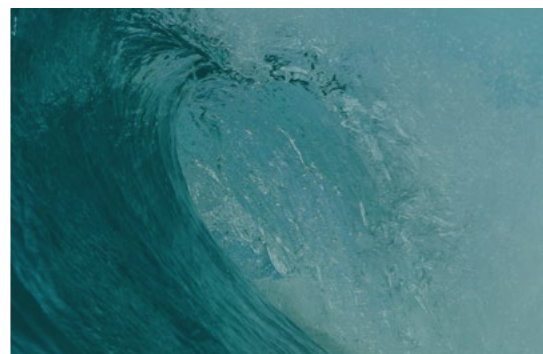




Sustaining Excellence in Decommissioning: The Key Messages of SPE Offshore Europe 2019

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Foreword

Decommissioning is quickly becoming a major consideration in the global oil and gas industry, with analysts predicting expenditures of around \$32 billion over the next four years.¹ The offshore market is projected to reach \$8.9 billion by 2027, with a compound annual growth rate (CAGR) of 4.8% from 2019 to 2027.²

Europe is the largest and fastest growing market, by value, for offshore decommissioning, followed by North America. The UK and Norwegian sectors of the North Sea are predicted to witness the highest offshore decommissioning spending.

According to Wood Mackenzie, the UK—with around 85% of its overall projects yet to be completed—will be responsible for around a third of upcoming global decommissioning activity in the next decade.

The gradual decommissioning of aging and mature infrastructure worldwide will last decades. Therefore, it is vital we work efficiently to transfer learning, attract a diverse and skilled talent pool, develop new business models, and embrace new technology.

In September 2019, I was pleased to host a session at the SPE Offshore Europe conference, bringing together a diverse, forward-thinking panel of speakers to discuss these issues in more detail. This paper provides a summary of that session.

It's my belief that real innovation and diversity of thought will help drive forward the creation of a new, more dynamic, sector, where a different kind of mindset is required.

There are huge opportunities to innovate, reduce costs, and develop valuable expertise and skills. The energy transition and the commitment to net zero carbon is focusing minds on finding alternative ways to not only remove but also modify and reuse redundant infrastructure for carbon storage and hydrogen.

It's becoming clear that best practice is to plan decommissioning activities at least six years before cessation of production, and we are now seeing decommissioning strategies being embedded at the earliest design stage.



Andy Samuel
Chief Executive at the
Oil & Gas Authority

¹ <https://www.woodmac.com/news/editorial/are-cost-rises-inevitable-for-global-upstream2/>

² <https://www.researchandmarkets.com/reports/4244547/offshore-decommissioning-market-global-forecast>



The race to decommission is less aggressive than the race to first production. There is a benefit to structuring and sequencing activity to gain optimum cost-efficiency without overheating the market, while creating a transparent activity forecast that allows the supply chain to invest to provide cost-effective solutions.

There are already many exceptional performers pioneering best practice. They are realising the benefits of collaborating in new ways: between operators, partnering with the supply chain, and with regulators and technology providers. There is also real enthusiasm to investigate radical approaches to contracting strategies and delivering cost reductions at scale. In various parts of the world, there are natural groupings of operators who are collaborating in “clubs” rather than as individual companies.

The decommissioning future we envisage is win-win for operators, the supply chain, and the UK as a whole. It’s time for strong, dynamic leadership, innovation, inclusion, and trust in the supply chain to help deliver it.

“It’s becoming clear that best practice is to plan decommissioning activities at least six years before cessation of production...”



Introduction

What is the status of UK offshore oil and gas (O&G) upstream decommissioning? In a word, positive. But the industry should not rest on its laurels. Industry players can capture tremendous value by making additional performance improvements, but capturing the value will not be easy. For lessons on how to overcome the challenges, those in the O&G industry can look to the experiences of other industries as well as US and UK offshore decommissioning projects. These lessons point to three main levers for sustaining excellence: enabling decommissioning at scale, integrating transformational technologies into a risk-based approach, and developing a people strategy.

Those are the key messages that emerged from “SPE Offshore Europe 2019: Breakthrough to Excellence – Our License to Operate” a four-day conference held in early September in Aberdeen, Scotland. Conference participants included leading operators, oilfield services and equipment companies, and government officials, as well as technical and strategic advisers to the industry. The general tenor of the discussions was upbeat and forward-looking, as participants took stock of the industry’s recent accomplishments and shared insights on how to build on the industry’s success in the years ahead.

In this paper, we provide an overview of the key messages and offer our thoughts on the path forward.

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A Positive Trajectory, But Substantial Challenges

In 2017, the UK's Oil and Gas Authority (OGA) announced its target to cut decommissioning costs in the UK continental shelf to no more than £39 billion, a reduction of at least 35% from the 2017 estimated cost base of £59.7 billion. Today, the UK decommissioning industry is halfway to this goal, having reduced costs to £49 billion. The industry delivered its 2018 plan for £1.4 billion, representing a 25% reduction compared with the original estimate of £1.9 billion—without diminishing the scope. Despite the cost reduction, high-quality work continued at the project level. The industry is also pursuing a variety of technology developments, including multi-string logging, multi-string removal, and alternative lengths and materials for well barriers (we discuss these developments below).

The industry should regard this positive performance as a platform on which to build. By applying traditional approaches at lower cost, as well as deploying new approaches, operators can free up capital for new investments and further innovation to optimise economic recovery in the UK basin. Additionally, the industry may be able to export its knowledge and capabilities to other regions. Operators in Malaysia, Norway, and Australia have reached out to their UK counterparts for support. The prize for setting the global standard is significant: The global market for oilfield decommissioning services is expected to reach \$100 billion in next ten years. The UK's oilfield services sector already generates approximately 40% of its revenues from overseas activity, according to EY. (See "[Review of the UK Oilfield Services Industry](#)," EY article, January 2019.)

To capture the value, the UK industry must overcome numerous challenges—many resulting from sub-par performance in the past. These include challenges relating to the operational environment (for example, in many countries, half of the wells are more than 30 years old), deficiencies in the knowledge base (such as non-existent or low-quality data), inadequate tools (for example, immature technologies), and the uniqueness of decommissioning projects (including each well's distinctive history).

These challenges cause environmental risks (stemming from operations), financial exposure (arising from uncertain costs), and safety and subsurface containment risks. The industry must also cope with risks in the business environment arising from depressed oil and gas prices.

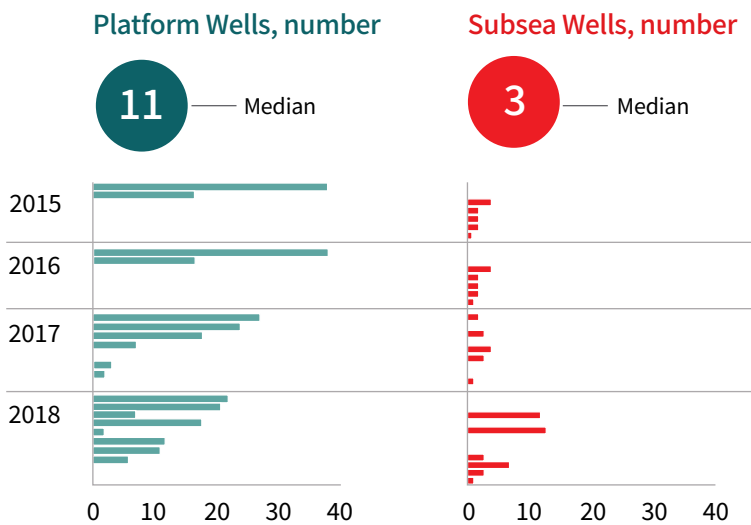
The industry should regard this positive performance as a platform on which to build.



The greatest concern is that the industry is not set up to capture the benefits of scale. According to the OGA, in the past three years, the median size of annual subsea plug and abandonment (P&A) activity for a UK operator was three wells. (see Exhibit 1). Many contracts include traditional terms that are not suited to maximizing the benefits of scale. For example, the contracts fail to align incentives between operators and contractors or allocate each risk to the party most capable of managing it. Scale has also been impeded by the difficulties some specialized contractors have encountered in gaining traction in the market.

...the industry is not set up to capture the benefits of scale.

Exhibit 1: UK Offshore Well P&A Activity Is Fragmented



Source: OGA

Note: Each horizontal line represents an operator's well P&A activity in a year



Lessons from Other Industries

The experiences of other industries offer lessons for offshore decommissioning operators.

ONSHORE O&G DECOMMISSIONING

Three lessons from onshore decommissioning are especially relevant:

- **People.** Capture the knowledge of key operating team members while they still work for you. Ensure that your asset documentation is up to date when the operating team hands off the asset to the demolition team.
- **Asset value.** Unless there are clear opportunities to reuse components or pieces, consider assets to be scrap. The option to sell assets is viable in only a few situations and should be pursued only when the payoff is clear, as making a deal can consume significant effort and time.
- **Decommissioning is not construction in reverse.** Even though there is no “first oil” target to chase, delays in decommissioning have the potential to increase risk and thus drive costs higher. Operators accustomed to development must alter their mindset with respect to the project goal and how to achieve it.

ONSHORE UNCONVENTIONAL OIL DEVELOPMENT

Since 2013, the cost of supply (US E&P average) for onshore unconventional oil has been cut in half, from \$70 per barrel to approximately \$35 per barrel. Several factors have promoted the success of onshore unconventional oil development:

- **Efficiency.** Operators can drill a 7,500 foot horizontal well in 10 to 15 days.
- **Scope of Work.** Each operator can drill more than

100 wells per year, which means that, in aggregate, operators drill and complete thousands of wells annually. This broad scope of work allows an individual operator to gain a tremendous amount of experience—both from its own work and by drawing lessons from other operators’ activity—in a very short time period.

- **Dynamism.** The industry has collected a large volume of data and conducted a lot of experimentation. Operators can readily try out a new idea and understand the results very quickly. They can apply successful new ideas at scale within a few weeks while quickly dropping unsuccessful ideas.
- **Reduced Risk.** Operators do not need to spend significant resources (people or financial) studying a project to ensure that it is significantly de-risked. This is in sharp contrast to conventional offshore development, where an operator may only need to drill a dozen wells.

From these successes, decommissioning operators can learn several lessons:

- **Be dynamic.** Look for opportunities for fast experimentation and quick wins. Accelerate adoption whenever possible.
- **Question the status quo.** Be innovative and transformative. Apply that mindset to optimise operations through continuous improvement.
- **Use data.** In the UK, 1,465 offshore wells are expected to be decommissioned from 2018 through 2027. (See the O&G UK Decommissioning Insights Report 2018.) To improve future performance, operators should capture data related to this activity and learn from it.



US NUCLEAR DECOMMISSIONING

In recent years, operators in the nuclear industry have pursued an unprecedented level of business model innovation. A change in perspective is responsible for this emphasis on innovation in what had been regarded as a very conservative industry.

Two sales by Entergy illustrate the innovative mindset:

Example 1: In January 2019, Entergy completed the sale of its Vermont Yankee nuclear plant to NorthStar, an industrial demolition company. The sale—the first of its kind in the nuclear power industry—involved the permanent transfer of ownership, license, liability, and the decommissioning trust fund.³

This sale illustrates the importance of changing perspective: Instead of Entergy having an approximately \$500 million liability⁴ on its books, NorthStar has an approximately \$500 million demolition project with significant upside potential.

Example 2: In August 2019, Entergy completed the sale of its Pilgrim nuclear plant to Holtec, a contractor that specializes in spent fuel. Holtec is adding Pilgrim to a portfolio of four other reactors it purchased or is in the process of purchasing. For each reactor, Holtec plans to perform end-to-end decommissioning. Within a relatively short period of time, Holtec has built the potential for a project backlog worth more than \$2 billion.

Each of these projects is expected to start quickly and take 8 to 12 years to complete, as opposed to 60 years as originally intended by the operators. Significant efficiencies are expected from this fleet management approach.

This change in perspective was enabled by three events:

- The contractors identified the opportunity to capture value by taking charge of the projects despite incremental risks, and were able to demonstrate that they could be prudent decommissioning operators.
- The nuclear operators trusted these specialist players to manage the projects safely and recognized that all stakeholders would benefit from transferring responsibilities to them.
- The US Nuclear Regulatory Commission and other state and local regulators saw the opportunity to accelerate these projects and were able to trust these specialist players to manage the projects safely.

The main lesson for the UK offshore O&G decommissioning industry is the importance of adopting a fresh perspective: looking at decommissioning not as billions of pounds in liability for individual operators, but as billions of pounds of opportunity for companies operating in the basin; and considering alternative value drivers—such as risk reduction and liability transfers—beyond price alone.

³ Vermont Yankee was the first permanent transfer for decommissioning. The first temporary transfer for decommissioning occurred in 2007, when Exelon transferred the Zion Station to EnergySolutions.

⁴ Liability is determined using the size in the Nuclear Decommissioning Trust Fund as a proxy.



Lessons from US Offshore O&G Decommissioning

US operators in the Gulf of Mexico complete offshore decommissioning projects much more quickly than their UK counterparts, and at a lower cost. Three lessons stand out:

- **Hire dedicated decommissioning contractors.** Decommissioning is performed in the Gulf of Mexico by dedicated decommissioning contractors with an efficiency mindset, not contractors with an engineering and construction mindset.
- **Deploy fit-for-purpose technical solutions.** The US experience shows that executing isolated projects using a fit-for-purpose technical solution is more valuable than gaining experience (and reaping benefits of scale) across multiple projects with the wrong technical solution. In the Gulf of Mexico, nearly all well P&A jobs are rig-less—operators do not pull tubing. The inexpensive project design allows operators to complete the work in approximately four days, compared with 11 or more days in the North Sea.
- **Reduce the burden of insurance requirements.** An important driver of low costs in the Gulf of Mexico is less stringent requirements for insurance. Only one company participating in the license for a decommissioning project is required to demonstrate financial capability to the US government and the other companies participating in the license. In contrast, for North Sea decommissioning, every participant in the license must demonstrate its financial capability and letters of credit represent approximately 5% of the decommissioning costs. Demonstrating financial capability is manageable for the major integrated oil companies, but for smaller companies, the burden is often too high.

...dedicated decommissioning contractors with an efficiency mindset, not contractors with an engineering and construction mindset.



Lessons from Successful UK Offshore Decommissioning Projects

CNR has identified three lessons from its recent experience decommissioning the Murchison field (comprising platform topsides, derogated jackets, wells, and subsea infrastructure) and Ninian North (comprising platform topsides and wells):

- **Build truly diverse decommissioning teams.** CNR does not pigeonhole people in either onshore or offshore roles. Onshore personnel take roles offshore during campaigns, while offshore personnel take roles in the office so that they can contribute their insights. For example, Ninian North's offshore installation manager joined the onshore project team to contribute to the platform removal preparation, bringing to bear in-depth knowledge of the asset. This flexible approach to staffing enables timely cross-learning and continuous improvement. The breadth of diversity in the decommissioning team also allows the company to leverage a broader range of perspectives, experiences, and ideas. The approach has enabled CNR to meet or exceed the OGA cost-reduction target.
- **Use a contracting strategy to facilitate both continuous improvement and technology development.** CNR uses a contract based on "end goals" that define the outcome of the project. When working with a contractor, the company focuses on aligning values and ambition around continuous improvement. The company created an integrated team for drilling and P&A composed of representatives of each contractor, and it rewarded the contractors with continuity across projects. CNR also facilitated cross-training of personnel from the multiple contractors, enabling it to form a small integrated team.
- **Make decommissioning fun.** For example, CNR's mission statement stresses encouraging people to work together to create value for shareholders, and to do it, "with fun and integrity". CNR regards this mission statement as critical to attracting and retaining high-calibre people to decommissioning. The company also discusses the mission statement in kick-off meetings with its contractors. To put the emphasis on people, its leaders talk about behaviours and outcomes from a personal perspective.

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Three Levers to Drive Success

The lessons can be condensed into three levers that operators can apply to promote the success of offshore decommissioning.

LEVER 1: ESTABLISH THE REQUIREMENTS FOR DECOMMISSIONING AT SCALE

Today's business model does not enable decommissioning at scale. Some industry participants strongly believe that decommissioning should remain inside the E&P company and that the incumbent team should deliver this work. Other participants, however, are exploring innovative models in which the E&P company outsources to a ring-fenced decommissioning unit or to an independent new company. In either of these innovative models, decommissioning is handled by an autonomous organisation with its own mandate and budget, tailored processes, and a clear scope of work.

In our view, these models can coexist. In fact, many models have delivered very cost-efficient scopes. However, we would argue that only the innovative models will enable decommissioning at scale and basin-level optimization. (See "Oil and Gas Needs Decommissioning Models That Work at Scale," BCG article, August 2019.).

To bring the innovative models to life, decommissioning operators need to change their perspective to focus on the opportunities, not the liabilities.

There are several prerequisites to decommissioning at scale: A strategic decision on the scope of the company's decommissioning work, incentives, executive-level partnerships between operators and suppliers, and investment to develop fit-for-purpose capability.

With respect to strategic decision making, it is surprising that decommissioning has not taken a more prominent position on the C-suite agenda given its significant scale and clear relevance across the entire industry. Operators and service companies must choose between doing no decommissioning or doing a lot of it. The worst case is having one decommissioning project. A single project entails all the costs of learning how to do it, but offers no additional opportunities to apply that knowledge going forward. Industry leaders must resist the urge to approach decommissioning with an execution mindset. Rather, they should think strategically about how decommissioning offers value to their business.

Applying an external perspective is critical to success. The experiences of successful acquirers of assets that require decommissioning provide a model for all operators to follow. In researching a potential acquisition, these companies employ a well-honed process to gain a detailed understanding of the decommissioning liability and how they can extract value from the asset. Once they acquire an asset, they sharply curtail spending for the first three months to give themselves time to understand the cost base and how it creates value. Experienced acquirers can apply their knowledge of best practices to reduce the cost base of an acquired asset by 25% to 35%.



We see two clear opportunities to decommission at scale in the UK:

- There are 207 open water suspended exploration and appraisal wells, all of which must be permanently abandoned. According to the OGA, the average age of these wells is 24 years, raising the issue of mechanical integrity. Twelve operators hold 70% of the wells, with an additional 28 operators holding the rest. (See the OGA Wells Insight Report 2018.)
- The East of Shetland basin has tremendous scope: four operators control a total of 12 installations, nearly 500 wells, 85 subsea structures, and nearly 700 kilometres of pipeline. (See Exhibit 2.) CNR, EnQuest, TAQA, and Total are considering a multi-operator collaboration effort to deliver this scope. This would be the first such collaboration in the North Sea.

Exhibit 2 The East of Shetland opportunity to decommission at scale



Installations

10 steel piled structures
2 gravity based structures
250k mT topsides
207k mT substructures



Wells

373 platform wells
107 subsea wells



Subsea Structures

85 subsea structures
2,756 mattresses

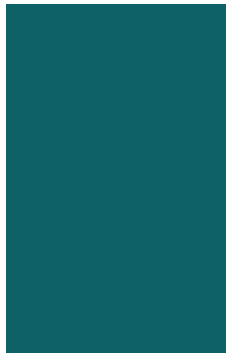
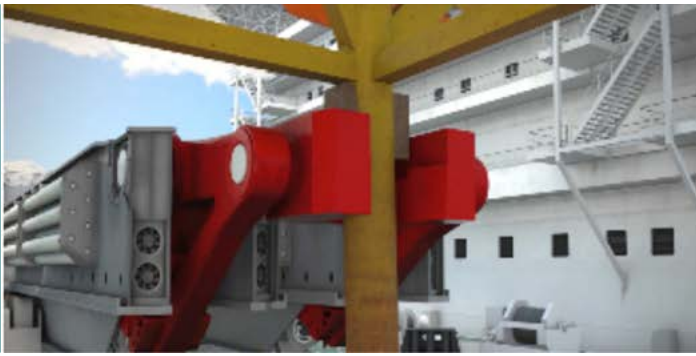


Pipelines

24 pipelines >16”
696 kms of pipeline <16”



Source CNR



LEVER 2: INTEGRATE TRANSFORMATIONAL TECHNOLOGIES INTO A RISK-BASED APPROACH

Practice risk-based P&A in order to apportion resources efficiently and make minimum viable designs. Devote your resources to the areas of highest risk. Not all wells are the same and not all risks are equal. For example, HPHT (high pressure, high temperature) wells carry inherently greater risks than those in depleted gas reservoirs.

Adopt transformational technologies to achieve the ultimate goal of “through-tree P&A” that minimizes the use of a rig. Three elements are required:

- Multi-string logging diagnoses well integrity efficiently. The first successful multi-string logging technology was run by a decommissioning operator in the Southern North Sea in late 2017 through 2018. Other companies are working on similar capabilities.
- Multi-string removal places the barriers downhole efficiently. Various companies are developing multi-string removal capabilities. Prototypes are expected to be field tested 12 to 18 months from the date of publication of this report. These capabilities include lasers, rocket propellant, abrasive water, and plasma.
- Alternative lengths and materials for barriers used in plugging are available now and being field tested, including bismuth alloys and resins.

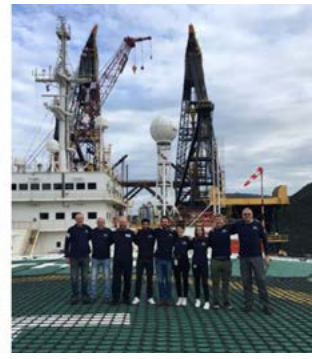
Three distinct improvement levers are necessary to achieve a step-change in operational cost and HSE performance through fit-for-purpose design and execution at scale: risk-based P&A, transformational technologies, and a steep learning curve.

AECOM estimates that 32% of cost reductions in decommissioning will come from technology innovations. To support efforts to implement transformational technologies, the Oil & Gas Technology Centre (OGTC) is actively driving a targeted portfolio, including:

- A state-of-art immersive simulation suite
- Well P&A materials and verification capability
- Lasers and drones for better monitoring and planning
- Innovative cutting and removal techniques

The simulation suite is the first of its type in the UK, and enables the development of a robust and scalable decision-making tool based on artificial intelligence (AI) algorithms, real experience, and visualisation capabilities. This tool will have the capacity to host a “smart basin” concept—an integrated platform to access and process data from across the UK continental shelf using powerful data analytics. Such capability will transform how we as an industry engage with each other to maximise our technical innovation and de-risk its deployment.

In partnership with the University of Aberdeen, the OGTC established the National Decommissioning Centre (NDC) to champion fundamental research that would underpin the best approaches to decommissioning and build the UK supply chain expertise on an evidence-based, scientifically rigorous approach.



LEVER 3: DEVELOP A PEOPLE STRATEGY

Companies that focus on their human assets as much as their physical assets will likely emerge ahead of the pack. (See “Decommissioning – A Different Perspective” EY article, August 2019.). Forward-looking organisations are thinking about workforce planning, how to assemble and incentivize the right people, and what changes to make in their business structure. The starting point is a detailed understanding of present and future needs, aligned to a wider decommissioning strategy.

The transformation is supported by three pillars:

- Optimise the workforce across the project lifecycle. Invest in redeployment and retraining, so that the workforce continues to reflect business needs. Executives must be confident in their knowledge of which skills are transferable and the roles that best fit the decommissioning agenda.
- Be clear about the employee value proposition. An integrated approach to obtaining the necessary capabilities should consider the balance between internal and external resources by capability type. Clarity on the career opportunity for employees and long-term incentivisation of key staff are fundamental.

- Focus on culture and transition management. To support the transformation, an organisation must adopt regular engagement and feedback mechanisms, as well as executive-led initiatives that visibly support and reinforce the organisation’s culture. Comprehensive transition planning and support, along with a dedicated and comprehensive HR strategy, are needed as personnel migrate to new roles and career paths.

Workforce change is particularly tricky for smaller operators, which are likely to require decommissioning resources for limited periods of intense activity. Certainly it is not efficient to fully staff an internal team to complete the process just once or twice. In such situations, collaboration and partnerships with experienced and well-staffed service providers offer a compelling alternative.



The challenge in O&G decommissioning in the UK is substantial. To capture full value, we need delivery models to deliver at-scale, fit-for-purpose solutions, specialist capabilities, and a work context tailored to decommissioning. And all of this begins with attracting and retaining high-calibre people.

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