

# Offshore®

SPECIAL REPORT

## 2024 EXECUTIVE PERSPECTIVES

In this 3rd annual report,  
industry leaders identify the challenges  
and solutions, trending technologies,  
top projects, and the path forward  
for the offshore oil and gas industry.



COURTESY DNV

## DNV exec shares insights on challenges, path forward for offshore industry

Torgeir Sterri, DNV's senior vice president and director of offshore classification, says leveraging cross-sector expertise helps tackle offshore challenges.

Ariana Hurtado, Editor and Director of Special Reports

Torgeir Sterri, DNV's senior vice president and director of offshore classification, recently gave a keynote address in October at DNV Technology Week in Katy, Texas, in which he focused on the energy transition and shared his positive outlook for the industry.

"While the world is in transition, we are just beginning our energy transition," he said. "It's not an on/off switch, but a journey to find the right balance."

DNV has issued several industry reports this year covering topics such as AI, emissions and offshore wind. Sterri's team aims to ensure that offshore assets and operations are safe, reliable, compliant and meet the expectations of the offshore industry and its stakeholders.

Sterri recently shared his perspective with *Offshore* about the initiatives at the top of his list and what DNV will be focused on as we head into the new year.

"More broadly, the energy transition and the drive within the maritime world toward a low or zero carbon future remains at the top of everyone's agenda," Sterri told *Offshore*. "But even

with this focus, we need to meet our clients wherever they are in their decarbonization journey and support them toward their goals."

With more than 25 years of experience in the maritime industry, Sterri currently leads the company's global maritime offshore classification business from its headquarters in Høvik, Norway. He has held a variety of leadership roles at DNV, including maritime regional manager for region West Europe as well as regional manager and chairman for Greater China.

He has a strong technical foundation in areas such as plan approval, ship newbuilding, ship operation, and certification of materials and components. He also brings hands-on maritime expertise, having served as a captain on ferries in Oslo. In addition, Sterri is a naval architect and a graduate of the Norwegian University of Science and Technology.

In the following Q&A, Sterri details the challenges the offshore energy sector is facing, how DNV is helping solve those issues and the path forward for the offshore oil and gas industry.



Torgeir Sterri

COURTESY DNV

### Offshore: For those not in attendance, what were the takeaways of your keynote at DNV Technology Week?

Sterri: To secure energy, we need three things: energy security, environmental sustainability and reasonably priced energy. This energy trilemma is a model that emphasizes the balance

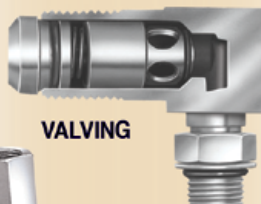


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## EXECUTIVE PERSPECTIVES SPECIAL REPORT: The Path Forward

needed with all three to be successful. As an industry, we can learn from this model and look at how we can impact the outcome. By being a part of the green shift, maximize energy by minimizing emissions, and make the industry enticing of the next generation of driven and creative minds, we can contribute to progressing the transition.

I am positive about the future of our industry. We have a lot of knowledge and passion, and we have a new generation coming with fresh creative ideas that are more engaged than ever. As we attract and train this generation to the industry, we also bring in new ideas, refreshed passion, and more opportunities for innovation and collaboration. Together, we can tackle the challenges ahead.

### Offshore: What are the most important issues for DNV Maritime as we head into 2025? Why?

Sterri: As an organization, we are continually working to empower our customers to meet the challenges they face—so their issues are our top issues. And you can't get past the energy transition and the ongoing impact of greater digitalization on the industry.

On the energy transition, we're on a journey, but it's one where there are many different paths for our customers. There is no longer a "one size fits all" solution; we're there to help find a balanced approach, one that incorporates both energy efficiency and the adoption of new technologies.

Digitalization is the key to unlocking many of the challenges we face in the shipping and offshore industries, including decarbonization. We have many of the tools we need already, like digital monitoring, collection, connected platforms, 3D models and simulations, but we need to accelerate their deployment, make sure they are frictionless to use, and train the people using them.

AI is going to be a real wild card, and I think it would be a real mistake to think that AI will have a limited impact on the maritime and offshore industries. The

jumps these systems have taken in the last year or two are only likely to accelerate, and we could see big changes in everything from vessel design, autonomous vessels, maintenance, through to risk and supply chain management. These systems could take us in directions that we have not anticipated and realize incredible efficiencies and advancements.

### Offshore: What are the top challenges in the offshore oil and gas industry? What can DNV do to help/ affect those issues?

Sterri: The offshore segment is extremely complex and has the twin challenges of adapting to a world that is in an energy transition and looking to decarbonize, while deploying new digital technologies and systems that will enable the creation of new value propositions, business models and services. One of the things we are very proud of at DNV is our ability to leverage cross-sector expertise at a very deep level to help tackle these challenges.

Safety in the offshore sector has improved, but challenges remain. So, as we continue to move forward, we have to make sure we do not lose sight of safety. We need a holistic approach to ensure regulations are updated to match the pace of technological innovation. This requires continuous collaboration, not just within the industry, but also with wider stakeholders like governments, financial institutions, suppliers and the general public.

Cybersecurity is going to be one of the industry's key safety issues over the next decade. Increasing connectivity and reliance on software, means of course that we are increasingly vulnerable to cyber attacks and are increasingly reliant on cybersecurity. Simulation-based test regimes like HIL [hardware in the loop] testing are one remedy, but more has to be done in order to create the same levels of assurance and performance as we are used to from analogue systems.

At DNV, cybersecurity has been part of our class scope for several years, now fully

aligned with the new IACS Unified Requirements. We run webinars and trainings to boost competence, and with the acquisition of CyberOwl, NIXU and Applied Risk, we now have a 500-plus person cybersecurity team. Combined with our offshore knowledge, we can support our customers in building digital robustness and cybersecurity resilience into their design and operation.

### **Offshore: What's the path forward for the offshore oil and gas industry?**

Sterri: The offshore oil and gas industry still has a big role to play, but we have to stay relevant and adapt to a business environment where decarbonization will be even more emphasized, digitalization will become even more important to unlock efficiencies, and competition for talent intensifies.

In the maritime world, we've seen a big shift toward alternative fuels, particularly LNG, so offshore gas will be essential to enabling this transition for those hard to decarbonize segments of the industry.

At the same time, we have to be aware of our own footprint as an industry, which is why we've been working with partners on initiatives like the Abate notation. This helps our customers deploy a structures approach to reducing emissions through implementing onboard abatement measures in power generation, fugitive emissions from process plant and storage tanks, and non-routine flaring.

The offshore industry is also experiencing a digital revolution, as new technologies and data-driven solutions enable new ways of working. Information security must become an integral part of daily operations—on board and at shore. Understanding what makes security arrangements robust and matching the complexity of assets is vital to keep smarter vessels and offshore units secure.

One upcoming sector that could play a big role going forward is carbon capture and storage [CCS]. CCS is needed wherever there are emissions, in both power generation, in industrial processes and potentially through onboard carbon capture in shipping. While the name of the game is to stop emitting CO<sub>2</sub> to the atmosphere, as long as there are fossil fuels in the power mix, CCS is needed.

In addition, regulations like the EU Net Zero Industry Act (NZIA), which recently came into force, will spur development of this sector. The NZIA identifies CCS as a strategic net-zero technology, setting a target of 50 million tonnes of annual CO<sub>2</sub> injection capacity by 2030 and mandating contributions from oil and gas companies.

The offshore sector's expertise in drilling and engineering can make a major contribution to the safety and efficiency of CCS operations. Offshore platforms also provide a unique opportunity for CCS due to their existing infrastructure, but they must be adapted for carbon storage. DNV aims to assist operators and authorities in developing and deploying sustainable CO<sub>2</sub> storage solutions, utilizing best practices, to implement CCS technologies and meet critical climate targets.

### **Offshore: What advice would you give young professionals joining the industry or to someone debating the offshore oil and gas sector versus another industry?**

Sterri: Firstly, that this is an exciting time to be a part of the offshore industry. We are experiencing significant technological advancements, particularly in areas such as digitalization, automation and the use of artificial intelligence.

The industry is also expanding and exploring innovative ways to utilize our core competencies, particularly in harnessing renewable energy in the ocean space. Beyond the growth of the offshore wind sector, which includes both bottom-fixed and floating wind farms, there are other exciting developments like offshore fish farms where the industry is leveraging its expertise. These farms are designed to cultivate fish in large, floating structures located in open-sea areas and equipped with advanced technologies for monitoring and managing fish health, water quality and feeding systems.

Ultimately, the offshore oil and gas sector offers diverse opportunities. By embracing innovation, prioritizing safety and staying adaptable, you can build a successful and impactful career in this industry. ●

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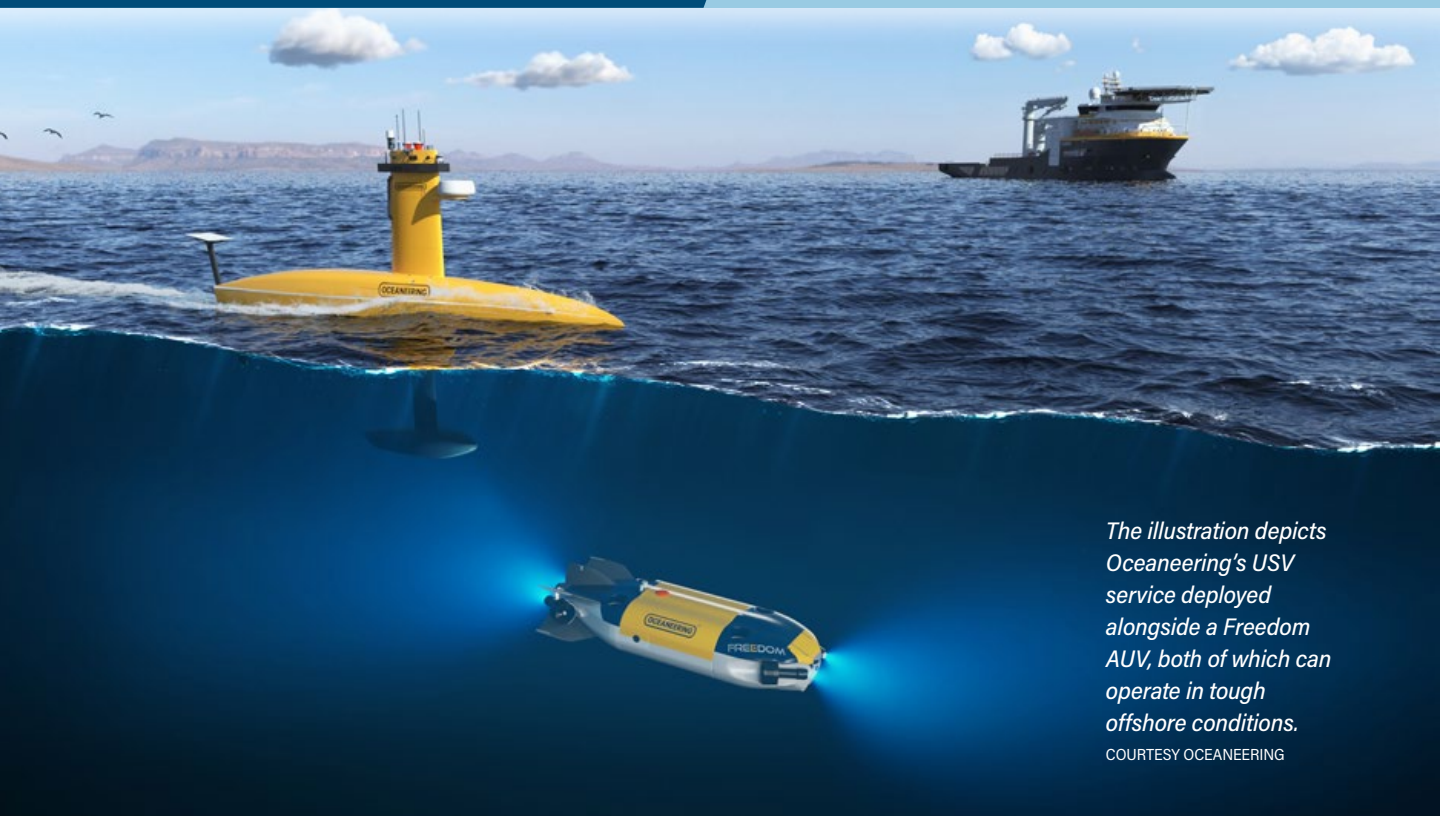
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*The illustration depicts Oceanneering's USV service deployed alongside a Freedom AUV, both of which can operate in tough offshore conditions.*

COURTESY OCEANEERING

## Opinion: Offshore energy operators' top 3 priorities to ensure long-term resilience

The offshore sector needs to collaborate on technological advancements, prioritize resilience and focus on workforce transformation.

**NIKUNJKUMAR PATEL**, Oceanneering

As the offshore sector faces increasing challenges—ranging from environmental sustainability to cost efficiency—the path forward lies in embracing innovation at both the technological and operational levels. Companies across the industry need to focus on these three key elements: collaborative technology development, resilience in changing market dynamics and workforce transformation.

### **Collaborative technology development**

The future of offshore operations will rely heavily on the adoption of autonomous systems, artificial intelligence (AI) and data-driven insights. However, no single company can tackle these challenges alone. Industry-wide collaboration on research and development (R&D), shared standards and data transparency

will drive faster, more effective solutions. It's essential for key players to invest in partnerships that foster innovation and ensure interoperability of emerging technologies.

### **Resilience in changing market dynamics**

With fluctuating global markets, geopolitical uncertainties and evolving regulatory landscapes, the offshore industry must build resilience into its operations. This means adopting flexible technologies that can scale and adapt to changing conditions, and diversifying services across energy sources—from traditional oil and gas to renewable energy solutions. Companies that can quickly pivot and adapt will be better positioned to weather market volatility and seize new opportunities.

### **Workforce transformation**

Automation and remote technologies will reduce the need for onsite personnel, but this shift will require reskilling programs to prepare the workforce for new roles in managing and interpreting data, overseeing autonomous systems and maintaining a digital infrastructure. Offshore companies should prioritize workforce development to ensure a smooth transition into this new operational paradigm.



## Leveraging technology

Oceaneering leverages advanced technologies that are designed to improve insights, efficiency and safety, especially in harsh, demanding environments. The company has three key objectives that aim to help safeguard the workforce, protect the environment and optimize operations:

- Improving operational processes through automation to reduce HSE exposure;
- Optimizing efficiency and sustainability by minimizing environmental footprints and reducing costs; and
- Delivering deeper insights through data analytics and real-time monitoring for informed decision-making.

## Digitalization in the offshore energy sector

Oceaneering's four key areas of focus include remote operations, residency, autonomy and fleet management. Remote operations enable tasks to be managed from onshore, significantly reducing personnel costs and improving efficiency. This centralized approach allows subject matter experts to oversee multiple systems, ensuring expertise is available when needed.

High-reliability solutions, such as resident vehicles, play a crucial role, as systems that can operate without human intervention for extended periods enhance safety, reduce downtime and streamline operations.

Autonomy, coupled with AI and machine learning, is transforming subsea operations. It enables underwater vehicles to navigate complex environments, optimizing routes and decision-making through real-time data analysis.

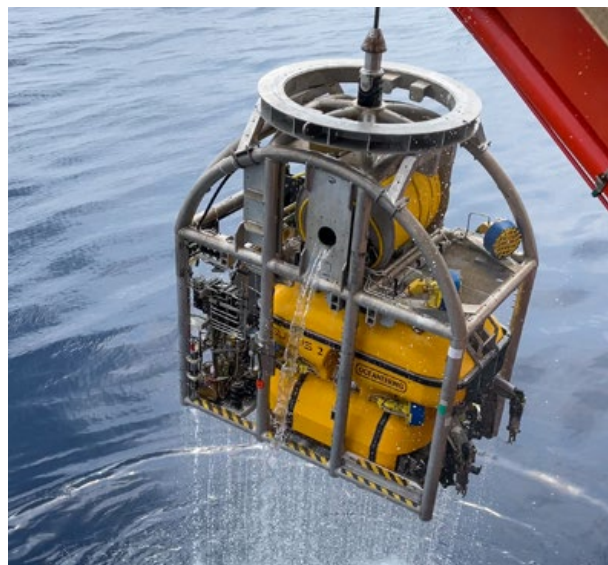
Fleet management further enhances subsea operations by interconnecting robotic fleets, where AI enables seamless collaboration and efficient execution of tasks, boosting safety and productivity across the board.

## Technology investment

Oceaneering invests in subsea technologies that have been qualified through years of rigorous testing around the world.

The company's Liberty resident system is a docking system for remote or resident operations, reducing the need for a surface vessel. Liberty can house ROVs and AUVs, offering 550 kwh of battery power. It can communicate with an onshore remote operations center via an integrated buoy, rig downline or subsea infrastructure connection. This technology has the potential to save substantial operational costs while enhancing safety. Liberty can perform work-class tasks within a 1,000-m working radius, eliminating the need for a support vessel and mobilization of personnel offshore. This capability is particularly beneficial during critical operations where timely responses are essential.

The company's Freedom autonomous underwater vehicle (AUV) leverages advanced autonomy to provide a more efficient and environmentally friendly method for completing operations. Freedom offers a faster alternative to traditional work-class ROVs. Its ability to operate in close proximity to pipelines and



*The Isurus ROV is extracted after completing offshore operations.* COURTESY OCEANEERING

umbilicals enables its advanced autonomous software to trigger inspection behaviors when it detects points of interest. As a result, Freedom provides full inspection coverage of the pipeline length with higher data resolution than traditional AUVs.

The Isurus ROV, designed for harsh environments, enables the completion of work scopes in challenging conditions, including severe current environments, while effectively reducing risk, costs and time spent waiting for favorable weather. Suitable for both shallow and deep water, Isurus is ideally suited for renewable energy applications and high-speed ROV surveys.

Additionally, Oceaneering has released a new uncrewed surface vehicle (USV) service. These remote-controlled and supervised autonomous vehicles operate in tough offshore conditions, ensuring optimal data quality while reducing downtime. The USVs' endurance and speed make them ideal for high-speed nearshore surveys. The company's integrated ROV and survey services further optimize offshore drilling operations by eliminating the need for survey personnel onboard vessels, reducing HSE exposure and increasing efficiency.

## Conclusion

By collaborating on technological advancements, prioritizing resilience and focusing on workforce transformation, the sector can ensure long-term resilience and success. However, the offshore industry must not only adopt these technologies, but actively shape their evolution. The time to act is now as the industry urgently stands at the threshold of an unprecedented technological transformation that will define its future. ●

**Nikunj Patel** has more than 20 years of experience in the energy industry. He serves as vice president of engineering and technology at Oceaneering, where he leads new product development, emerging technology and operations.

# Navigating challenges, seizing opportunities in a dynamic OSV market

The global offshore support vessel (OSV) market is estimated to grow from \$25.52 billion in 2024 to \$36.18 billion by 2029, at a CAGR of 7.2% during the forecast period.

JYOTI SINGH, MarketsandMarkets

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Offshore support vessels (OSVs) play a crucial role in supporting operations at sea, including offshore installation, oil exploration and construction activities. These vessels are instrumental in providing supplies, transporting equipment and facilitating personnel involved in oil exploration and drilling activities. OSVs are categorized based on their specific functions, including seismic vessels, crew vessels, standby and rescue vessels, multi-purpose support vessels, platform supply vessels, anchor-handling tug supply vessels, and chase vessels. These are designed to operate in both shallow-water and deepwater environments.

In the offshore oil and gas and renewable energy industries, OSVs are vital for ensuring efficient logistics, shipping and additional services such as platform support, rescue operations, standby duties and anchor handling.

The growth of the OSV market is driven by significant investments in renewable technologies and offshore oil and gas

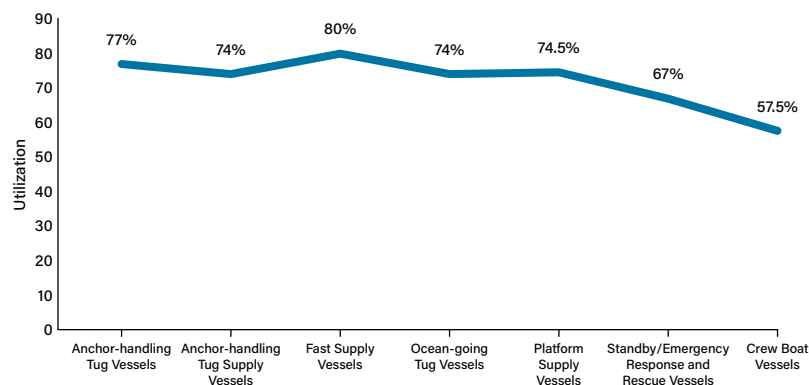
exploration. However, the market faces challenges from volatile crude oil prices, which have led to an oversupply of vessels, potentially hindering market growth over the forecast period. Additionally, government regulations and high operating risks continue to pose obstacles to the OSV market.

## Overview of offshore industry

Countries such as Saudi Arabia, Brazil, Greece and nations in Africa are tapping into their offshore oil and gas reserves to boost production. Meanwhile, the energy shift is accelerating toward renewables, with the share projected to rise from 10% in 2019 to 65% by 2050, according to the BP Outlook 2023. Offshore wind farms are central to this transition, as evidenced by projects like the 1,400-MW Sofia wind farm in the North Sea. Such initiatives highlight the growing investments in offshore renewables, supporting the expansion of the OSV market to accommodate increased energy production activities.

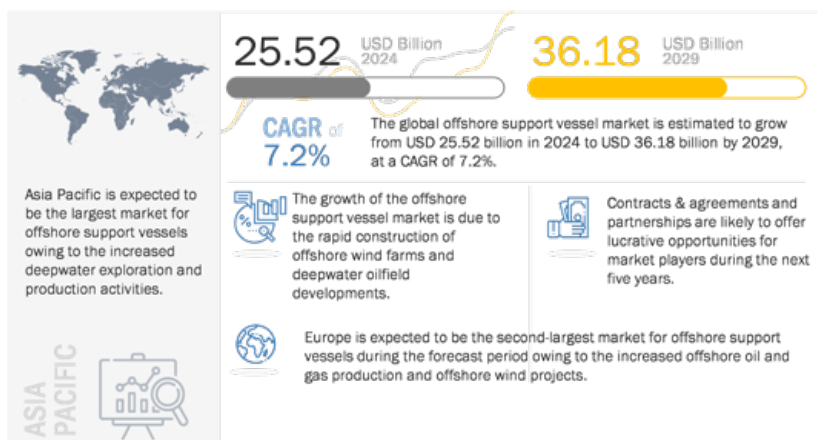
## Technological advancements

Technological innovations in vessel design, propulsion and automation are revolutionizing OSV capabilities. Modern vessel designs emphasize fuel efficiency, stability and operational versatility, which is evident in hybrid OSVs and unique configurations like the Ulstein X-Bow, which enhances seaworthiness. These advancements enable OSVs to perform complex tasks in challenging conditions, increasing their appeal to operators across diverse maritime sectors.



Average vessel utilization rate by type, January 2023

SOURCE: OFFSHORE ENGINEER, SECONDARY RESEARCH, INTERVIEWS WITH EXPERTS, AND MARKETSDANDMARKETS ANALYSIS



SOURCE: SEC FILINGS, INVESTOR PRESENTATIONS, INTERVIEWS WITH EXPERTS, AND MARKETSDANDMARKETS ANALYSIS

Propulsion technology developments, including dual-fuel engines and azimuth thrusters, play a key role in boosting vessel performance. Dual-fuel engines offer flexibility in fuel choice and lower emissions, while azimuth thrusters provide exceptional maneuverability for dynamic positioning. Together, these technologies ensure safer and more efficient operations for offshore support tasks.

Automation is also transforming OSV operations. Advanced sensors, AI systems and remote operation capabilities reduce human intervention, exemplified by projects like Kongsberg's *Yara Birkeland*, an autonomous vessel that enhances efficiency while cutting crew requirements. These advancements expand OSV applications, from traditional oil and gas exploration to supporting offshore renewable energy projects, propelling the maritime industry toward a more sustainable, technologically advanced future.

### Supply-demand gap

The OSV market is grappling with a persistent supply-demand imbalance, where the number of vessels far exceeds the current demand. This oversupply has heightened competition among OSV companies, driving down prices and squeezing profitability across the sector. The market's challenges are tightly linked to the oil and gas industry's cyclical nature, which has seen significant fluctuations over the years. A surge in oil prices previously fueled the demand for OSVs, prompting companies to add new vessels. However, the sharp downturn in oil prices starting in 2014 led to a steep decline in demand, leaving many companies burdened with excess capacity.

The overcapacity issue was worsened by the delayed cancellation of new orders placed during the peak period, forcing companies to bear the cost of these vessels despite the reduced demand. This has resulted in fierce competition among OSV companies, leading to price pressure, reduced profitability and financial instability.

To address the overcapacity problem, some OSV companies have reduced their fleet sizes by scrapping or selling vessels or

delaying the delivery of newbuilds. In 2020, Tidewater, Hermitage Offshore Services, BOURBON, Seacor Marine and POSH Terasea sold 61 OSVs worth \$180 million. The COVID-19 pandemic further compounded the problem, reducing global offshore activity and leading to a 30% drop in vessel utilization. Many smaller operators faced bankruptcy, while several vessels were either laid up or stranded due to operational restrictions. This ongoing oversupply issue remains a significant barrier to the market's recovery and growth.

### Market outlook

The global OSV market is estimated to grow from \$25.52 billion in 2024 to \$36.18 billion by 2029, at a CAGR of 7.2% during the forecast period. This growth is primarily driven by increasing global energy demand, especially in emerging markets, leading to higher investments in offshore exploration and production (E&P). Offshore reserves are attractive due to their significant oil and gas volumes, making them key to addressing rising energy needs. Additionally, spending on E&P is projected to increase by 11% in 2023, with offshore activities seeing a substantial 20% rise, according to BP stats insights.

Governments and energy companies are increasingly focusing on offshore fields to meet energy requirements, recognizing their potential to supply the growing global demand. This expanding offshore activity, coupled with new technological advancements, positions the OSV market for steady growth as it supports essential services in both traditional oil and gas exploration and the burgeoning offshore renewable energy sector.

OSVs play a crucial role in various aspects of offshore activities, including transportation of personnel and supplies, towing, anchor handling, and emergency response. With technological advancements and rising energy prices, the market for OSVs is expected to expand further.

Three factors influence the OSV market:

- As countries explore new offshore oil and gas fields, the demand for OSVs to support these operations increases.
- Technological advancements in vessel design and propulsion systems are enhancing the efficiency and capabilities of OSVs.
- Higher energy prices make offshore exploration and production more economically viable, driving demand for OSVs.

The growing OSV market presents significant opportunities for both vessel owners and operators as well as the broader maritime industry. As the demand for offshore support services continues to rise, the OSV market is anticipated to remain a key driver of growth in the years to come. ●

**About the author:** Jyoti Singh is a senior research analyst with the Energy & Power Practice at MarketsandMarkets.



# Navigating offshore insurance takes adapting to new risks and realities

Subsea construction insurance has become increasingly difficult to obtain, even for projects with modest budgets. **JACK SWIFT**, Lockton



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As the offshore oil and gas industry continues to evolve, so do the risks and complexities associated with insuring these projects. Lockton's Offshore Projects Practice is keenly aware of the challenges these changes present, especially as the market increasingly focuses on high capex projects and the ongoing volatility in subsea construction.

## High capex projects and the insurance market

Offshore projects today are characterized by substantial capex, demanding high insurance capacity to mitigate the risks involved. Oil and gas in particular is a frontier-type industry; the low-hanging fruit has all been picked, and the industry is pushing into ever more remote and demanding environments. Inevitably, this heightens both the risks and the insurance requirements.

In general, Lockton is seeing strong market appetite for the excess layers of large non-subsea placements. However, securing primary coverage remains a challenge, especially as pricing must meet insurer expectations to generate interest.

## Hardening of the subsea insurance market

In contrast, subsea construction insurance has become increasingly difficult to obtain, even for projects with modest budgets. This shift is largely due to the sector's challenging claims history and a lack of insurer leadership options. Notable high profile losses on a number of projects have prompted insurers to reevaluate their participation. These loss records have cast a long shadow, with high-profile claims reminding insurers of the inherent volatility of this segment. As a result, there has been a hardening of the subsea insurance market, a reality that subsea clients cannot afford to ignore.

Premiums have not kept pace with many insurers' view of the risk profile, leading many insurers to withdraw or reduce their capacity for subsea construction altogether. Among them are major players such as Zurich, Aspen, Swiss Re, and the Norwegian Hull Club, whose absence marks a notable shift in market dynamics and reduction in the available market capacity.

The hesitancy of insurers to underwrite subsea construction is understandable given the track record. Rate reductions over time, paired with substantial claims, have made this a difficult class for many to support. Insurers must now see a compelling case for adequate premiums before they will entertain the idea of covering new subsea ventures. Brokers recognize that a proactive approach, grounded in transparency and high-quality information is essential for engaging insurers effectively.

## Balancing ESG considerations

The offshore industry is also facing increased scrutiny around environmental, social and governance (ESG). Insurers are asking more questions, reflecting a need for deeper insights into the environmental impacts and safety protocols associated with projects. The industry is in the midst of a transitional phase, where greener practices are crucial but must be balanced with operational realities.

Underwriters are more focused than ever on the details of risk management. Beyond ESG scores, they need to understand the health and safety protocols, training procedures and overall operational robustness of each project. These elements are now as critical as the environmental credentials, if not more so, given the inherently high-risk nature of offshore projects.

## Adapting for the future

Given that 2025 is a year likely to be marked by continued volatility, positioning yourself as a transparent, well-prepared and engaged partner will set you apart. Insurers will always place a premium on high-quality information. In a competitive and challenging market, it is essential for project stakeholders to present a well-documented risk profile and take control of the narrative rather than wait until underwriters start asking questions. This proactive approach not only enhances credibility but also significantly improves chances of securing the best possible terms. This can make a real difference when it comes to negotiating favorable rates and ensuring long-term support for projects. ●

**About the author:** Jack Swift is head of the Offshore Projects Practice at Lockton.

# What is Norway's role in securing Europe's power supply?

Norway must focus on maintenance strategies that ensure long-term operational stability.

MURRAY WILSON, Sulzer

Norway has taken on a pivotal role in securing Europe's power supply as sanctions on Russian oil and petroleum imports reshape the region's energy landscape. With Russia's imports severely restricted, Norway has ramped up production, becoming Europe's top exporter of natural gas.

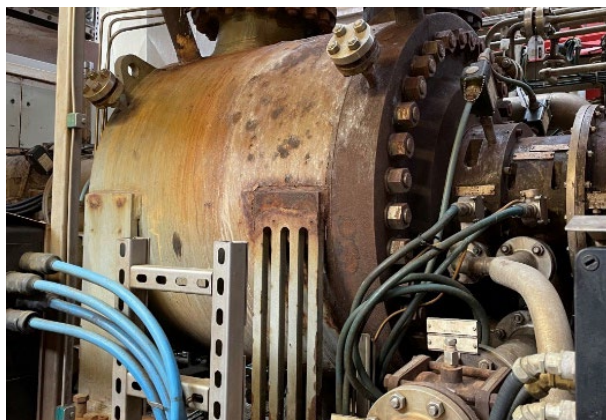
The Norwegian Continental Shelf remains crucial in bridging the gap between supply and demand, with the country's government showing its commitment to energy security. Energy Minister Terje Aasland recently announced that Norway would continue developing its petroleum sector, issuing 62 new production licenses this year—a notable increase from 47 in 2023. With investment in the sector expected to reach record highs, the focus is increasingly on ensuring the reliability of existing infrastructure to support growing demands.

However, last year saw several unplanned maintenance shutdowns, impacting production. The Nyhamna gas processing plant, for example, was offline for two months due to issues with its cooling system. To maintain its role as Europe's top gas exporter, Norway must now focus on plantwide efficiency improvements and holistic maintenance strategies that ensure long-term operational stability while maximizing output from both new and existing assets.

## Unlocking efficiency in operations and maintenance

Norway has long been a leader in offshore technology and automation, with sovereign wealth funds enabling significant investments. The country is also advancing in areas like electrification and green hydrogen, setting a high bar for safety, cost reduction and environmental outcomes. Yet, there are still opportunities to improve.

One area where Norway could gain further efficiencies is in operations and maintenance. Historically, operators have maintained separate teams for specific equipment types, such as pumps and electro-mechanical components. While this approach ensures specialization, there is potential to increase synergies by integrating operations and maintenance strategies across equipment types. By focusing on plantwide efficiency, Norwegian operators could reduce emissions, lower costs and improve overall reliability.



*A low-pressure compressor was fatigued due to exceeding the change-out time.* COURTESY SULZER

## Case study: North Sea compressor repairs

A recent example highlights how targeted interventions can boost efficiency. A platform in the North Sea was operating both compressor trains in parallel due to low availability, eliminating redundancy and driving up maintenance costs. Sulzer identified oil contamination and seal leakage as key issues, scheduling repairs during planned shutdowns.

By splitting the work across two shutdowns, compressor availability rose from 58% to 95.2%, doubling the platform's production capacity and significantly reducing fuel gas consumption. This reduction in fuel gas helped to future-proof operations and also cut carbon emissions by 40,000 tonnes annually.

## Maximizing upgrades for long-term gains

Re-rates and retrofits are another area where Norwegian operators can unlock major benefits, especially as infrastructure ages. When equipment is re-rated by 10% or more, it is essential to ensure compatibility across the entire process train. By inspecting and upgrading components such as motors and transmissions, operators can improve energy efficiency and extend the lifespan of critical assets.

Working with contractors who can provide integrated repair, maintenance and installation services across various equipment types ensures that every aspect of the system functions seamlessly. This holistic approach positions Norway's oil and gas operations for long-term reliability and sustainability, safeguarding the country's critical role in Europe's energy future. ●

Murray Wilson is the regional director (Nordics) with Sulzer.

# Severe corrosion of offshore structures highlights the need for field-based testing

Biological aspects are tricky to accurately and repeatedly simulate in a laboratory.

**DR. TOM VANCE** and **DR. TAMSIN DOBSON**, PML Applications

Nobody wants to work on a corroded platform or deal with leaks that might result from corroded piping. However, life-time extension schemes mean that the industry is seeing older platforms and offshore structures still in service, and severe corrosion is commonly observed on these older assets.

This corrosion is often significantly more severe and extensive than expected based on current predictive models. The misestimation occurs because most corrosion rate predictions are based on results taken from laboratory-based tank tests.

These tank tests do not include the corrosive effects produced by a number of interacting biological, chemical and physical mechanisms that occur in the marine environment. These include micro and macro biofouling organisms, pollution and the effect of fluctuations in seawater velocities and physiochemical properties.

Biocorrosion, in particular, is often completely overlooked in traditional models and is defined as corrosion initiated or exacerbated by the presence of biofouling organisms. It causes accelerated deterioration and can cause premature material fracture. This can dramatically increase maintenance and operational costs as well as risk the safety of the crew and the loss of the offshore structure.

Microbial-induced corrosion is often witnessed on offshore structures and has been observed to account for a number of reported corrosion losses. The participation of microorganisms in corrosion alters the metal-solution interface so that, although the corrosion is still electrochemical in nature, its behavior is modified.

In the case of pipeline failures, sulphate reducing bacteria are frequently blamed due to the presence of sulphate in these environments. However, this is not always provable, and acid-producing bacteria, along with other synergistic corrosion mechanisms, could also be culpable.

Importantly, conducting studies under controlled conditions in the laboratory to measure the corrosion rates produced by these mechanisms is challenging. This is principally due to the difficulty of experimentally generating and maintaining microbial populations with representative diversity and abundance. Consequently, real-world corrosion rate predictions and models that fully account for the microbial influence are often ignored or underestimated.

Corrosion tests, undertaken simultaneously in the marine environment and in laboratory-based tank tests, highlight the need for field-based testing. The results from tests conducted at PML Applications evidence different corrosion mechanisms occurring in the presence of biofouling, at both micro and macro scales. As these corrosion mechanisms are not captured in isolated laboratory-based tests, they lead to dramatic underestimates of real-world material loss due to corrosion.

Where tank tests are used to control particular variables (such as seawater flow rate, turbulence or temperature), the results must be validated by field-based tests to ensure that real-world biological interactions between the simulated variables and real environmental factors are considered.

For example, although high flow rates increase flow-accelerated corrosion and erosion-corrosion, high flow can also restrict the attachment of some biofouling organisms and can therefore result in a net reduction of corrosion.

PML Applications is embarking on a campaign to support the offshore and maritime sector by reevaluating corrosion rate standards in light of the full range of corrosion mechanisms that occur in the real world. The aim is to ensure offshore structures, hulls and raw water systems are appropriately designed and protected in the context of the complex, interacting and often underestimated factors of biofouling and corrosion.

It is vital that owners and operators have the full picture and field-based tests, such as the ones carried out at PML Applications, provide just that.

## Conclusion

PML Applications' understanding of the biological contribution to corrosion mechanisms is increasing, but these biological aspects are notoriously tricky to accurately and repeatedly simulate in the laboratory. As a consequence, corrosion rates calculated from laboratory test results alone do not always fully account for biological processes and are frequently diverging from the corrosion rates observed in the real world. A balanced testing approach that includes the biological influence on corrosion mechanisms is required to ensure that offshore design specifications, inspection and maintenance schedules are well informed. Field-based testing is one way to achieve this. ●

**Dr. Tom Vance** is COO and **Dr. Tamsin Dobson** is an applied marine scientist and biocorrosion lead with PML Applications.

*References available upon request.*



# 3 steps to maximize value from mature fields

Approximately 70% of oil and gas production today comes from mature assets.

Alex Garcia and Guillaume Fauchille, BAKER HUGHES

Operators are always in search of the next elephant, but extracting the most value from existing fields can add value in less time with less capital investment.

Looking at production in terms of existing assets makes sense. Brownfield production increases can be achieved in a shorter cycle than greenfield developments. The lifting cost per barrel from a mature field is normally less than \$10. And then there is sustainability. Producing a greenfield barrel requires exploration, drilling campaigns, a production platform and other facilities. Mature fields have a smaller carbon footprint because existing infrastructure can be used, and normally, extraction methods have become more efficient over time.

The key to capitalizing on mature reservoirs is finding a way to manage technical, operational and economic challenges.

Recognizing the potential value of maximizing brownfield production, Baker Hughes began building a strategy around mature assets solutions that includes an integrated spectrum of services.

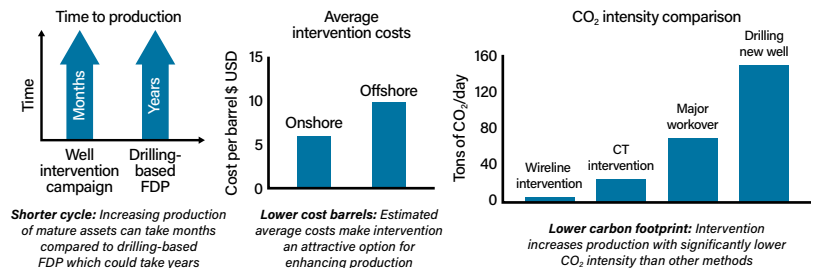
Traditional sourcing methods make it difficult to cut costs because the only avenue open to operators is to negotiate prices for individual services. The usual approach to an intervention campaign is for multiple companies to perform discrete services. The job eventually is completed, but there is limited room for achieving efficiencies.

Integration allows the process to be reimaged from start to finish. Instead of the energy company connecting products and services in the field, it can work with one partner that manages a spectrum of services. A single point of contact pulls together a team of subject matter experts and specialized vendors and acts as a representative for the entire team to simplify communication with the customer.

Changing the model changes the results. With internal integration established, the next step is to apply a commercial model that promotes efficiency across the team so vendors are motivated to work together to improve performance across the project. It might sound overly optimistic, but it works.

In a recent P&A project for a 61-well program, Baker Hughes took on overall management, integrating its proprietary products and solutions as well as all third-party services.

A baseline for performance was established, with incentives paid for work completed ahead of schedule. Good performers were rewarded with a higher day rate while low performers



*Extracting more value from mature assets through integrated services delivers value across the board from shorter cycle times and lower lifting costs to a smaller carbon footprint.* COURTESY BAKER HUGHES

received a lower rate, and all the efficiencies had to be achieved without compromising safety.

The team delivered 76 wells in the time allocated for the 61-well program.

The third step for maximizing value is to incorporate technologies that enable faster, more effective processes and better performance.

One example is the PRIME technology platform, which is designed to enable seamless integration of data and intervention tools to transform task range and performance. In an application in the Middle East, this technology executed a multiphase production logging job in a sour environment in a highly deviated well, tractoring more than 14,000 ft at speeds up to 64 ft/min to determine the source of downhole gas ingress.

Another technology allows wells to not only produce less water with less energy but to produce more oil and gas without intervention, cutting up to 75% of water production and lowering lifting costs. In Colombia, this tool was used on 30 wells, decreasing produced water by as much as 900 bbl/d and improving hydrocarbon production by 43%, with the performance sustained for more than two years following the treatment.

The potential for extending this three-step approach is boundless. Improving and expanding integration, fine-tuning operational models to eliminate silos and encourage teamwork, and implementing more advanced technologies will facilitate production and at the same time deliver safety and ESG gains as well as time and cost savings. ●

**Editor's note:** Read an extended version of this article at [offshore-mag.com/55239104](https://offshore-mag.com/55239104).

**About the authors:** Alex Garcia is Baker Hughes' vice president of Integrated Solutions, and Guillaume Fauchille serves as the company's director of Mature Assets Solutions.

# From LLMs to seismic foundation models, AI can be utilized for subsurface E&P

Combining data into a single model delivers more comprehensive subsurface insights.

WADII EL KARKOURI, TGS

Large language models (LLMs) are driving a significant shift across industries, offering new levels of efficiency, cost savings and data-driven insights. Initially developed to process and generate human language, LLMs have quickly gained recognition for their ability to handle vast amounts of text. Their adaptable architecture is now being applied in various fields. LLMs automate workflows, improve decision-making and uncover deeper insights from complex datasets.

The impact of LLMs in the energy industry is promising. As demand grows for enhanced operational efficiency, lower costs and more accurate subsurface data, LLMs are being tailored to solve challenges specific to exploration and production (E&P). With their ability to process and analyze vast data efficiently, LLMs are helping energy companies streamline operations, make more informed decisions and drive innovation, particularly in subsurface geology and resource management.

## LLMs for subsurface applications

LLMs have revolutionized fields, like natural language processing, by learning from massive datasets, making them adaptable for various tasks with minimal additional training. When applied to subsurface exploration, LLMs have the potential to streamline data interpretation and automate decision-making processes that previously required manual intervention.

One of the most exciting applications of LLMs in subsurface exploration is their ability to handle domain-specific text data, such as technical reports and operational documents, that geoscientists and engineers rely on for decision-making. LLMs can automatically summarize lengthy technical documents, extract key insights and even recommend best practices based on historical data. However, while LLMs are effective for textual data, subsurface exploration often requires processing diverse data types, including seismic volumes, well logs and geological maps. This is where the power of multimodal machine learning models becomes essential.

## Role of multimodal learning

Multimodal learning refers to models that can process and integrate different types of data, also called modalities. In subsurface exploration, multimodal models can analyze data from

various sources (e.g., seismic surveys, well logs, core samples and production data) all at once. This capability allows them to generate a more comprehensive understanding of the subsurface environment.

While LLMs excel in handling textual data, multimodal models are more adept at correlating multiple input types to provide actionable insights. For example, a multimodal model can combine seismic data with geological maps to identify hydrocarbon reservoirs or predict drilling hazards by cross-referencing past drilling logs and seismic interpretations.

By leveraging multimodal learning, these models can provide holistic subsurface insights beyond what can be inferred from a single data type. This is critical in complex environments, such as offshore basins, where decision-making relies on understanding the interplay between geophysical datasets.

## Seismic foundation models

TGS has adapted the principles of multimodal computer vision models to create seismic foundation models (SFMs) specifically designed to handle seismic data and, in the future, other geophysical inputs. SFMs build upon the foundation laid by LLMs and multimodal models. Still, they are tailored to meet the unique demands of subsurface exploration, particularly in interpretation tasks and processing seismic data.

SFMs are pre-trained on vast global seismic datasets collected from multiple basins. This large-scale pre-training enables the models to generalize effectively across various geological formations and regions, providing valuable exploration, drilling and reservoir management insights.

Building an SFM is all about scale, and TGS leads this development with an extensive corpus of multiclient seismic data. By utilizing a cloud-based data management ecosystem, optimized I/O modules and the chunked seismic data format (MDIO), TGS maximizes GPU utilization during training, ensuring a highly efficient and scalable process.

As TGS continues to develop its SFMs, the potential for integrating even more data modalities grows. Combining seismic data, well logs, natural language and production data into a single model will allow TGS' multimodal models to deliver even more accurate and comprehensive insights into subsurface conditions. Partnerships with cloud providers and AI leaders will enable the scaling of these models, ensuring they remain indispensable tools for the offshore oil and gas industry. ●

Wadii El Karkouri is the executive vice president of Imaging & Technology at TGS.

# Technology, social media attracting next gen to O&G industry

New media is making traditionally blue-collar industries more appealing to Generation Z and Millennials.

**KATERINA JONES**, Fleet Advantage

The oil and gas industry has long been a cornerstone of the global economy, providing the energy needed to power everything from homes to businesses. However, like many traditional industries, it faces the challenge of attracting younger workers, especially in the face of increased competition from renewable energy sectors. Historically, careers in oil and gas have been perceived as hazardous, labor intensive and environmentally contentious. But advancements in technology and the rise of social media influencers are changing the industry's image and appeal to younger generations.

The demand for skilled workers in the oil and gas industry has reached critical levels, with an increasing number of experienced workers retiring. This has created a skills gap that threatens the industry's long-term sustainability. In addition, only a small fraction of workers entering the industry are under the age of 30, compounding the challenge of finding and retaining new talent.

The image problem of the oil and gas industry is partly to blame. It is often seen as dangerous, with limited opportunities for career growth outside of manual labor. However, social media is beginning to reshape that perception, showcasing the sophisticated technology and engineering challenges that come with oil exploration, production and distribution.

## Role of new media in attracting younger talent

Social media, digital media and the age of influencers are playing an active role in possibly reversing these industry issues, especially in many companies' pursuit of attracting a younger workforce—for jobs at all levels, whether that's as an engineer, distributor, safety inspector, etc.

Platforms like Instagram and Facebook have turned into powerful tools in reshaping perceptions while influencing career choices among younger generations. Today a growing number of influencers have established large followings by showcasing

their experiences and expertise in all areas of oil and gas. These influencers offer a glimpse into the day-to-day life of working in the industry, and this has helped others view these jobs as interesting and even desirable.

These influencers' stories may be one reason why the number of students enrolled in vocational-focused community colleges rose 16% last year to its highest level since the US National Student Clearinghouse began tracking such data in 2018.

The hashtag #bluecollar drew 500,000 posts on TikTok in the first four months of 2024, up 64% over the same period in 2023. Posts with #electrician increased 77% over the same time, with #constructionworker and #mechanic posting similar increases.

Companies are also leveraging social media platforms like LinkedIn and Facebook to spotlight employees and showcase awards, accomplishments, accreditations, articles and company achievements. The use of social media to spotlight these accomplishments goes a long way toward reinforcing company culture and solidifying camaraderie, and employees have a chance to repost and engage with that content.

## Building a podcast, growing a following

Podcasts have become established as a mainstream media platform, attracting a growing and highly engaged audience. According to Edison Research, 67% of the 12-plus age population has listened to a podcast, and 47% of the 12-plus age population are monthly podcast listeners, while 34% are weekly listeners.

Reaching a newer and a more diverse audience is important, which is a leading reason why Fleet Advantage launched its own educational transportation fleet podcast series earlier this year. The series offers an opportunity to engage listeners on a more direct level, providing education on specific issues that are important to followers of varying professional age groups. The platform allows for educational long-form content that can dive deep into topics, tell stories, and create a sense of connection and community for dedicated followers, while also being more personable. In fact, Fleet Advantage has seen on average a 600% growth rate in podcast views/listens this year. ●

**Katerina Jones** is the chief marketing officer for Fleet Advantage.