

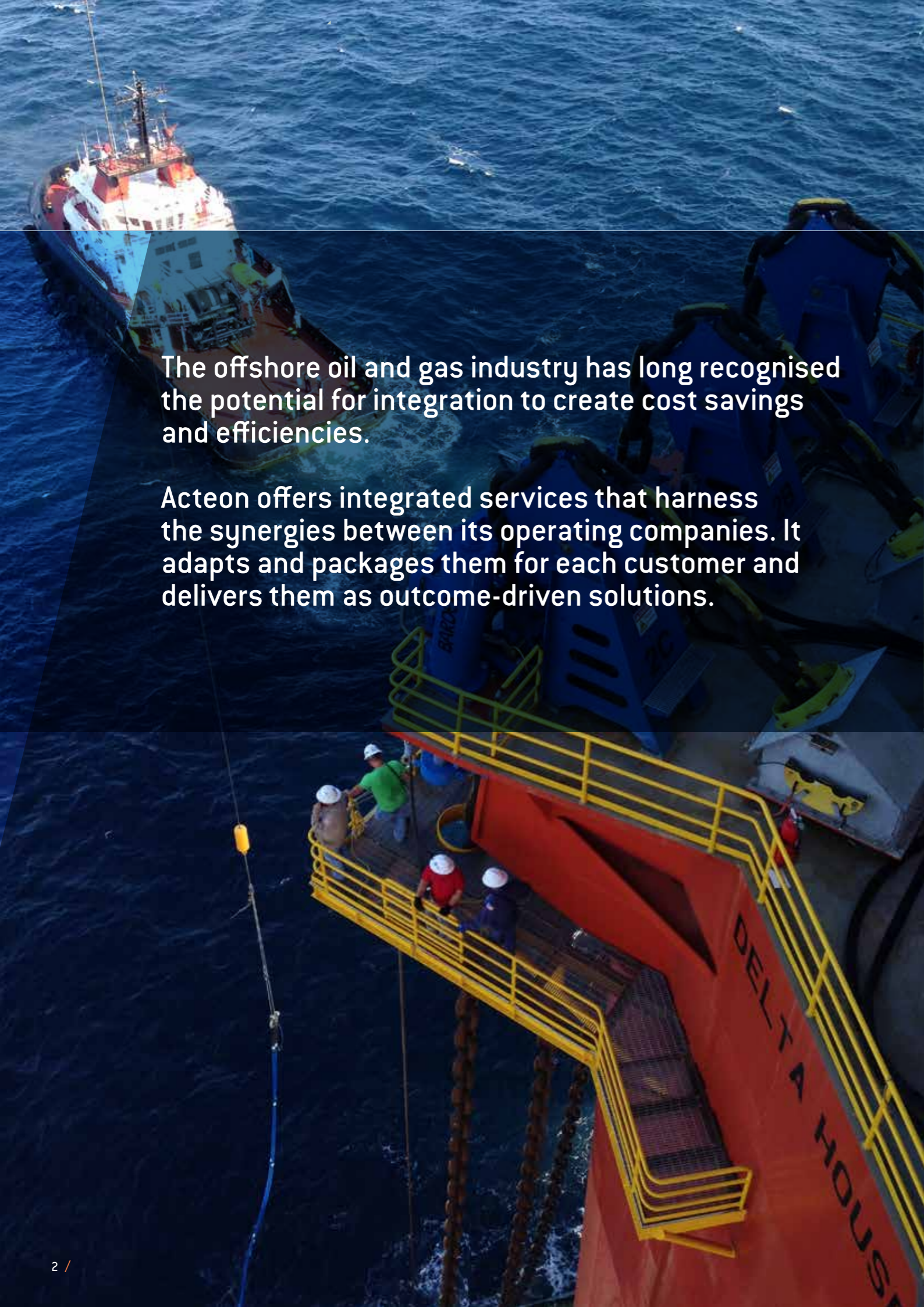


FLOATING FACILITY INSTALLATION SUPPORT

OPTIMISED LIFETIME STATIONKEEPING SOLUTIONS FOR
OIL AND GAS FIELDS IN ANY WATER DEPTH

ACTEON

www.acteon.com



The offshore oil and gas industry has long recognised the potential for integration to create cost savings and efficiencies.

Acteon offers integrated services that harness the synergies between its operating companies. It adapts and packages them for each customer and delivers them as outcome-driven solutions.

INTRODUCTION

Floating facilities have enabled the development of many oil and gas fields that would otherwise be unviable. They perform roles that include the production, storage and offloading of hydrocarbons. The method of installation of each depends on the type of unit, the water depth and the anticipated sea conditions, but all must be installed correctly with accurately positioned subsea infrastructure and remain reliably on location throughout their lives.

WHY INTEGRATE?

Installing and positioning a floating oil and gas facility involves many complex and simultaneous subsea and offshore operations. Engineering, procurement, construction and installation contracts, which are favoured by some operators, do not tend to promote collaboration between participants. The same is true of service-orientated inspection, repair and maintenance (IRM) contracts. For example, contractors may find themselves competing for assets and favourable weather windows in which to complete their part of the overall work scope.

Acteon's operating companies offer an extensive portfolio of innovative products and services that reduce the cost of installing and positioning floating facilities. Our proactive approach to integrating, managing and performing sequential or complementary operations and anticipating the full range of activities throughout the life of a facility has the potential to amplify savings and realise considerable benefits. By doing so, we offer large operators the prospect of better outcomes and may make smaller companies' projects viable.

COMBINING STRENGTHS

Acteon is committed to achieving a 30% reduction in the total cost of ownership of subsea assets by increasing its scope and ownership of all processes. This ambition drives its focus on promoting integrated services as the basis for complete solutions to complex subsea challenges.

The Acteon field life service team pre-packages products and services from Acteon operating companies into integrated services that answer established industry needs. If these cannot deliver the specific outcomes customers expect, we have the people and technologies necessary to create bespoke integrated services. These may combine elements of pre-packaged integrated services with us and third-party products or services.

Customer-specific integrated services are delivered as part of our complete solutions that offer our customers a single point of contact, simplified interfaces with the service providers, greater value and lower costs through efficiencies and lower overheads.

COMPREHENSIVE FACILITY INSTALLATION

Life-of-facility solutions for reliably positioning floating assets

1 INTEGRATED PROJECT MANAGEMENT

2

3

/ Crowded back deck

5

SURVEYING AND NAVIGATION

- 2 FPSO positioning and hookup
- 3 Offshore navigation
- 4 Geophysical and geotechnical surveying

6

/ Riser integrity, structural stability

7

4

/ Congested seabed, geophysical obstacles

DESIGN AND ENGINEERING

- 5 Modular equipment, bespoke design
- 6 As-built engineering, riser system digital twin
- 7 Umbilical and flowline installation
- 8 Driven pile design, fabrication and installation
- 9 Suction pile design, fabrication and installation
- 10 Offshore engineering

11

12

/ Congested field, vessel availability, water depth, cost-effective system

ANCHORS AND MOORING

- 11 Pre-lay mooring
- 12 Mooring design and installation
- 13 Permanent mooring installation
- 14 Anchor and SEPLA fabrication and installation

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CREATING OPPORTUNITIES

It goes without saying that oil and gas field operators expect their floating facilities to be installed safely, on time and within budget. Consistent with these outcomes, they also welcome increased efficiencies, seamless project management, efficient data integration and reduced costs.

These objectives must be achieved while completing work scopes that can be diverse, technically challenging and span pre-development and development phase activities. Delivering them can involve a wide range of specialist expertise, for example, in geophysical and geotechnical surveying to assess the suitability of the seabed for foundations and the design, procurement and installation of mooring and riser systems. Installation-related IRM activities may then extend throughout the operations phase.


VISIBLE BENEFITS

Operators often select installation and IRM contractors for their ability to deliver specific elements of the operators' programme. However, inherent in this approach is a lack of visibility of the overall scope of work to individual contractors. This does not encourage synergies between participants, which have the potential to achieve better technical and scheduling outcomes, greater efficiency or a lower overall cost.

Our integrated support services for oil and gas floating facility installation bring together deep domain knowledge and specialist expertise from across our operating companies. Drawing on these resources, the Acteon field life service team can develop, manage and deliver creative, imaginative and customisable end-to-end installation and positioning solutions that outperform individually procured services for as long as a vessel is on location.

Adopting an integrated approach can help operators to expedite the installation of floating facilities, reduce the risk of cost overruns and increase value over their lifetime. It can also promote innovation and minimise procurement and project management overheads that would otherwise deplete an operator's resources.

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DRIVING EFFICIENCY GAINS

Operators and lead contractors typically tender separately for each aspect of a floating facility installation. Doing so helps them to evaluate competing offers but, because the scope of work must be prescribed in detail, it may limit the ability of subcontractors to propose alternative solutions.

Our integrated services for floating oil and gas floating facility installation improve outcomes for operators. By combining the delivery of products and services under common project management and improving communication between our operating companies and third parties, we can drive schedule and cost efficiencies.

Much of the value of solutions based on our integrated services arises from the flexibility they offer. We are able to customise offerings to the client's needs, from a basic installation service to a suite of services including survey and riser design, mooring design and installation, flex-lay services, remotely operated vehicle services and foundation installation.

INFRASTRUCTURE AND INSIGHTS

We aim to maximise the benefits of integration by applying our extensive knowledge of installation processes to understanding each of our customers'

complete needs. Using the insights this brings, we minimise the costs of installing infrastructure by creating solutions from a wide range of products and services, each appropriate for the soil type, meteorological and sea conditions, asset weight and other factors.

For example, we have a wealth of experience in mooring and pile design that enables us to select the most suitable options from a range of proprietary infrastructure products that includes conventional anchors, driven- and suction-piles and our patented Suction Embedded Plate Anchor (SEPLA), all of which we fabricate and install.

Our range of infrastructure products extends to components, sensors and tools that we sell or rent including chain, rope and connectors and other mooring and installation jewellery. Acteon's infrastructure services include the use of its infrastructure products as well as other installation, maintenance, repair and refurbishment services and the provision of personnel. We offer a wide range of offshore engineering and subsea installation survey services; navigation, pre-laying of moorings; installation of permanent and temporary moorings and floating production, storage and offloading (FPSO) unit positioning and hook-up.

THE BENEFITS OF INTEGRATION

Drawing on the group's resources, the Acteon field life service team is able to develop, manage and deliver creative, imaginative and customisable end-to-end installation and positioning solutions that outperform individually procured services for as long as a vessel is on location.

The ability to provide a wide range of products and services required from a single adaptable source gives Acteon complete flexibility to tailor the combinations and contributions of its operating companies and third parties to meet customers' objectives. Larger operators and contractors may elect to manage some aspects of the installation themselves. Smaller operators may prefer full management of their installation project to benefit from the peace of mind that comes from having fewer interfaces and a unique project management point.

Integration also enables solutions to be developed that take into consideration the full life cycle of the project, including the need for future maintenance, life extension programmes and decommissioning. For example, early or pre-development work such as geophysical and geotechnical surveying can be planned and conducted to inform foundation, mooring and riser designs, which in turn can be aligned with procurement and engineering and/or fabrication services. Similarly, considering

integrity management needs at the design stage may inform future data acquisition requirements and allow the installation to be optimised for IRM programmes.

In all cases, integration enables us to manage the supply chain, minimise the interfaces between service providers, eliminate unnecessary activities, create efficiencies of scale and capitalise on lessons learned from other assets. The unique interface improves communication between our customers and our project manager and enables a smoother and more efficient relay of the client's needs and project specifics to the installation contractors.

The benefits to our customers are lower capital and operating expenditure, improved scheduling and operational efficiency with fewer risks of variations that result in delays. Adopting an integrated approach can help operators to expedite the installation of floating facilities, reduce the risk of cost overruns and increase the value over their lifetime. It can reduce procurement and project management overheads that deplete the operator's resources and promote innovation between participants in the process.

We offer integrated services on innovative or flexible terms and conditions that some operators may find attractive: for example, by delivering all services under a single comprehensive contract or providing many scopes of work under a master services agreement.

The Acteon field life service team is central to the delivery of the group's integrated services. It is the initial point of contact for customers and helps them to define their objectives.



AN INDEPENDENT TEAM

The Acteon field life service team is central to the delivery of the group's integrated services. It is the initial point of contact for customers, helps them to define their objectives and tailors the scope and specifications of each integrated service to meet customers' challenges.

The team introduces customers to the relevant Acteon delivery team lead. It manages relationships and collaboration with and between the Acteon operating companies and the other service providers through an interface who is often a specialist based in the customer's office. It can support the delivery of integrated services by providing project and activity management services and second personnel or recruit contractors, as required.

Because Acteon is independent of vessel operators and subsea equipment manufacturers, the field life service team can build strategic partnerships on a project-by-project basis. This helps to secure the most suitable vessel for delivering each integrated service,

anywhere in the world and at the most favourable rates. Independence enables the field life service team to focus on delivering cost-effective solutions for all phases of mooring: from installation and IRM to decommissioning and towing.

Similarly, alignment between our operating companies has been shown to enable innovative and cost-efficient alternatives to being reliant on the use of heavy costly assets, such as large construction vessels or special-purpose ships. Partnerships with international vessel providers enables Acteon to charter optimally specified vessels for each installation project, as required and on competitive terms.

The freedom to schedule activities to optimise their utilisation and to fit each contractor's schedule, and the ability to deploy multiskilled crews to execute consecutive services across many aspects of the process also improves efficiency and reduces the total cost further.

CASE STUDIES

CASE STUDY/1



TIMELY FLOATING STORAGE AND OFFLOADING (FSO) UNIT REPLACEMENT

Chevron wanted to tow a replacement FSO unit to its Benchamas field in the Gulf of Thailand and locate it using the existing turret mooring system and piles.

Acteon provided project management, engineering and manpower for the tow. We helped to minimise the field shutdown period and costs by thoroughly preparing the FSO in good time for the sail-away date and put in place procedures to avoid delays. For example, we anticipated fishtailing of the FSO when towed from the stern and made allowance for having to reduce the towing speed.

We also provided engineering and analysis for the hook-up of the new FSO and installation of the riser. The work was completed on time, without any interruption of production or lost-time incidents.

CASE STUDY/2



MOORING SOLUTION DELIVERED BY ADAPTED ANCHOR HANDLING VESSEL

LLOG Exploration needed to moor its Delta House floating production system (FPS) in 1341 m of water in the Gulf of Mexico. Acteon's low-cost solution involved using an anchor handling vessel that had not previously handled mooring components of the size needed.

Acteon designed, engineered and fabricated 12,150 t suction pile anchors, each 85 ft long and 16 ft in diameter. We worked closely with suppliers and manufacturers to ensure that our equipment would work efficiently with the vessel and designed and manufactured equipment that gave the vessel the ability to position and install the large components.

We installed the permanent anchors, pre-installed the entire chain and polyester mooring lines on the seabed and hooked them up to the FPS on time and without incident.

CASE STUDY/3



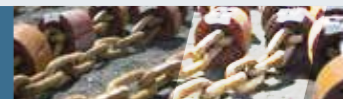
RAPID-RESPONSE MOORING AND RISER SYSTEM UPGRADE

China Offshore Oil Engineering Co. Ltd (COOEC) engaged Acteon to uninstall, relocate and reinstate a buoy-turret mooring system in the South China Sea LuFeng field and install a new system on the original location. The diverse scope of work included hooking up the new buoy and installing a new 8-inch flexible flowline and riser.

This was our first major project in China and the main challenge was interfacing with the lead installation vessel to accommodate the project requirements and a tight eight-week timeframe. Procedures for simultaneous offshore operations with divers, remotely operated vehicles and the support vessel contributed to the project being completed on schedule, within budget and with no lost-time incidents.

Wang Jiewen, project manager at COOEC, praised the high level of performance achieved by Acteon on the project.

CASE STUDY/4



EFFICIENT ULTRA-DEEPWATER FPSO UNIT PRE-COMMISSIONING

Shell needed a range of subsea services performing in 2892 m of water as part of its Turrutella FPSO unit pre-commissioning programme in the Gulf of Mexico Stones field.

Acteon provided tow masters aboard the unit; tensioned and de-tensioned the mooring chains before cutting and removing excess chain; stretched and transferred the riser pull-in rope to the FPSO unit and designed, procured and installed the FPSO heading control steering lines.

As well as having to compete for good weather windows during simultaneous operations, we faced technical challenges typical of ultra-deepwater projects, including high loads (more than 200 t). Nevertheless, the chain removal was completed successfully with no lost-time or recordable incidents and no dropped objects. The job was completed without any impacts on the FPSO schedule.



STRENGTH IN INDEPENDENCE

Acteon is an independent group of industry-leading companies with complementary capabilities and strong client relationships. Our operating companies' character, drive and technology focus are what makes our group unique.

INDEPENDENT AND GLOBAL

Acteon is shaping and leading an evolving global subsea services market. Our focus is on reducing the total cost of ownership of our customers' critical subsea infrastructure safely and responsibly throughout the life of a field.

Independence enables us to take a unique approach to subsea operations: one unconstrained by the need to maximise the use of manufacturing assets or a fleet of vessels. Consequently, we are free to deliver services that align with our clients' needs rather than those that serve our business objectives.

We have global strength yet employ local staff with regional expertise to carry out projects. We are represented in all the major offshore oil and gas capitals and are involved in projects in the world's primary hydrocarbon provinces.

As a trusted global partner, we support our clients by delivering the highest levels of international compliance; outstanding quality, health, safety and environmental performance; a flexible workforce to support projects worldwide; and market leadership in each area of activity.

OUR OPERATING COMPANIES

The Acteon group offers an extensive range of products and services that are developed and sold directly by its operating companies. We have applications that can be used throughout the life of a field, from the pre-development planning through to the development, operations and late-life phases, and decommissioning and post-abandonment operations.

Through integration, we leverage the technologies, combined strengths, unique skills, deep domain knowledge and experience of these companies and tailor them to solve our customers' challenges.

THE FIELD LIFE SERVICE TEAM

Acteon Field Life Service Ltd, a subsidiary of Acteon Group Ltd, was created to focus the creativity of Acteon operating companies and strategic partners on providing service-orientated solutions with simplified interfaces and a high degree of innovation. Our goals are to deliver the outcomes customers need through new and disruptive commercial and technical offerings that lower costs, increase operational efficiency and overcome unresolved challenges in subsea asset ownership throughout the life of a field.

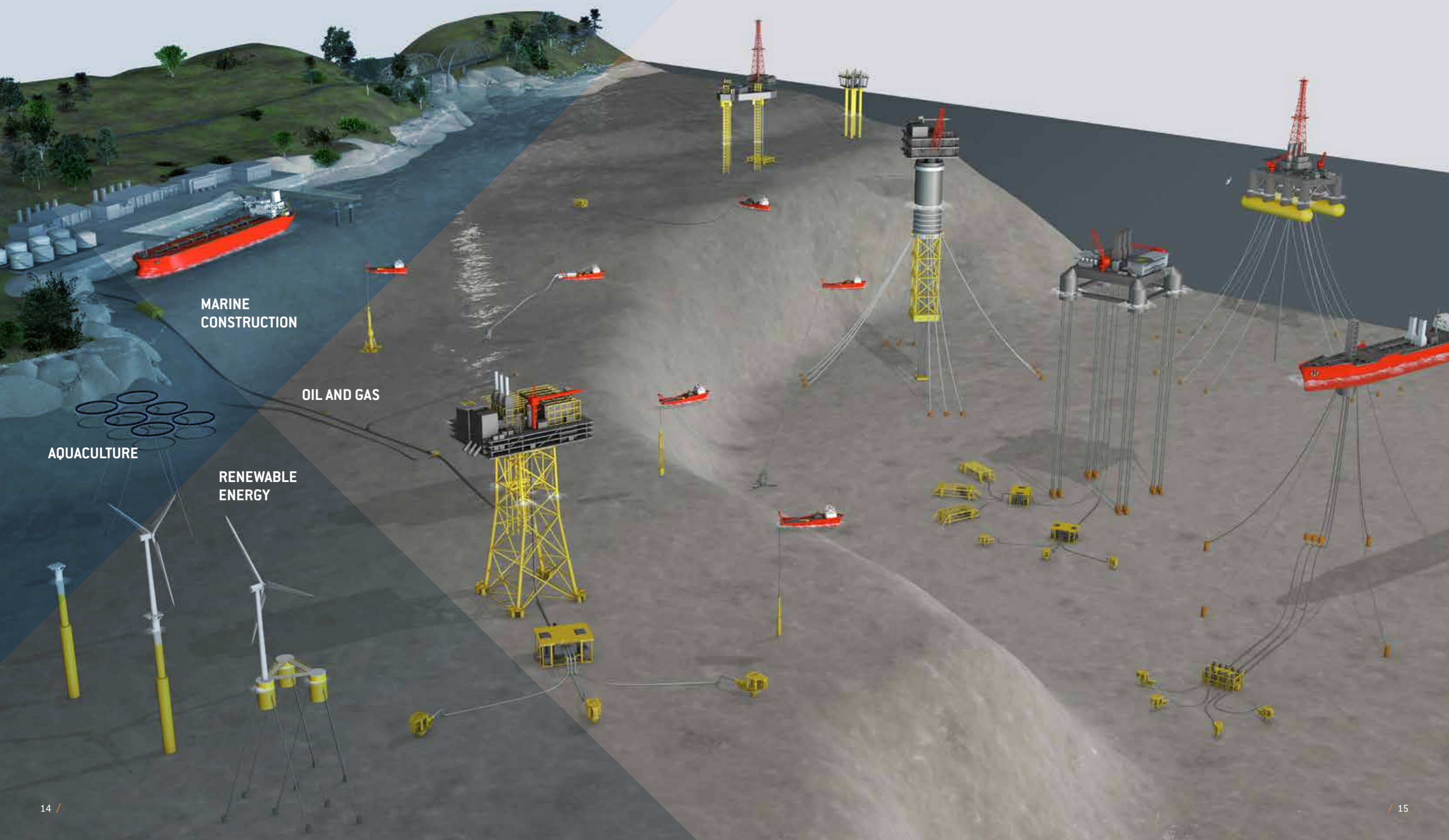
The Acteon field life service team develops and delivers customer-specific integrated services that address complex challenges by promoting collaboration and connecting skills, technologies, products and services wherever they exist. It combines and packages infrastructure and insight products and services to realise specific subsea engineering projects of any scale. The team's unique combination of subsea specialists and partners within Acteon and third parties enables it to recommend only what is necessary to answer a customer's service integration needs.

INNOVATIVE SOLUTIONS

We aim to reduce the cost of owning subsea assets through the integration of products and services. Our customer-focused solutions offer a high degree of flexibility, exceptional service quality and fresh thinking. They may be based on complete pre-packaged integrated services or combine elements from more than one existing or bespoke integrated service. They are typically offered with conventional pricing or on innovative commercial terms tailored to the scope of work and the specific customers' needs. Terms vary from conventional time and materials to lump sum and may share risk and reward.

We are shaping and leading an evolving global subsea services market. Our focus is on reducing the total cost of ownership of our customers' critical subsea infrastructure safely and responsibly throughout the life of a field.

THE ACTEON PORTFOLIO – REDEFINING SUBSEA SERVICES



MARINE
CONSTRUCTION

OIL AND GAS

AQUACULTURE

RENEWABLE
ENERGY

Contact the Acteon field life service team if you need a solution that combines Acteon products or services.

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