackups (~42.8 years) – and this does not yet take into consideration direct negotiations, pre-tenders, potential extensions and exercising of contract options that may also occur.

The outstanding demand for drillships is mainly centred in South America, Africa, India and Southeast Asia, whereas new semisub demand is being driven by Northwest Europe, the Mediterranean, Australia, Canada and South America, with jackups having highest number of requirements in the Middle East, India, Asia Pacific and Northwest Europe.

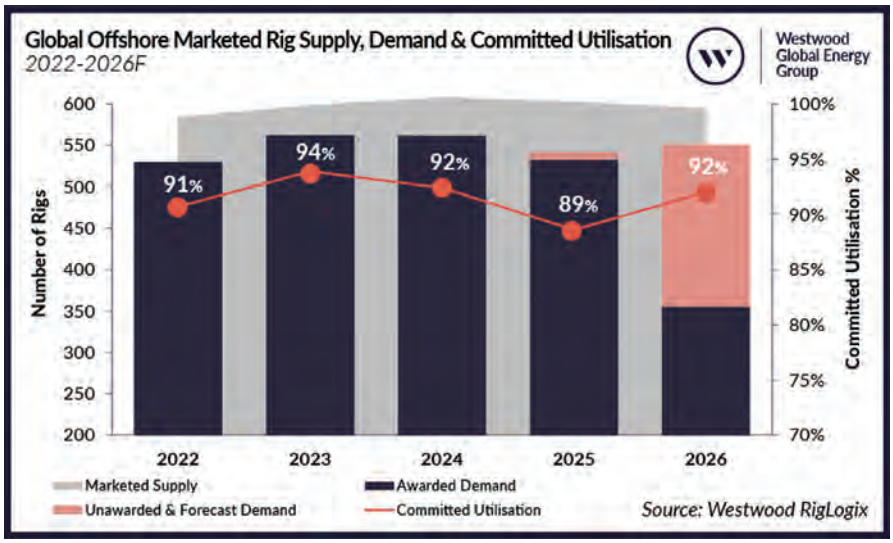
For the full year of 2025, global marketed committed utilisation is expected to reach 89%. This considers actively marketed rigs with ongoing contracts or those already booked with future commencement dates. If all planned 2026 demand comes to fruition, alongside anticipated attrition and likely further cold stacking of unnecessary supply, forecast global marketed committed utilisation could rise to between 91% and 92%. Committed jackup utilisation is expected to reach 91.8%, semisubs to 92.5% (mainly driven by falling supply and a slight uptick in demand), with drillships marginally higher at 92.6%.

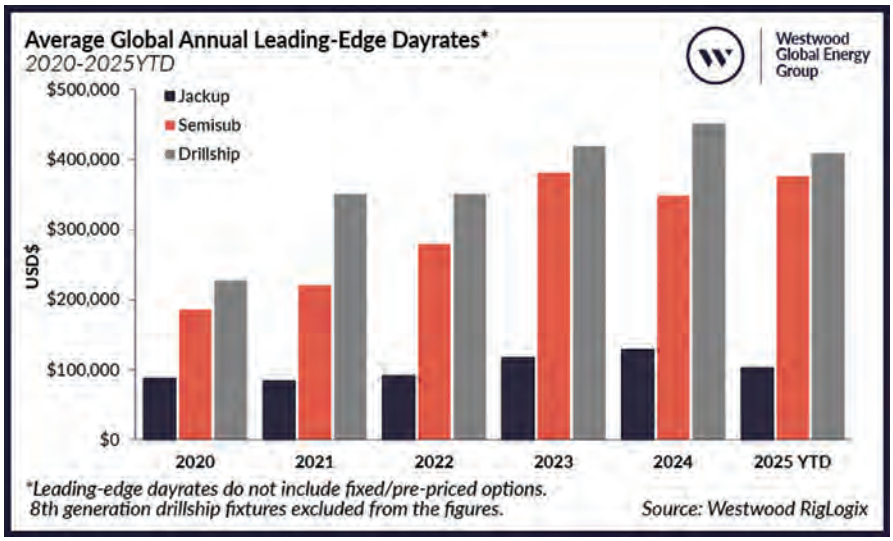
Leading-Edge Dayrates Could Fall Further in First Half Of 2026

Due to market softness during 2025, jackup and drillship dayrates fell below that of 2024 by 20.6% and 8.2%, respectively. Semisubs on the other hand appeared to buck the trend with dayrates increasing by just over 8%, however, this stems from the lack of many benign semisub dayrates being revealed, while those that were divulged tended to be for awards for 6th generation, harsh-environment units in Norway, which command some of the highest dayrates for rigs globally.

Further dayrate decreases are expected due to continued high competition, especially for jackup and semisub campaigns outside of Norway, and for drillships with a 1H 2026 start date, particularly for those units with scheduled whitespace during this period. For campaigns starting later in 2026 and 2027, Westwood anticipates dayrates will begin to stabilise, with modest improvements as demand and utilisation strengthen.

To sum up, although the first half of 2026 may continue to be a highly competitive market for offshore drillers, Westwood expects to see some market recovery next year, with noticeable improvements in demand and utilization emerging in the second half of 2026 into 2027.





U.S. OFFSHORE ENERGY 2026 OUTLOOK

Building Momentum in the Gulf of America

By Erik Milito, President, National Ocean Industries Association

The Gulf of America is back and the momentum is unmistakable. After two years without federal lease sales, the December 10, 2025, Gulf of America lease sale, Big Beautiful Gulf 1, marks a turning point for the U.S. offshore energy sector. With $300 million in winning bids and companies spending an average of $1.6 million per lease block, up from $1.2 million per block in the December 2023 sale, America's offshore industry is signaling its readiness to invest, innovate, and grow.

This sale is more than a one-off event; it represents a restart of the predictable leasing cadence that previously delivered two Gulf of America lease sales per year. Restoring this rhythm is essential. Offshore oil and gas projects are complex, multi-billion-dollar undertakings with timelines spanning 20 to 30 years. Predictable leasing allows companies to plan strategically, invest in technology and infrastructure, and maintain the highly skilled workforce that has kept the Gulf among the world's most productive offshore basins.

The Gulf of America is not just a source of energy; it is a strategic platform for U.S. energy leadership. Its world-class reserves, advanced subsea and offshore technology, and deepwater engineering expertise uniquely position it to deliver secure, lower-carbon energy to the U.S. and its allies. Gulf-produced oil has a carbon intensity 46% lower than the global average, displacing higher-emission imports while supporting energy security and environmental stewardship.

Beyond oil and gas, the Gulf anchors emerging energy sectors. Offshore wind, carbon capture, subsea minerals,

and next-generation exploration all rely on the engineering expertise, supply chains, and infrastructure developed around traditional offshore energy. This synergy makes the Gulf a versatile energy hub capable of sustaining industrial leadership across multiple sectors for decades to come.

The economic impact is substantial. In 2024, Gulf of America oil and gas operations supported roughly 428,000 jobs across the U.S., generated $35.9 billion in economic activity, and produced $7 billion in federal revenue. These positions span more than 200 occupations, from subsea engineers to data analysts to welders, with wages averaging nearly 30% above the national average.

Predictable offshore activity supports not only operators but also thousands of additional workers in fabrication yards, ports, service companies, and supply chains that depend on a steady flow of projects.

The impact extends well beyond individual operators. Consistent offshore activity sustains local suppliers, fabrication yards, and service providers, supporting thousands of additional jobs nationwide. When Gulf Coast companies can rely on long-term projects enabled by federal lease sales, they are able to invest in advanced technology, workforce training, and infrastructure, strengthening the region's energy cluster and keeping it globally competitive. This chain reaction ensures the Gulf of America remains the cornerstone of America's offshore energy industry, delivering lasting benefits to communities, families, and local economies for generations.

The 24-month leasing gap underscored just how disruptive unpredictability can be. Delayed projects, frozen capital, and workforce reductions highlighted the importance of consistent federal leasing. With the December 10 sale, and the potential for the next Gulf of America lease sale in March 2026, the industry is poised to regain momentum and maintain it for years to come.

Permitting certainty is the next frontier. The bipartisan Standardizing Permitting and Expediting Economic Development (SPEED) Act promises transparent processes, clear timelines, and litigation reform. With predictable permitting, companies can commit capital, retain skilled workers, and deploy new technologies with confidence. Combined with regular lease sales, the SPEED Act would ensure long-term stability, continued innovation, and expanded economic impact across the Gulf.

Global energy demand is accelerating. Population growth, electrification, AI-driven data centers, and industrial expansion all require secure, reliable, and affordable energy. Gulf offshore projects meet domestic needs while supporting international markets, reinforcing U.S. energy leadership and providing allies with dependable, lower-carbon energy.

The Gulf is also a proving ground for technology. AI-driven operations, autonomous inspections, predictive maintenance, and advanced subsea robotics are becoming standard. These innovations improve efficiency, reduce environmental impacts, and set global benchmarks for offshore production. Predictable leasing and permitting are essential to sustaining these technological advances.

Domestic supply chains and industrial capacity depend on consistent project pipelines. Fabrication yards, shipbuilding, port operations, and specialized service providers require long-term project visibility to invest and expand. Regular federal leasing ensures that this expertise remains in the U.S., maintaining American leadership in offshore energy.

Workforce development is equally critical. High-paying offshore energy jobs support families and communities, while apprenticeships and training programs prepare the next generation of engineers, technicians, and mariners. Predictable leasing and permitting keep these workforce pipelines robust, supporting generational career growth, regional resilience, and sustained industry leadership.

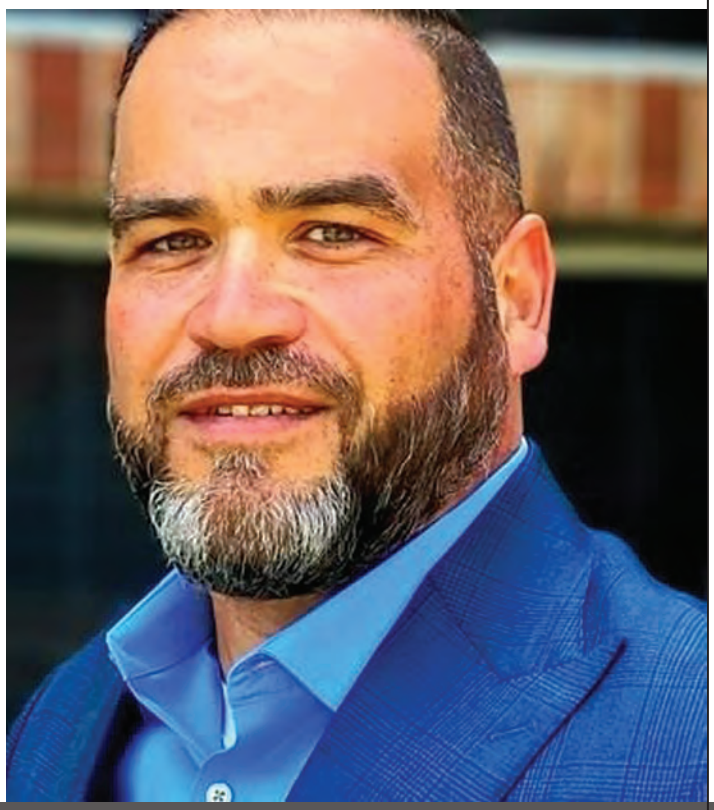
Production coming online today reflects decisions made years ago. Wood Mackenzie estimates that long-planned deepwater projects will add 300,000 barrels per day in 2025 and another 250,000 in 2026. These volumes are vital to offset onshore declines and reinforce U.S. energy security. None of this happens without consistent lease sales and permitting clarity.

With the December 10 lease sale and the 29 additional sales mandated under the One Big Beautiful Bill, the Gulf of America is poised to continue anchoring the U.S. offshore energy economy. Momentum built in 2025 can extend into 2026 and beyond, especially with SPEED Act reforms in place. Companies and workers will have the confidence to invest, innovate, and compete globally.

The Gulf of America demonstrates how strategic energy policy, technical expertise, and a skilled workforce combine to deliver secure, affordable, and reliable energy while supporting high-paying jobs, strengthening industrial capacity, and driving long-term economic growth. Predictable leases and permitting keep investment in America, the workforce employed, and the nation energy secure.

The time for sustained policy, regular leasing, and permitting certainty is here. With the Gulf of America ready to propel U.S. energy forward, America can embrace energy dominance, economic growth, and a resilient offshore workforce for decades to come.

OCEANEERING REDEFINES OFFSHORE OPERATIONS



All images courtesy Oceaneering International

*As offshore energy development confronts more applications, increasingly complex operating environments, and a turbulent global market, adaptability and integrated offerings may be the solution. At the center of this vortex is Oceaneering International's Offshore Projects Group (OPG) and Vice President **Dan Vela**, who shared insights with **MTR** about the operations of a multi-vessel, multi-mission fleet.*

By Celia Konowe

Dynamic flexibility

Dan's wide-ranging career in oil and gas has spanned from an offshore technician to sales, account management and now operations. He's held his current role as vice president - OPG Americas for three years.

A typical day may vary greatly, but there's a common emphasis on developing the teams and scopes that will address the projects that come their way. "It's a lot of planning of future work, of current work, and a lot of risk and hazard identification and management," Vela said. "We spend a lot of time on quality and making sure that our teams are prepared. Then, it's just the flawless execution of the projects and making sure that that they're going off the way that we planned, and that we can come back, reload and head out to the next one."

The role is dynamic, requiring flexibility. "Whereas in manufacturing, you plan something, you put it in the system, and it kind of flows through. This does that, but it tends to move around in that process," he explained. "Our job is to keep it as tight and as in line as we can with the plan and follow it all the way through execution. That's evolved over time of us learning how to do that the most effective way for both internal and external results. And we're still learning. It's always something new. It's never a dull moment, that's for sure."

External factors pose dynamic challenges. "Whether that's weather that affects us doing our operation or it's a customer schedule that moves. A lot of our day-to-day is

reacting to those inputs as they come in and then reshuffling or replanning, repreparing, re-evaluating and then moving forward to the next step."

Fit for mission

From a vessel activity standpoint, the bulk of OPG America's work in the Western Hemisphere is in the Gulf of America, with additional projects ranging across the Caribbean and down to South America.

Its five vessels underwent an update in recent years as Oceaneering considered how to approach fleet management as an enduring strategy. In addition to operating their own ships, they entered into long-term agreements with other vessel owners to build fleet capability and scope.

There are two large vessels in the fleet, which have 250-ton heave cranes onboard, with a back deck of about 12,000 square feet. These ships specialize in subsea hardware installation and interventions—projects that require bigger equipment and larger crane capabilities at deeper water depths. Ocean Evolution was built for and is owned by Oceaneering, while the second is chartered from an independent vessel owner. Speaking about the latter, Vela explained, "The boat is staffed with Oceaneering management and execution teams, and then the vessel owner staffs it with the marine team that operates the vessel. We coordinate with them on operations and on what's needed for the vessel, like maintenance."

Two medium-sized vessels have 165-ton heave cranes and slightly smaller back decks. Those boats flex up or down based on the project; often they are used for smaller installation or intervention work, but also tasked for inspection, maintenance and repair (IMR). Oceaneering's smallest ves-

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sel is also chartered and primarily does IMR-based work.

What makes the company's fleet unique is that regardless of the vessel, all boats are equipped with its own ROVs and survey services. This holistic approach, Vela said, allows the company to collaborate and coordinate internally.

"On a day-to-day basis, we evaluate the needs of projects coming in and look at the vessel best available to suit that," he added. "We try to match the vessel to the scope the best we can, and if we don't have it available then we're able to move things around and shift work from vessel to vessel."

One-stop shop

A recent project, although non-traditional, showcased Oceaneering's service capabilities from start to finish. The customer, a pipeline company in the Gulf of America, wanted to change their production lines subsea, as opposed to shutting down processes before starting the work. Oceaneering's engineering team was able to build complex skids with isolation valves that would allow for operations to continue. "They built the system, tested it and then we received the system and went offshore to do the installation," said Vela. "It allowed us to bring the full weight of what Oceaneering can do to the table, from creating the engineered product, to building it, testing it, delivering it and installing it."

He added, "We're looking forward to doing more of that with this customer. They've got several more of these projects coming up and we're well positioned to help."

Ship Shape

In a turbulent global business environment, with rapidly growing trends like marine autonomy and the use of artificial intelligence (AI), Oceaneering is embracing adaptability to best serve its customers. "There are a lot of external impacts that affect our business and are the biggest drivers," said Vela. "A lot of that has to do with the market and where and how our customers are spending their money. That's a key point for us to understand to help us react or be proactive to those trends. When we think about AI on the vessels, there's some opportunity there, but I think the biggest part is how we can use it to help us work more efficiently." He noted that tracking and planning can be streamlined using AI.

Regarding autonomy, Oceaneering's fleet already features autonomous processes, such as dynamic positioning systems, subsea survey equipment, ROV systems and the cranes. "We also have a group whose sole focus is looking at autonomous vessels. We collaborate with them on what we use the vessels for and how can we integrate autonomy into how we use our fleet in the Gulf of America. And that's an ongoing discussion.

Plotting a Course

For Vela, the near-term future holds exciting potential for Oceaneering. "In the next three to five years, we're trying to really understand what our fleet needs to look at. What does it look like? How many autonomous vehicles are included in that?"

Crewing is one factor that requires the right balance. "We're looking at how we can reduce our crew sizes offshore. Not that we want to reduce people, but we see areas where we can move into remote operations."

It's just one element under consideration. "So, on top of our day-to-day operations, we're looking at a lot in the background. There's a lot of things going on, a lot of moving parts and challenges, but we have great people here that want to be challenged. They want these new and exciting opportunities to think about and plan for and problem solve with."

FILL-FOR-LIFE: Wind's new Standard?

Pushing gear oil limits for lasting performance

As demand for wind energy intensifies, turbine reliability and efficiency are paramount. In this context, lubrication plays a vital - yet often underestimated - role. Over the years, lubrication technology has been an important problem-solver for the industry. From preventing micro-pitting, to enhancing cold-temperature fluidity and resisting white etching cracks, lubrication formulators have continually met the evolving demands of wind power. And now, as extending oil drain intervals becomes increasingly integral to productivity and cost management, we're on the cusp of another breakthrough: "lifetime lubrication".

Exxon Mobil's Michael L. Blumenfeld has been one of the team working on an advanced new formulation and "top-treat" package, engineered (and DNV-certified) to offer protection and performance for the lifetime of the turbine. He advocates for a new approach, where wind turbine gear oils are viewed as valuable, enduring assets – to be maintained alongside the equipment itself.

As wind energy demand intensifies, turbine reliability is increasingly critical. Gearbox performance is a major driver both of operational costs and overall efficiency. This is where lubrication plays a pivotal, but often undervalued, role, and a recent breakthrough is poised to revolutionize oil service life and maintenance plans.

History of Problem-Solving

Every moving component in a wind turbine relies on lubricants to reduce friction, dissipate heat and prevent wear. Since the industry's inception, advanced lubricants have been pivotal in solving key mechanical challenges. Initially, standard industrial gear oils were the norm. However, the transition to megawatt-class turbines in the 1990s necessitated specialised lubricants to prevent the micro-pitting that was threatening gear life. Later, in the 2000s, installations in cold climates prompted the need for high-viscosity index basestocks with improved low temperature fluidity. This spurred the creation of metallocene catalysed PAO (mPAO), now the industry standard. A decade on, the emergence of white etching cracking (WEC) drove intensive R&D to identify and prevent lubricant-related causes, culminating in formulations engineered to not contribute to the phenomenon.

Wind turbines really are the ultimate challenge in lubricant formulation - operating in remote and extreme conditions, with a myriad of moving parts demanding precise lubrication. For the lubrication industry, this has meant adjusting to staggering torque demands (measured in millions of Newton Meters in a turbine vs hundreds for a passenger car engine) and the need for advanced durability. Throughout this process, close collaboration between lubrication chemists and engineers and OEM design teams has been crucial, as we collectively strived to extend equipment lifespan and simplify maintenance processes. Despite the obvious differences between the industries, lubrication

companies like mine have been able to draw from our expertise in sectors like automotive to craft solutions tailored to the challenges of wind energy.

The Quest for Longer ODIs

Today, much like the automotive industry, extending oil drain intervals (ODIs) is a key ambition for wind operators, OEMs, and lubrication manufacturers. With stiff competition from other energy sources, efficiency is critical to extracting every electron from a wind turbine - at the lowest possible cost and in an environmentally responsible manner. Extended ODIs can help reduce service frequency, safety risks and costs while generating less used oil. Significant advances have been made in this area: leading manufacturers have progressed from wind turbine gear oils with a three-to-five-year lifespan two decades ago to products with a ten-year warranty a decade later. This leap forward represents a huge cost and time saving, allowing operators' maintenance teams to prioritise higher-value tasks that keep turbines running efficiently and profitably. As we look ahead, the pressing question is: how long can a wind turbine gear oil truly last?

Pioneering 'Lifetime Lubrication'

In line with the requirements of leading turbine OEMs and owner operators, we now view wind turbine gear oil in a completely different way. Traditionally, it was seen as a disposable component, replaced periodically. We're advocating an approach that treats lubricants as valuable assets – to be maintained alongside the equipment itself. This shift involves introducing specialized additives, known as "top-treats," to rejuvenate the gear oil over time. By supplementing durable base stocks with these performance-enhancing "vitamins," we can significantly extend the lubricant's lifespan. And so, instead of transporting cumbersome oil drums for expensive and time-consuming replacements, technicians can use small bottles of a top-treat such as Mobil Xtra WT. It's an innovation that has been a decade in development, with detailed analysis of thousands of oils that have been replaced in the field, and one that I truly believe is poised to revolutionize turbine maintenance.

DNV-certified to achieve more with less

Returning to my earlier question, I am thrilled that, today, we have a solution that can match the lifespan of your turbine. Following over six years of research, accelerated life testing, and optimization, we've been able to develop a product and top-treats package that offers performance and protection for the equipment's lifetime. To validate this, we've been through a rigorous DNV audit, with Mobil SHC™ Gear 320 WindPower receiving certifications for lifetime lubrication (DE-DNV-SE-0074-10516) and WEC resistance (DE-DNV-SE-0074-11037). This innovation not only helps reduce operational and maintenance costs, but also has the potential to cut oil usage and waste. By offering lifetime ODI capability, the product can deliver an estimated 80% reduction in Global Warming Potential (GWP) compared to a product with an ODI of five years.

Innovation

When we finally hit the ceiling of what's possible for a wind turbine power-wise, only its internal components will be able to help extract more power and value. With this in mind, the industry's focus on reducing costs and waste while ensuring profitability very much aligns with advanced lubrication solutions with the potential to enhance maintenance efficiency. Collaboration between OEMs and component suppliers remains essential to ensure compatibility and synergy among the materials used in turbines, preventing unexpected failures. Organisations such as APQP4Wind are also playing a vital role in quality standardisation and process simplification, ensuring consistent standards across the industry.

Unlocking Future Potential

The future of wind energy hinges on the drive to innovate beyond traditional boundaries. Within this, lubrication technology deserves a strong emphasis, given its historical problem-solving role. I would urge OEMs and operators to demand more from their lubrication suppliers, challenging them to provide cutting-edge technology and support in solving emerging operational challenges. By following the example set by the automotive sector, the wind industry has the opportunity to revolutionize maintenance efficiency by embracing the fundamental role of advanced oils and greases, and prioritising collaboration. By inspiring and adopting lubrication breakthroughs, we can collectively push the boundaries of turbine efficiency, lower costs and solidify the future of wind energy as a reliable and cost-effective source of renewable energy for future generations.

EFFICIENCY FIRST:

Inside Olympic Subsea's Bet on Greener Offshore Vessels

*A new generation of hybrid vessels is demonstrating significant gains in both fuel economy and operational output. For Olympic Subsea's owner and CEO **Stig Remøy**, it proves that technology-led efficiency is the fastest path to decarbonization—and a powerful business case.*

By Josefine Spiro

Image courtesy Josefine Spiro

STIG REMØY, OWNER AND CEO OF OLYMPIC SUBSEA, IN THE COMPANY'S HOMETOWN OF FOSNAVÅG. REMØY IS CHAMPIONING A DUAL-TRACK STRATEGY, INVESTING IN HIGH-EFFICIENCY VESSELS THAT SERVE BOTH THE RENEWABLES AND TRADITIONAL ENERGY SECTORS WHILE SIGNIFICANTLY CUTTING EMISSIONS.

When Stig Remøy began pivoting Olympic Subsea toward subsea and renewables a decade ago, the move was met with some internal skepticism. “Naturally, there were internal discussions — some believed oil and gas was the future,” he recalled. Rather than exit the conventional market, Remøy backed a dual-track strategy centered on a simple, guiding principle: cut energy use first.

From his company's headquarters in Fosnavåg, a small town on Norway's northwestern coast and the heart of a world-leading maritime cluster, Stig Remøy sat down with Offshore Engineer to explain his strategy.

“We build and operate ships that serve both offshore wind farms and traditional oil and gas fields, because the transition takes time," Remøy explained. This approach is embodied in a new generation of vessels, including hybrid-electric CSOVs already in service and advanced Sustainable Energy Vessels (SEVs) on the way.

THE EFFICIENCY DOCTRINE

Olympic’s strategy has been a systematic technological progression. “We started transitioning early, back in 1999,” Remøy said. “We focused heavily on energy: first diesel-electric instead of diesel-mechanical, then hybrid”.

AN OLYMPIC SUBSEA CSOV MAINTAINS ITS POSITION NEXT TO AN OFFSHORE WIND TURBINE, SHOWCASING THE 'WALK-TO-WORK' OPERATIONS ESSENTIAL FOR MAINTENANCE. THE VESSEL’S ADVANCED DESIGN IS KEY TO MAXIMIZING UPTIME AND OPERATIONAL EFFICIENCY IN THE RENEWABLES SECTOR.

Image courtesy Olympic Subsea

Image courtesy Josefine Spiro

Stig Remøy presents data demonstrating the success of his 'efficiency first' strategy. The chart shows that the new CSOVs, *Olympic Boreas* and *Olympic Notos*, have achieved a roughly 50% reduction in fuel consumption per gross tonnage compared to the company's older vessels, proving the business case for the new technology.

The latest vessels layer on more advanced solutions, including a four-thruster azimuth propulsion system — providing what Remøy likens to a maritime 'four-wheel drive' — as well as permanent-magnet (PM) technology, variable-speed generators, and waste-heat recovery systems.

The impact is substantial. A modern vessel of around 6,700 gross tonnes with up to 126 personnel can now operate on approximately three tonnes of fuel per day in certain scopes, whereas older conventional ships might consume three to four times that amount.

Remøy emphasized that the economics support these higher-cost, higher-efficiency choices. "These kinds of technology choices have always paid off for us," he said. "When we built our first diesel-electric PSV in 1999, conventional options were about 20% cheaper, but we chose it because we knew the energy had to be paid for... With carbon taxes multiplying by 2030, the return on energy efficiency will only get bigger".

A NEW GENERATION OF HARDWARE: THE SX222 AND UT 7623

Leading this new generation are the company's two Ulstein-designed SX222 CSOVs, Olympic Boreas and Olympic Notos. Built at Ulstein Shipyard using state-of-the-art Norwegian technology, its bi-symmetrical TWIN X-STERN hull is purpose-built for both wind and subsea work, allowing either end to face the weather to reduce energy use during dynamic positioning.

The results in the field are stark:

- **Operational Output:** Independent client measurements confirm more than 25% higher operational efficiency than competitors. On wind farms like Horns Rev, for example, the vessels can service up to 200 turbines in the time it takes others to manage 150.
- **Energy Savings:** Olympic's own data reveals the new systems have driven a roughly 50% reduction in energy consumption compared to its 2012-era fleet.

"The uplift comes from the total system," Remøy argued. "It's the vessel itself, the gangway, how quickly you get to the tower, how efficiently the engineers can perform maintenance, and how you manage the weather windows". A key component is the vessel's W-type Ampelmann gangway, a fully electric system with an integrated lift and a large operational envelope, compensating for landing heights from approximately 8 to over 30 meters.

Building on these lessons, the next leap is the Kongsberg UT 7623 SEV. Developed in partnership with Kongsberg Maritime, two of these Sustainable Energy Vessels are

THE HYBRID-ELECTRIC CSOV *OLYMPIC BOREAS*, AN ULSTEIN-DESIGNED SX222, OPERATES IN AN OFFSHORE WIND FARM. VESSELS LIKE THIS ARE CENTRAL TO OLYMPIC'S STRATEGY, EMBODYING A NEW GENERATION OF HARDWARE THAT SIGNIFICANTLY CUTS FUEL CONSUMPTION WHILE BOOSTING OPERATIONAL OUTPUT.

Image courtesy Olympic Subsea

A RENDERING OF THE KONGSBERG UT 7623 SUSTAINABLE ENERGY VESSELS (SEVS) SLATED FOR DELIVERY TO OLYMPIC SUBSEA IN 2027. THE DESIGN VISUALIZES THE COMPANY'S DUAL-MARKET STRATEGY, WITH VESSELS CAPABLE OF SERVING BOTH OFFSHORE WIND AND TRADITIONAL OIL AND GAS INSTALLATIONS.

Image courtesy Olympic Subsea

slated for delivery in 2027. These vessels incorporate close to NOK 1 billion in equipment and technology from the Norwegian maritime cluster per pair. "We are aiming for at least a 10% further reduction on the newbuilds... we invest more to achieve lower consumption and higher efficiency," Remøy stated.

REMØY PROPOSES A CO_2 FUND

With Norway's CO_2 tax expected to rise significantly by 2030, Remøy argues passionately that the industry needs a mechanism to accelerate its green transition. His solution is a dedicated CO_2 fund, modeled directly on the country's NOx Fund—a framework that has been a proven success in financing emissions-cutting projects since 2008.

"The tax should be returned to the industry through a CO_2 fund. That way, shipping companies can invest in green technology that actually cuts emissions".

Remøy pointed out that such a system would create a powerful circular economy for decarbonization. It would not only incentivize shipowners to adopt new technologies but also strengthen the Norwegian equipment industry's global competitiveness by scaling up demand for innovative, cost-effective solutions. "In Norway, we should do the same as the EU requires and ensure the money is used for emission reductions, with simple administration and clear, measurable effects," he stated.

THE BUSINESS CASE

The strategy is already rebalancing the company's portfolio. "Ten years from now, renewables will be our most important leg to stand on," Remøy predicted, "but oil and gas will be around for decades and will need efficient infrastructure. Our newbuilds fit both."

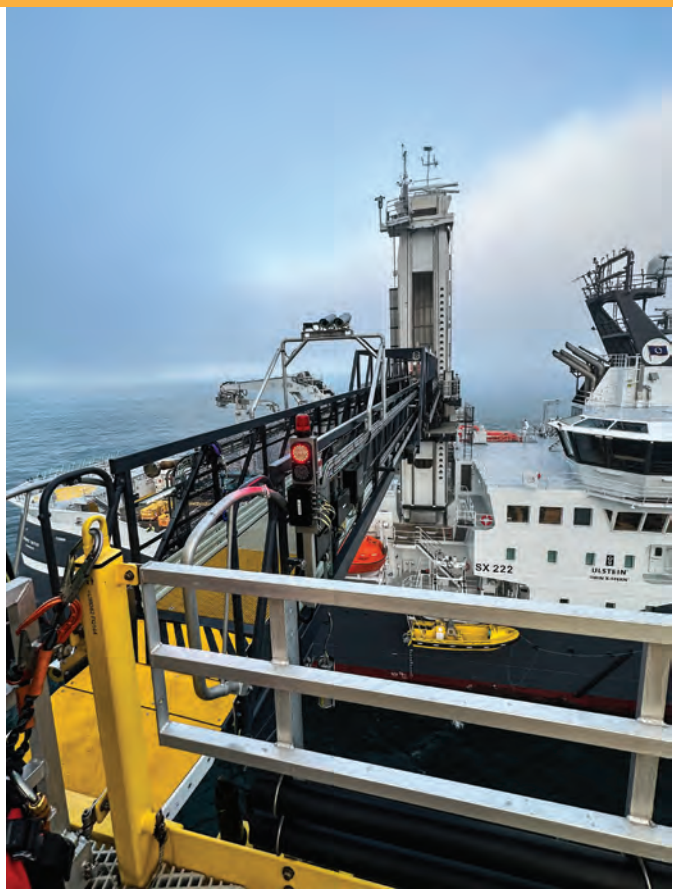
This versatility and performance are key for clients like Siemens, RWE, Ørsted, and GE. This success, Remøy insists, is rooted in local collaboration. "The Norwegian maritime cluster is absolutely crucial," he explained. "Without close cooperation with suppliers and shipyards, we could not have achieved this."

For Remøy, the path forward is clear and pragmatic. "Our approach is to lead by cutting energy consumption first," he concluded. "After that, the choice of fuel—be it methanol, hydrogen, ammonia, or battery—can follow once the market and infrastructure are ready."

The once-skeptical voices have grown quieter as the data from the new fleet comes in, proving that the big bet on efficiency is already paying off—not just in lower emissions, but in the hard-nosed economics of offshore operations.

THE *OLYMPIC BOREAS* IS CHRISTENED IN FOSNAVÅG, THE HEART OF THE SUNNMØRE MARITIME CLUSTER ON THE NORTHWESTERN COAST OF NORWAY. THIS EVENT CELEBRATES THE REGIONAL COLLABORATION BETWEEN THE SHIPOWNER, DESIGNERS, AND TECHNOLOGY SUPPLIERS WHOSE COMBINED EXPERTISE IS EMBODIED IN THE STATE-OF-THE-ART VESSEL.

THE FULLY ELECTRIC, W-TYPE AMPELMANN MOTION-COMPENSATED GANGWAY IS A KEY COMPONENT OF OLYMPIC'S NEW CSOVS. THE SYSTEM PROVIDES SAFE AND RELIABLE 'WALK-TO-WORK' ACCESS FOR TECHNICIANS WITH AN INTEGRATED LIFT AND A LARGE OPERATIONAL ENVELOPE.



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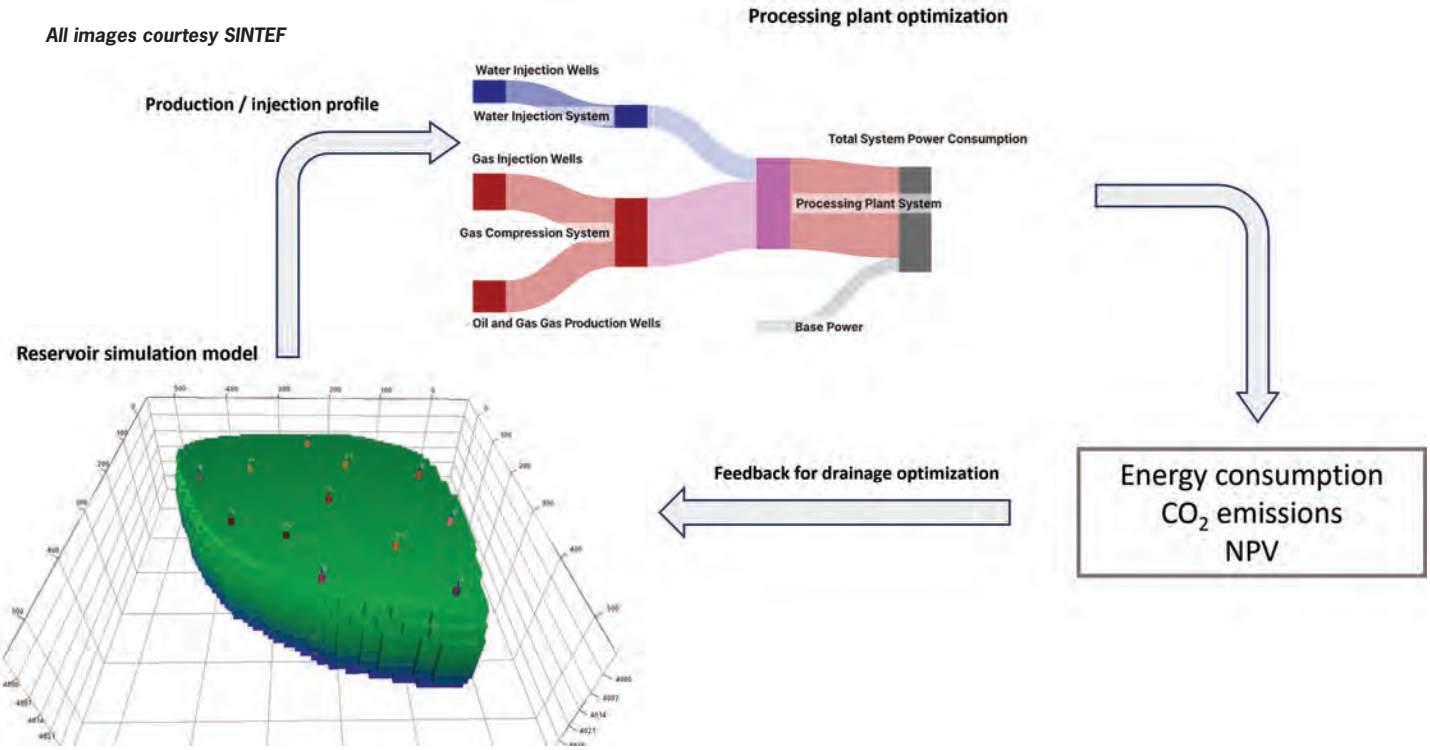


BOOSTING THE ENERGY EFFICIENCY OF WATER PROCESSES

*Water injection and the transport of produced fluids are some of the main energy consumers in offshore production. Researchers at **SINTEF** point to the need for a balanced approach to optimizing energy efficiency.*

By Wendy Laursen

The handling of produced fluids, a mixture of oil, water, and gas, is essentially a huge waste of energy. Water production is primarily caused by channeling and uneven drainage along the wellbore resulting from mobility contrasts within the reservoir. The water is a worthless byproduct of production, and its removal from reservoirs causes a loss of pressure that lowers production if it is not countered by reinjecting more water back in. This in turn increases energy consumption, as reinjection pumps are usually the second-largest energy consumers in offshore oil and gas production after gas compressors.

One of the goals of the LowEmission Centre, an eight-year research program managed by SINTEF, is to develop solutions that reduce the energy consumed by these processes. While focused on the Norwegian Continental Shelf, the solutions are anticipated to bring benefits globally.

Senior Research Scientist, Dr. Heiner Schümann, says energy efficiency is not only a climate measure but also an economic one. He is co-author in a recently published study, along with PhD candidate Handita Reksi Dwitantra Sutoyo and Prof. Carl Fredrik Berg, that analyzed the balance between high hydrocarbon demand and the imperative to reduce CO2 emissions by estimating how drainage strategies change under varying economic parameters.

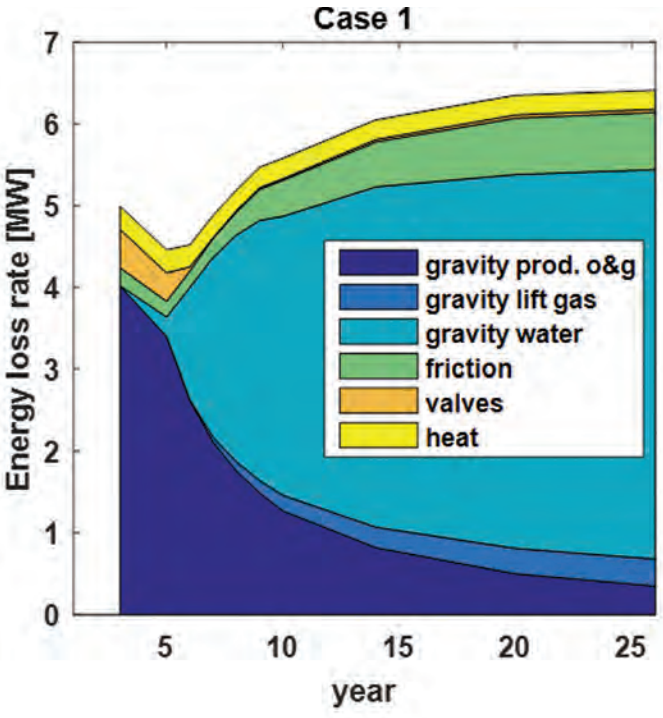
Using model simulations that included both net present value (NPV), yield, energy consumption, and CO2 emissions, they concluded that increasing gas prices favor reducing reservoir pressure below the bubble point pressure, thereby releasing solution gas and leaving oil in the reservoir. Although lower reservoir pressure reduces the energy required for injection, the resulting increase in gas production necessitates more energy for gas compression, ultimately leading to higher emissions when gas prices rise relative to oil prices.

For greenfield scenarios where well design matches production volumes, the impact of a CO2 tax is limited, leading to a single optimal drainage strategy. In this case, a non-linear relationship was evident between the reduced production and emissions. For increasing tax levels there were diminishing returns on lower emissions, reflecting reduced opportunities for emission reduction by changes in the drainage strategy. Some increments in tax rate will therefore have negligible impacts on drainage strategy, reducing profitability with negligible emission reduction.

In contrast, drainage strategies for less energy-efficient facilities are more dependent on variations in CO2 tax and oil and gas prices. Under-saturated oil reservoirs where

"There is a balance between maintaining sufficient reservoir pressure and reducing selective inflow.

– Handita Reksi Dwitantra Sutoyo



Energy loss rate per mechanism in the production stream of a studied NCS field. Major energy losses are caused by lifting and transporting produced water.

"In the absolute best-case scenario for processing, produced fluids would be transferred directly from the underwater wells to shore.

– Dr. Heiner Schümann, Senior Research Scientist

"Norway's continental shelf accounts for about a quarter of our national CO_2 emissions, and 80 percent of those come from gas turbines powering offshore platforms.

– Dr. Stefania Gardarsdottir, Center Director

water injection is used to maintain pressure may shift towards favoring gas production over oil when gas prices rise, prompting the adoption of a pressure depletion strategy. This transition can lower reservoir pressure and reduce energy consumption, but the increase in gas production necessitates more energy-intensive gas compression.

The impact of CO2 emission costs is substantial, particularly affecting project revenue in inefficient processing plants due to improper sizing, which is common in brownfield projects, says Schümann. Therefore, increasing CO2 tax levels is mainly a measure impacting emissions from fields with inefficient production facilities.

Further research from the group, published in October this year, includes analysis of the energy efficiency of inflow control systems under various drainage strategies and well completion configurations. Inflow control devices increase oil production and can reduce the volume of water lifted to the platform and then reinjected.

Autonomous inflow control devices can choke flow in intervals affected by water and gas breakthroughs by differentiating fluid properties based on viscosity. This eliminates the need for well interventions.

The devices increase back pressure, and therefore increase energy dissipation when choking the fluid flow. This also limits production. Consequently, maintaining reservoir pressure becomes increasingly important, requiring higher energy levels within the reservoir and resulting in increased injection rates, therefore higher energy consumption. However, they can still decrease overall energy consumption if they reduce water production.

"There is a balance between maintaining sufficient reservoir pressure and reducing selective inflow," says Sutoyo. "Although it is crucial to maintain reservoir pressure, excessive increase in reservoir pressure appears to be disadvantageous to energy efficiency while concurrently giving limited increase in hydrocarbon recovery."

Most recently, researchers from LowEmission are working on ultralong transport lines. Schümann explains: In

the absolute best-case scenario for processing, produced fluids would be transferred directly from the underwater wells to shore – with no offshore platforms or logistics needed, eliminating their emissions by a 100%.

This isn't possible today, because the mixture does not flow smoothly over long distances. Problems like the loss of pressure, separation into fluctuating gas and liquid pockets, and wax formation – which in worst-case-scenarios can block the pipeline – all increase with distance.

Existing measures involve injection of large amounts of chemicals for hydrate prevention, intensive pipeline insulation with active heating schemes, or scheduled pigging for wax removal. However, these measures are costly, energy intensive, and partly pollutive in case of chemicals.

The new approach targets the controlled cooling of the production fluids allowing the formation of wax and hydrate as particles in a transportable, stable, non-sticky (inert) slurry. This may be reached in dedicated subsea cooling units involving seeding techniques or the introduction of anti-agglomerants. The flow of a stabilized slurry will then allow transport over much longer distances (100+ km), potentially combined with a subsea boosting / multiphase pump system.

The potential is a considerable reduction in energy consumption and footprint, says Schümann. "And we don't even need to make advancements all the way to shore to be effective in saving energy, costs, and emissions. Being able to have processing further away from wells could lead to more centralization, creating more efficient hub platforms supplied with production fluids from many different satellite fields."

Researchers Dr. Per Eirik Bergmo and Dr. Ruben Mocholi Montanes are also involved in the range of research underway at LowEmission, and Dr. Stefania Gardarsdottir, Centre Director, says: "Norway's continental shelf accounts for about a quarter of our national CO_2 emissions, and 80 percent of those come from gas turbines powering offshore platforms."

Improving gas turbine efficiency and recovering waste heat through combined or bottoming cycles, could reduce emissions by up to 25%. A new demonstration facility is currently being built, showcasing compact and robust solutions for offshore use. Additionally, improving energy use in separation, compression, and other platform processes, reductions of 5-30% are possible, and optimizing operations, speed, and weather routing of supply vessels could deliver emission cuts of 5-35%.

Researcher Dr Per Eirik Bergmo is involved in the range of research underway at Low Emission.

Prof. Carl Fredrik Berg has analyzed the balance between high hydrocarbon demand and the imperative to reduce CO2 emissions.

Researcher Dr. Ruben Mocholi Montanes is involved in the range of research underway at Low Emission.

All images courtesy Fugro

PROTECTING WILDLIFE:

Building the UK's First Nearshore Artificial Nesting Structures

As offshore wind rises to meet ambitious climate goals, balancing the need for infrastructure with maintaining biodiversity has become a pressing challenge. One innovative, recent example is the installation of the UK's first nearshore artificial nesting structures, designed to safeguard seabirds while enabling the development of the world's single largest offshore wind farm.

By Richard Gaunt, Project Support Surveyor at Fugro

Hornsea 3, developed by Ørsted, plays a critical role in the UK's clean energy transition. Yet the project faced a significant environmental challenge by needing to protect the black-legged kittiwake, a seabird whose populations have declined sharply and even face extinction due to habitat loss and changing food availability.

The solution involved building three artificial nesting structures close to the shore, each capable of hosting up to 500 pairs of birds thanks to alternating rows of fully partitioned, open, and semi-partitioned ledges.

INSTALLATION CHALLENGE

Each nearshore nesting structure was supported by a monopile – a steel foundation driven deep into the seabed. Installation in this way can often be time-consuming, requiring frequent pauses to manually check alignment and verticality – adding cost, time delays, as well as safety risks for crews.

To reduce uncertainty, Ørsted's construction partner, Red7Marine, therefore turned to Fugro to provide a more accurate solution. Deploying two of its technologies - Starfix® and InclinoCam® - the team was able to ensure the monopiles were installed remotely with maximum accuracy and minimal disruption.

TECHNOLOGICAL INNOVATION

Both technologies were critical in delivering real-time insights and monitoring. The Starfix solution provided accurate, in-depth analysis on the positioning of the vessels, crucial for monopile installation. By integrating data from motion reference units and global satellite navigation systems, Starfix ensured the barge and support vessel were always stable and precisely aligned.

This level of accuracy was essential for the safe and consistent placement of the structures. Using this technology meant the installation team could rely on a single point of reference for critical data, reducing uncertainty and streamlining operations.

Meanwhile, InclinoCam used twin cameras and intelligent visual recognition algorithms to measure verticality during hammering. This provided the hammer operator with live feedback, allowing immediate adjustments without interrupting piling activity.

By providing continuous, touch-free monitoring, these technologies help deliver more reliable and repeatable engineering outcomes. In the instance of Hornsea 3, that meant not only delivering three stable nesting structures but also doing so more safely and with less environmental disturbance.

This augmented-reality technology improves safety by reducing human intervention and increases project efficiency with real-time inclination measurements, without disrupting operations.

IMPACT ON BIODIVERSITY AND SAFETY

In time, the installation of the three artificial nesting structures will help protect as many as 1,500 pairs of kittiwakes, providing secure breeding space and helping offset the potential impacts of offshore wind development on the species.

Artificial habitats such as these can help maintain ecological balance by ensuring that critical life stages, such as breeding and chick rearing, can continue undisturbed by the expansion of human activity at sea.

NATURE-POSITIVE SOLUTIONS

The Hornsea 3 nesting project demonstrates how renewable energy development can coexist with biodiversity protection, creating the infrastructure needed for the energy transition while creating a safe haven for vulnerable species. By embedding conservation measures into the core of engineering and construction processes, industry leaders are showing that climate action doesn't need to come at the expense of nature.

Critically, it also highlights the value of partnership and collaboration. Ørsted, Red7Marine, and Fugro combined expertise in development, installation, and digital technology to deliver an ambitious environmental and energy outcome.

As the offshore wind industry continues to expand, the demand for innovative, nature-positive solutions will only grow further. More broadly, renewable energy projects' long-term success will depend not just on their capacity to deliver clean electricity, but also on how well they balance the needs of people, the planet, and wildlife.

By investing in innovation and collaboration, the offshore wind sector can lead the way in demonstrating how sustainable development is not just about building turbines – it's about building trust, resilience, and a future where energy and ecology can thrive together.

All images courtesy Wärtsilä

Designing Offshore Fleets that can Adapt, Endure

Volatile markets, rising costs, and tightening environmental regulation are reshaping offshore vessel design. Jon Inge Buli, Head of Offshore SGA at Wärtsilä, explains how flexibility, integration, and a modular approach are helping owners build resilience into the next generation of offshore fleets.

By Jon Inge Buli, Head of Offshore SGA at Wärtsilä

Uncertainty has always been part of the offshore industry, but recent shifts in costs, investments, and regulations are making that uncertainty more complex. Rising project expenses, tighter financing, and new emissions requirements are prompting owners and designers to reconsider how they plan, build, and operate the next generation of offshore construction and support vessels.

Rather than designing a vessel for one market or project, the focus is increasingly on flexibility. Ships need to operate efficiently across sectors; maintain compliance as fuel and emissions standards evolve; and achieve longer, more productive service lives. The sector is beginning to embed adaptability into design from the outset.

Offshore wind has brought this point into sharp focus. Projects approved only a few years ago have seen costs rise by around 80% compared with initial estimates. Forecasts by Bloomberg and Pareto Securities Equity Research for global installed offshore wind capacity in 2035 have been adjusted downward by about 12% in two years as new and established markets reassess expectations.

These shifts have altered vessel economics. Charter rates, utilization assumptions, and financing models built around rapid renewables growth are being reviewed. Even so, investment in offshore energy remains steady. Oil and gas projects continue in Brazil, the Middle East, and West Africa, while renewables developers are adapting plans in line with the changing market conditions.

For shipowners, this represents both challenge and opportunity. The key question is not where the work is, but

how vessels can adapt as markets evolve. Resilience has become a design principle, balancing capability, compliance, and cost efficiency across different operational demands.

Flexibility and Integration

Across the offshore fleet, from PSVs and anchor-handlers to CSOVs and subsea construction vessels, the priority is flexibility.

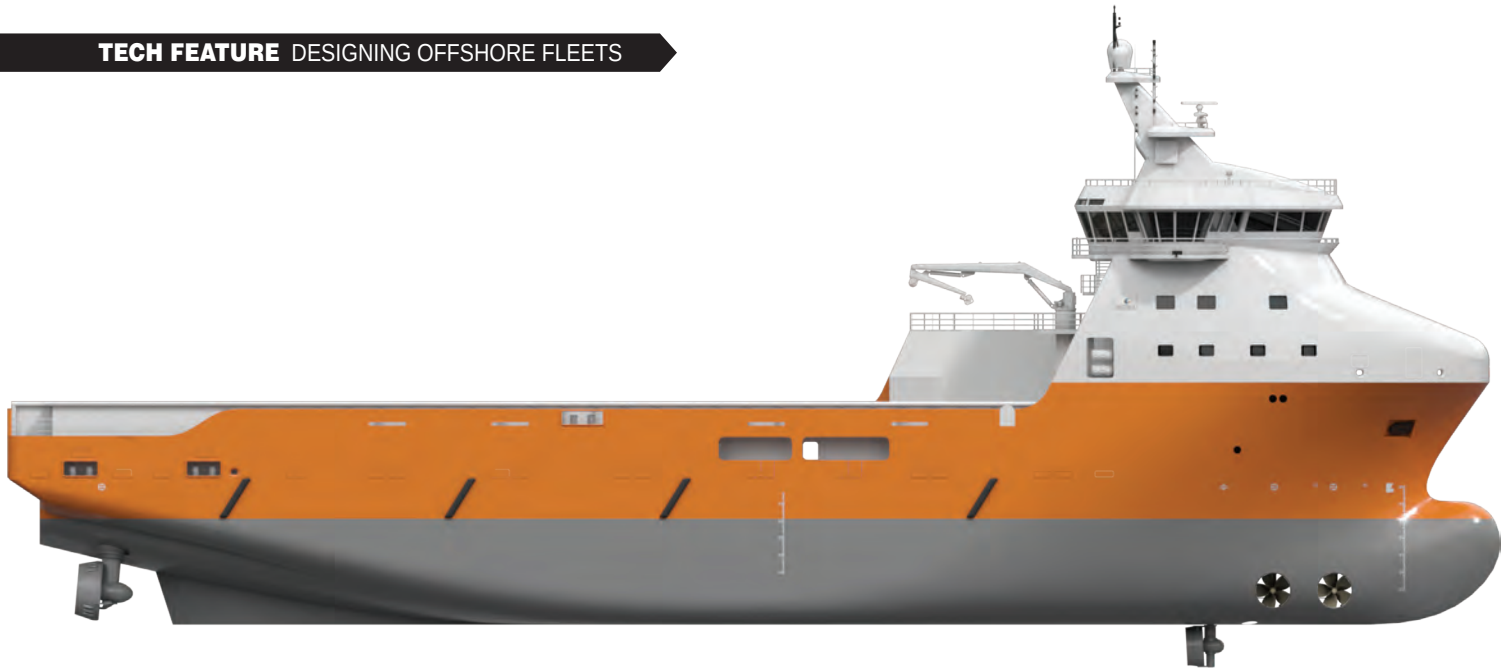
The recent expansion of commissioning service and construction support vessel (CSOV) newbuilds for wind projects demonstrates this shift. Vessels of this kind are now active in oil and gas, with companies like Petrobras tendering as they favor the utility of their walk-to-work and accommodation capabilities. The trend underlines the growing value of adaptable designs that can serve multiple roles.

Power and propulsion may not be the only defining features of a vessel's adaptability, but they play a key role in enabling cross-sector operations. Offshore wind and oil and gas vessels share many of the same fundamental design requirements, allowing ships to transition more easily between markets. Hybrid propulsion, energy storage, and digital control are increasingly standard in both segments, helping to ensure efficient operation while reducing fuel use, wear, and maintenance needs.

Electrical architectures are also evolving to improve overall efficiency and reduce operational costs. DC grid systems and variable-speed gensets are becoming more common as operators look to maximize energy efficiency, particularly as the shift towards low-carbon fuels increases fuel-related operating expenses. These solutions are already appearing in newbuild specifications worldwide. In Brazil, for example, ethanol-hybrid readiness has become a standard requirement in subsea vessel tenders.

This move towards hybrid and flexible energy systems reflects a wider change in design philosophy. Shipyards and suppliers are taking a lifecycle view of performance, integrating propulsion, monitoring, and emissions management into unified systems. The aim is to deliver reliable, efficient, and compliant operation over a vessel's full lifetime.

Regulation is reinforcing this direction. The International Maritime Organization's 2050 net-zero target and the European Union's ETS and FuelEU Maritime schemes are encouraging designers to build in compliance flexibility from the start. A battery-hybrid setup alone is no longer enough to stay competitive or avoid potential penalties. Selecting and preparing for alternative fuels is becoming essential, and power systems must be adaptable to evolving standards and upgrades, such as adding battery capacity or integrating new fuel technologies. Charterers and energy companies are also beginning to recognize that a vessel's



approach to alternative fuels is an important part of its long-term value.

For financiers, owners, and charterers, these capabilities are increasingly important. Demonstrating compliance readiness, operational efficiency, and the capacity for future upgrades helps to secure long-term employment and maintain asset value.

Pathways to Resilience

Putting this into practice requires collaboration between designers, integrators, and operators. Wärtsilä's work in modularity, fuel flexibility, and data-led lifecycle management supports that transition.

Engine development across the industry is moving towards platforms that can operate on a range of fuels, such as methanol and ethanol, without requiring significant hardware changes. The aim is to design power systems that can adapt as fuel infrastructure and regulations evolve, reducing the likelihood of early obsolescence. Wärtsilä's current work reflects this direction, with engine and system designs that support multiple fuel pathways and hybrid configurations.

Hybrid propulsion and energy storage are now central to offshore vessel design, particularly for operators active across both wind and oil and gas markets. Suppliers are developing solutions that combine batteries with optimized engine loading to improve fuel efficiency, extend maintenance intervals, and enhance redundancy. When integrated with DC grid systems and variable-speed operation on medium speed engines, such configurations can deliver measurable improvements in energy efficiency.

These trends are underpinned by a broader shift towards integrated design thinking. Rather than treating engines, thrusters, and digital tools as independent systems, this market should be creating unified power and control ecosystems. This approach supports smoother operation across variable conditions and simplifies future upgrades, whether they involve energy storage, software, or alternative fuels.

Modularity adds another layer of resilience. Systems built for upgrade or replacement can adapt to market or regulatory change without extensive redesign. This approach also enables faster and simpler conversions, helping owners return vessels to service sooner and reduce periods of non-hire. In this way, integration and modularity act as safeguards, helping owners manage uncertainty in fuel supply, emissions policy, and vessel utilization.

The offshore energy market will continue to experience change, while the drive to decarbonize will likely remain constant, despite battles being had over this matter.

The owners who succeed will not be those who try to predict every shift but those who prepare for variability. Vessels designed around hybrid power, modular architecture, and digital integration will be able to adjust to new requirements and remain competitive over their lifetime.

2026 EDITORIAL CALENDAR

OE OFFSHORE ENGINEER

JANUARY / FEBRUARY

Ad close February 6

- Floating Production Systems
- Digital Transformation: Downhole Data
- Offshore Wind: CTVs, SOVs, WTIVs
- Going Green: Carbon Capture & Storage
- Subsea: Workclass ROVs

EVENT PARTNERS

- **HYPACK EVENT** – New Orleans, LA
- **Subsea Expo 2026** – Aberdeen, Scotland
- **IPF 2026** – New York, NY
- **Oceanology International** – London, UK
- **IADC/SPE Intl Drilling Conf & Exhibition** – Galveston, TX

MARCH / APRIL

Ad close April 3

- Deepwater Exploration & Production
- Energy Ports
- Production: Topsides, Platforms, Hulls
- Abandonment & Decommissioning
- Going Green: Electrification

EVENT PARTNERS

- **Port of the Future 2026** – Houston, TX, USA
- **OTC 2026** – Houston, TX, USA
- **Wind Europe 2026** – Madrid, Spain

MAY / JUNE

Ad close June 5

- Digital Transformation: AI
- Floating Power
- Subsea: Subsea Tieback Projects
- Seismic & Geotechnical Surveys
- Safety Systems

EVENT PARTNERS

- **Japan Energy Summit & Exhibition** – Tokyo Big Sight
- **Underwater Technology Conference** – Bergen, Norway

JULY / AUGUST

Ad close August 7

- Robotics
- Digital Transformation: Cyber Security
- Offshore Wind: WTIVs
- Transport & Installation
- Heavy Lifters: Deck Machinery & Cranes

EVENT PARTNERS

- **Gastech** – Bangkok, Thailand

SEPTEMBER / OCTOBER

Ad close October 2

- Digital Transformation
- New Frontiers: Latin America
- Going Green: Water Systems
- Subsea: Electrification
- Power Generation

EVENT PARTNERS

- **ADIPEC 2026** – Abu Dhabi, UAE

NOVEMBER / DECEMBER

Ad close December 4

- Decarbonization
- Project of the Year
- Going Green: Outfitting the Green Rig
- Marginal Fields: Projects and Technologies
- Subsea: Vehicles – AUVs, ROVs, UUVs

EVENT PARTNERS

- **Underwater Intervention 2026** – New Orleans, LA

NearZero FPSO Design Brings Deep Emissions Cuts Within Reach

SBM Offshore has received an approval in principle (AiP) from American Bureau of Shipping (ABS) for its NearZero floating production, storage and offloading (FPSO) concept, marking a step forward in the development of lower-carbon offshore production units.

According to SBM Offshore, the NearZero FPSO design integrates a suite of low-carbon technologies at a systems level, collectively targeting a near-zero Scope 3 carbon emissions profile and achieving up to an 80% reduction in greenhouse gas emissions. ABS completed its assessment based on applicable class and statutory requirements.

Key technologies incorporated into the concept include all-electric topsides, a closed-flare system, carbon capture, and a seawater intake riser/deep intake sea hose. SBM Offshore said these technologies are intended not only to reduce carbon emissions, but also to lower overall power demand on the FPSO.

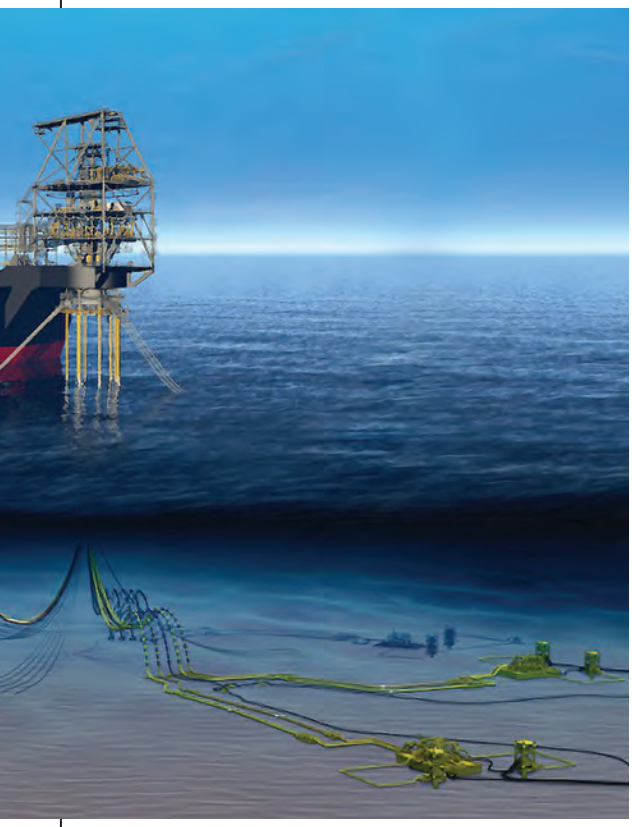
SBM Offshore said the NearZero FPSO concept is fully integrated with its Fast4Ward standardized FPSO design and delivery model, positioning the concept for potential deployment on future projects. The company added that the design reflects a high level of technical readiness and can be implemented using technologies available today, supporting its longer-term objective of achieving net-zero emissions by 2050.

ABS said the concept demonstrates how multiple low-carbon technologies can be combined within a single FPSO design to address emissions from offshore production, while maintaining compliance with class and regulatory requirements.

MODEC, Eld Energy to Test Fuel Cell Power as FPSO Emissions Cutting Tech

MODEC has awarded Eld Energy a contract to design and manufacture a solid oxide fuel cell (SOFC) pilot system for installation on one of MODEC's floating production, storage and offloading vessels (FPSOs), advancing efforts to reduce emissions from offshore production assets.

The project follows a feasibility study launched in Feb-



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ruary 2025 as part of MODEC's decarbonization initiatives. After completing Phase 1 activities, the companies have moved into Phase 2, covering the engineering, manufacturing, installation and offshore pilot testing of a 40-kW SOFC unit.

The fuel cell system will be manufactured at Eld Energy's facility in Bergen, Norway, with offshore installation scheduled for 2026. During the feasibility phase, the companies carried out system design and integration studies, including laboratory testing using simulated produced gas containing heavier hydrocarbons, supporting the decision to proceed with an FPSO-based pilot.

MODEC said the project represents a step toward demonstrating solid oxide fuel cells as a lower-emissions alternative to conventional power generation on FPSOs, while maintaining operational reliability.

The Phase 2 deployment is expected to be the first real-world application of SOFC technology on an FPSO, supporting wider efforts to reduce the environmental footprint of offshore oil and gas production.

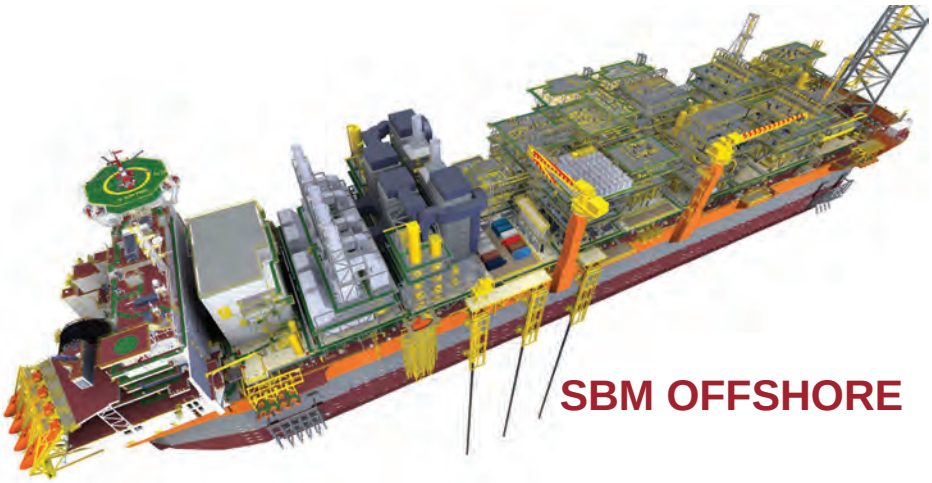
SAIRO Rig Optimization Pilot Targets Safer, More Efficient Offshore Drilling

ARO Drilling and Saudi Aramco have signed a Trial and Evaluation Agreement to pilot the Saudi Aramco Intelligent Rig Optimizer (SAIRO), a proprietary software solution developed by Saudi Aramco to enhance drilling performance using data-driven insights.

SAIRO is designed to process drilling rig sensor data, calculate performance indicators, and deliver advanced visualizations to support monitoring, optimization and efficiency improvements in drilling operations.

Under the agreement, ARO will evaluate the system's functionalities and usability, and assess its operational benefits in real-world offshore drilling environments by integrating it into ARO's high-specification jack-up rigs.

The six-month field trial aims to validate SAIRO's potential to improve operational performance, safety and cost efficiency across drilling activities. Saudi Aramco will provide technical expertise and support throughout the pilot. If successful, the companies may explore a licensing agreement to extend SAIRO's use across ARO Drilling's operations.



SBM Offshore, Petrobras Study Carbon Capture Modules for Future FPSOs

SBM Offshore has been awarded a study by Petrobras to evaluate the application of carbon capture modules on floating production, storage and offloading vessels (FPSOs).

The study is based on a previously completed engineering and design program between SBM Offshore and Mitsubishi Heavy Industries, with the concept qualified by DNV.

The proposed solution combines MHI's proprietary CO2 capture technology with SBM Offshore's Fast4Ward design principles, resulting in a compact modular configuration intended to reduce emissions associated with oil and gas production on FPSOs. The development forms part of SBM Offshore's emissionZERO program.

Under the scope of the agreement, SBM Offshore will carry out the design and commercial evaluation of multiple carbon capture configurations for potential installation on future FPSOs deployed on Petrobras-operated fields.

The assessment will consider different turbine types and machinery layouts, varying gas flow rates and installed turbine power, as well as different CO2 concentrations and gas compositions.

SBM Offshore said the study will support further development of the carbon capture module design in cooperation with MHI, using the latter's Advanced KM CDR Process technology, with the objective of enabling CO2 reduction on future FPSO projects.

Electric Actuation Tech for Subsea Electrification Set for Offshore Trials

TechnipFMC and Petrobras have kicked off a pilot of electric actuation technology as part of their shared effort to advance electrification of subsea field systems in offshore developments.

The technology, set to be integrated into a subsea tree scheduled for installation in 2026, will join TechnipFMC's eSolutions portfolio of electrical subsea system building blocks.

TechnipFMC's eSolutions suite is designed to enable the electrification of subsea infrastructure by replacing traditional hydraulic actuation systems with industrialized electrical components, including electrical actuators and controls. The portfolio's modular approach aims to reduce

emissions, lower operational risk, simplify field design and operations, and optimize tieback solutions while maintaining system reliability.

The pilot project leverages TechnipFMC's more than 20 years of experience with electrical subsea systems and the substantial operational record of its eSolutions systems. Through the pilot, Petrobras and TechnipFMC intend to test and monitor the performance of the electric actuation technology under real subsea conditions, demonstrating a step toward fully electric subsea fields in future developments.

The move reflects a wider industry shift toward electrification as a tool to improve field performance and cut the environmental footprint of offshore oil and gas production infrastructure.

North Sea Gas Platform Goes Greener with Offshore Wind Power

ONE-Dyas has brought the N05-A natural gas production platform into operation using electricity supplied from offshore wind, marking a step toward low-emissions offshore gas production in the Dutch - German North Sea.

The platform is connected via subsea cable to the Riffgat offshore wind farm, enabling N05-A to operate on renewable power. According to ONE-Dyas, this makes N05-A the first natural gas production platform in the Dutch and German North Sea powered by offshore wind energy.

Electrification at N05-A extends beyond production. A mobile drilling unit, temporarily connected to the platform to drill a second well, has been converted to operate on electric power supplied through the platform. This allows both gas production and drilling activities to take place with minimal CO_2 emissions, a configuration described as unique in this region of the North Sea.

ONE-Dyas said the offshore wind-powered setup reduces greenhouse gas emissions from platform operations to virtually zero, while maintaining gas output. N05-A is expected to produce up to 2 billion cubic meters of natural gas per year, contributing to regional supply during the energy transition.

The project demonstrates how offshore wind-powered electrification can be applied to both platform operations and drilling activities, offering a pathway to reduce the emissions intensity of offshore gas developments.