Oil & Gas Authority

UKCS Decommissioning

2019 Cost Estimate Report

July 2019

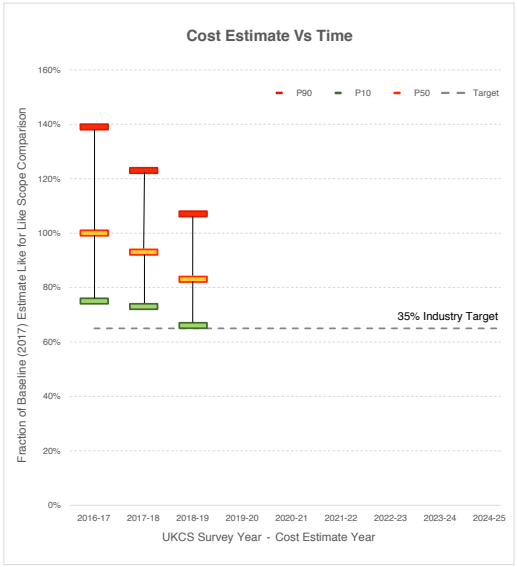
Contents

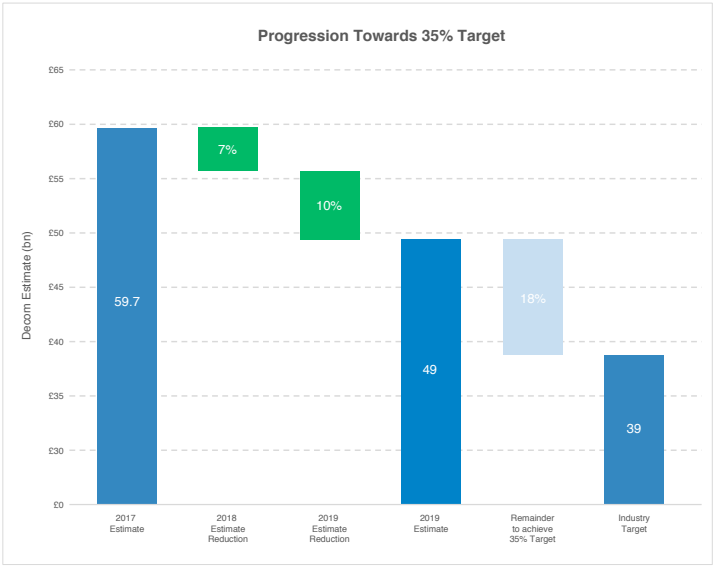
All costs in this report are in 2018 prices, based on forecast expenditure in 2019 and after, unless otherwise stated

1. Executive summary

The total cost of decommissioning remaining UK offshore oil and gas production, transportation and processing infrastructure has reduced by 17%, on a like-for-like basis, to £49bn[1] compared with a 2017 base-line estimate of £59.7bn[1]

Figure 1: Decommissioning cost reductions towards 35% reduction target (Like-for-like[1])





[1] Costs in 2016 prices, for expenditure in 2017 and after

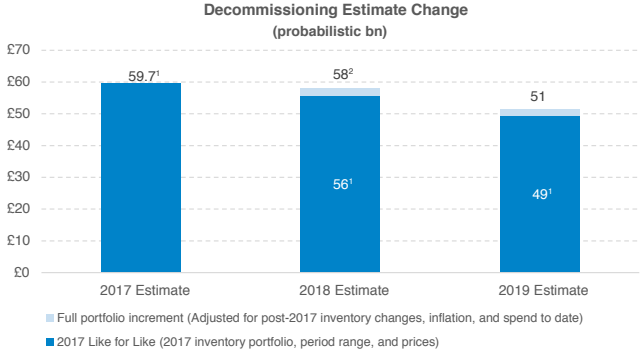
The 10% cost reduction on a like-for-like basis in 2019, in addition to the 7% achieved in 2018, is primarily driven by continued improvement in planning and execution practices, leading to reductions in the estimated cost of:

- Well Abandonment (P&A) in the Northern North Sea (NNS) and Central North Sea (CNS)
- Post Cessation of Production (COP) platform running costs in the NNS
- Platform and subsea infrastructure removals in the NNS and CNS
- Reduced contingency associated with improved cost estimating definition

There is considerable opportunity for future cost improvements, to meet the targeted UKCS cost reduction target of greater than 35% (to levels below £39bn[1]), as decommissioning operators and contractors extend industry learning to other offshore assets, and other cost categories. Threats and uncertainties with the potential to increase costs include inconsistent cost performance of different Operators and cost threats from oil-sector inflation.

Including £2bn for inventory changes since 2017, the total cost of decommissioning remaining UK offshore oil and gas production, transportation and processing infrastructure is estimated at £51bn.

Figure 2: Decommissioning Cost estimate changes with time



[1] Costs shown in 2016 prices, for expenditure in 2017 and after
[2] Costs shown in 2017 prices, for expenditure in 2018 and after

2. Introduction

The Maximising Economic Recovery (MER) Strategy for the UK sets out a central obligation and supporting obligations, including clarifying the actions and behaviours required for decommissioning. Lower decommissioning costs will help maximise value extraction from the UKCS. For the supply chain, which holds the specialist skills, knowledge and equipment to execute the work, there is a clear and sizeable opportunity to develop an efficient, low cost and exportable industry capability.

The OGA takes a probabilistic approach[2,3] to estimating total UKCS decommissioning costs, which takes into account the range of uncertainties inherent in cost estimation. Cost estimates for all fields are provided to the OGA by operators each year via the UKCS Stewardship Survey, with the 2018 survey forming the basis for the 2019 Report.

- Like-for-like estimates[1]: Cost reductions are measured against the £59.7bn[1] baseline calculated in the 2017 report, after inflation-adjusting and like-for-like aligning the portfolio/inventory with that evaluated in 2017.
- Full Portfolio estimate: There have been various changes in the to-be-decommissioned portfolio since 2017. The remaining decommissioning cost for the updated Full Portfolio (i.e. the latest view of remaining inventory, as from the beginning of each report year) is also calculated.

[1] Costs shown in 2016 prices, for expenditure in 2017 and after
[2] 2017 Cost Estimate Report: https://www.ogauthority.co.uk/media/4742/ukcs-decommissioning-cost-report-v2.pdf
[3] 2018 Cost Estimate Report: https://www.ogauthority.co.uk/media/4999/decommissioning-a5-2018-pdf-version.pdf

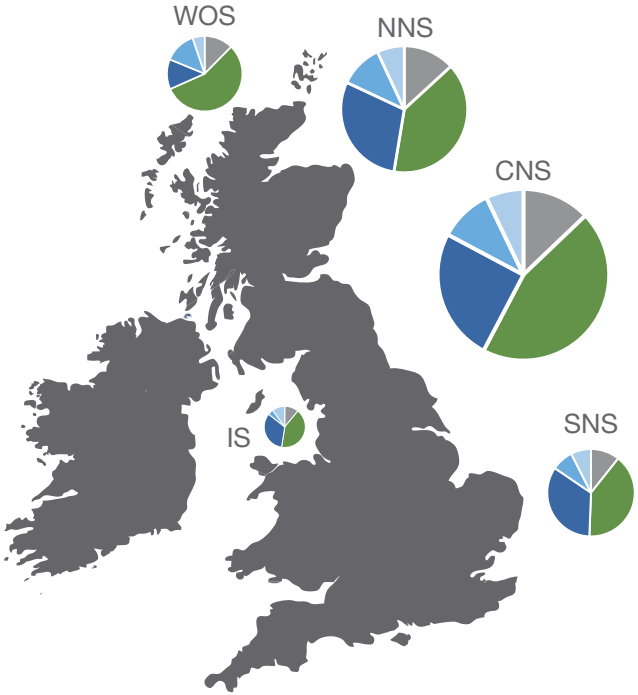
The updated cost distribution ranges for these estimates are shown below (also see Appendix 5):

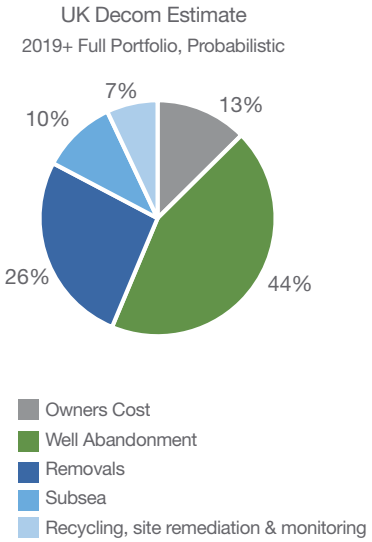
Figure 3: Like-for-Like Trend and Full Portfolio cost trends

The 2019 Full Portfolio estimate includes £2bn$_{P50}$ associated with as-yet Unsanctioned/Not-built projects.

[1] Costs shown in 2016 prices, for expenditure in 2017 and after
[2] Costs shown in 2017 prices, for expenditure in 2018 and after

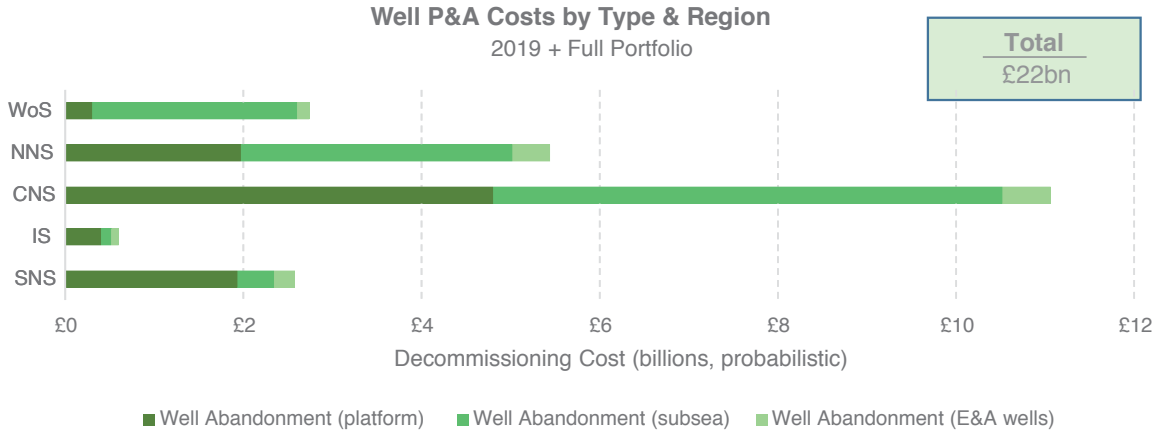
Figure 4: Decommissioning cost distribution by geography





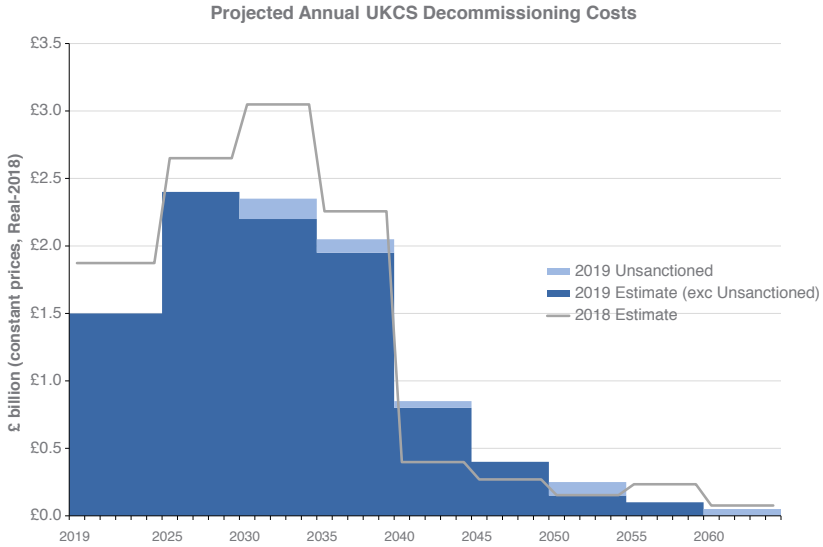
Well P&A is 44% of the total, with the CNS comprising a disproportionately large element, due to the many costly-to-decommission subsea wells in the sector, and a substantial number of high well-count production platforms.

Figure 5: Well P&A cost distribution by geography



An annualised forecast profile (averaged over 5 years) was created by scaling Operators stewardship submissions, proportionate to the skew of the associated uncertainty distributions. There is considerable uncertainty in this forecast but the profile does show that the majority (approx. 90%) of decommissioning expenditure is projected to be incurred over the coming 20 years. There is also a lower annual run rate forecast over the next 20 years compared with the 2018 estimate.

Figure 6: Annualised Decommissioning cost profile



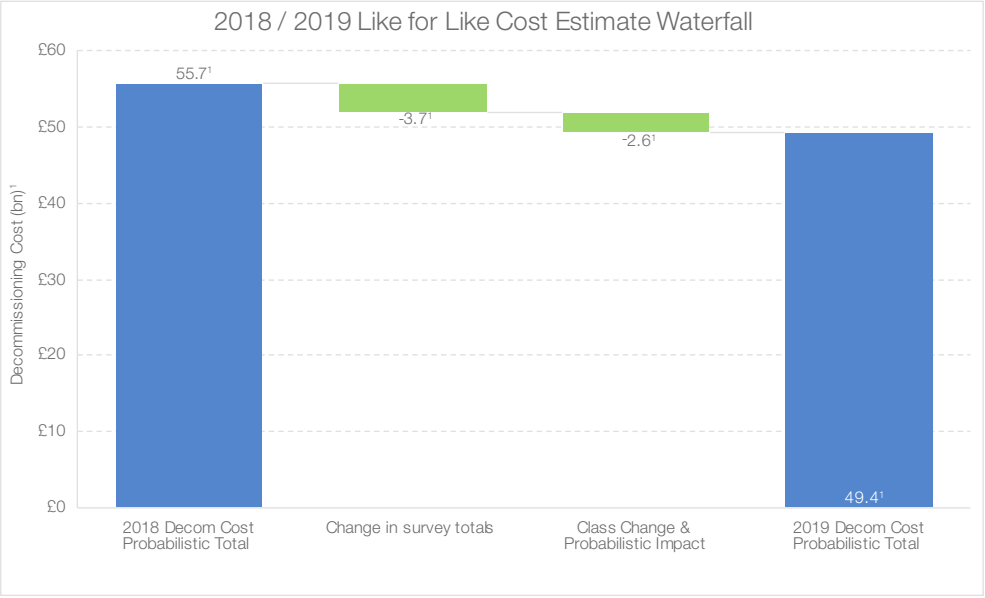
Reduced platform Running Costs

Benchmarked platform running costs after production cessation have reduced by 40%$_{P50}$ over the past 2 years. This is a major cost category in the northern and central North Sea, due to the high costs of operating the large, numerous personnel-on-board platforms in these sectors. Operators have learned the means to achieving these lower costs (incl. early well abandonment and prompt de-manning), and almost all new projects are being managed to achieve running costs 50-80% below the already reduced benchmark of £98million$_{P50,cumulative.}$

3. Cost Reduction Analysis

Compared with 2018, there has been more than £6bn reduction in the like-for-like cost estimate, due to a decrease in forecast and executed activity costs, and reduced-risk in the operator cost estimates.

Figure 7: 2018 to 2019 Decommissioning Cost reductions

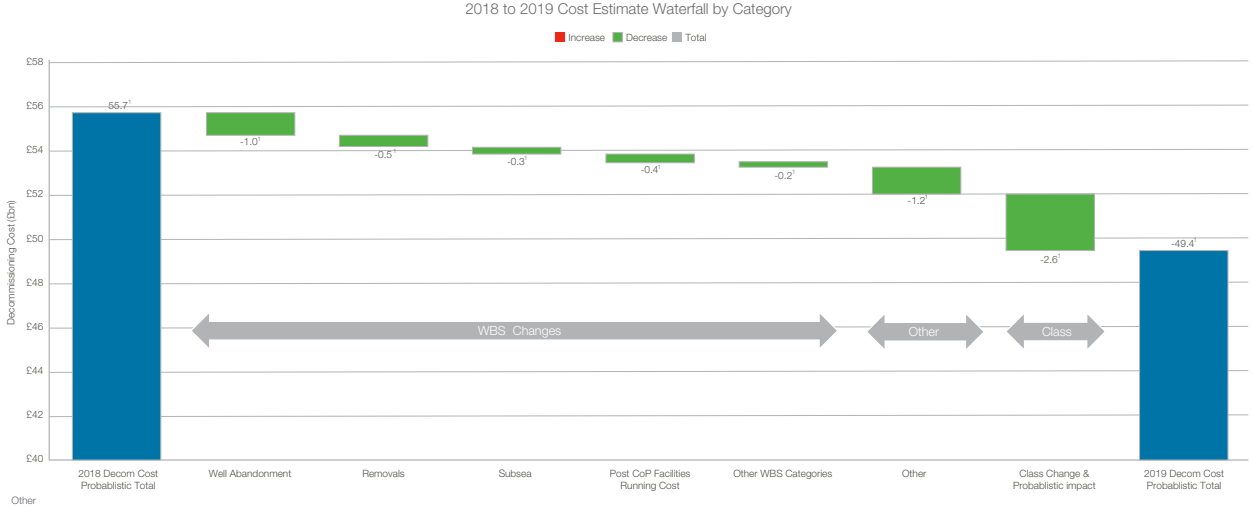


[1] Costs shown in 2016 prices, for expenditure in 2017 and after

3.1. Activity Costs

There has been a significant decrease in 2018 actual and forecast decommissioning activity costs compared with the 2018 cost estimate.

Figure 8: 2018 to 2019 Decommissioning Cost reduction categories



Other
-£0.7bn: Unsanctioned Projects, -£0.3bn: Onshore, Terminals. -£0.2bn: Removal of new 2019 items

Well P&A costs have continued to benefit from improved scoping of required work, and better execution practices. In the case of subsea wells, 2018/2019 costs are also benefiting from cyclically low rig/vessel rates. The unit cost of subsea well P&A has reduced by 40% since the last survey (see Figures 17 & 18).

[1] Costs shown in 2016 prices, for expenditure in 2017 and after

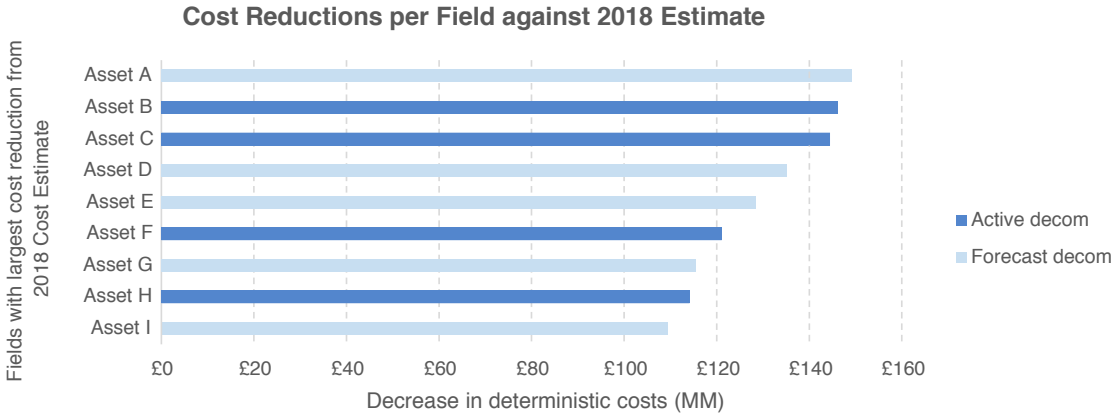
The running costs incurred after production has ceased continue to improve due to operators optimising P&A schedules to reduce warm phase durations. There is limited potential for further reductions in this area, as the reduced costs are now largely priced in.

Topsides and substructure removals are becoming less expensive over time. Lifting contractors have been rapidly developing their removals expertise and execution practices, showing real ingenuity with several recent projects.

Campaign approaches to subsea infrastructure decommissioning, combined with flexible timing, are helping reduce costs. These campaigns are still limited to those which individual Operators can assemble within their own portfolio, and opportunities from multi-Operator campaigns are yet to be capitalised on.

On a field-by-field basis there have also been significant cost reductions.

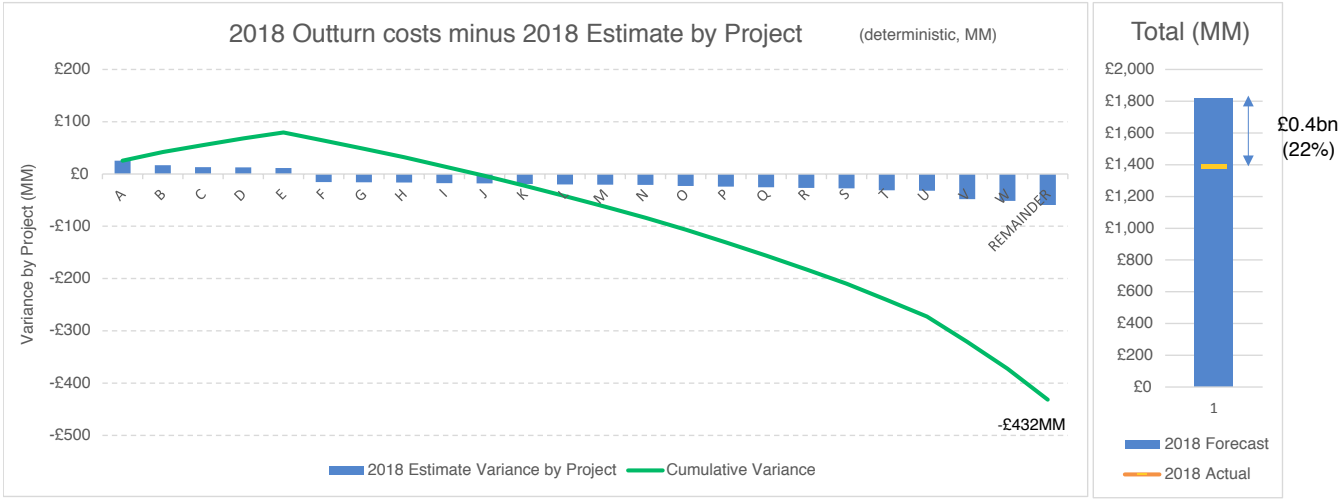
Figure 9: Major decommissioning total cost reductions relative to 2018 estimate



These cost reductions are, in many cases, being realised immediately. Actual decommissioning expenditure in 2018 was £400million lower than estimated the previous year (see Figure 10 below).

Around 90% of the variance is true total project cost reductions, with the remainder being deferral of activity/ expenditure to later years, partially offset by minor accelerations and cost increases in 2018.

Figure 10: Forecast 2018 spend minus 2018 Actual spend



3.2. Cost Uncertainty Classification

The decommissioning estimates provided by operators have lower uncertainty than those submitted in earlier surveys, which has resulted in a risk-weighted cost reduction of £2.6bn. Nonetheless the fraction of decommissioning cost estimates with high uncertainty (AACE Class 4 & 5 quality) remains high, even for assets being decommissioned in the coming 5-6 years.

The OGA expectation is that, for 90% of expenditure within 3 years, cost estimation quality should be of AACE Class 3 or better. In this most recent survey, 65% of 3-year forecast expenditure meets this key performance indicator (see Appendix 1 for AACE definitions). This is an improvement from the previous survey, where the equivalent value was less than 40%.

Figure 11: Decommissioning cost distribution by estimate quality

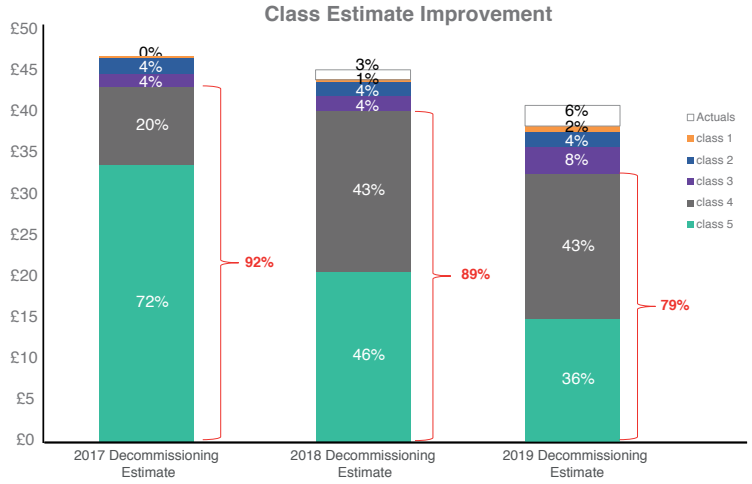
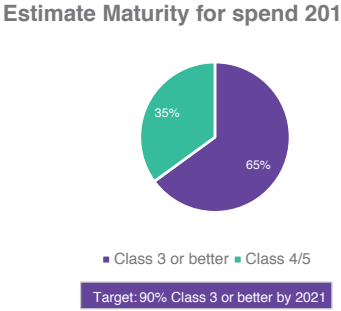


Figure 12: Estimate Quality for spend in 2019-2021 and adherence to OGA KPI



3.3. Cost Management

The current positive progress on decommissioning costs is largely based on operators' experience in 2016-2018 of being able to achieve significant cost reduction in platform running costs, well P&A costs and removal costs, in the NNS and CNS.

Several decommissioning estimate reductions in excess of £100 million (deterministic) contribute to the overall reduction, with a high proportion of these being driven by cost experience on active decommissioning programmes, with operators reducing costs by adopting different approaches, learning-from/sharing-with others, and challenging previous norms. The supply chain is also bringing new solutions to the market in terms of pricing structures, business models and technology.

The following are key opportunities for further cost reductions:

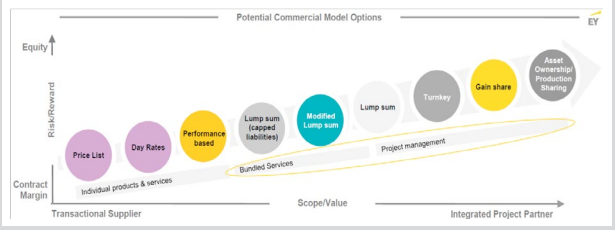
- The NNS and CNS together comprise 75% of the currently estimated cost of decommissioning, so the wider application of the 2016-2018 learnings, even to those sectors alone offers considerable promise. Many learnings will also be applicable in other sectors such as the Southern North Sea (SNS).
- Further improved asset stewardship to optimise value and costs through late-life and decommissioning.
- New service providers to the market initiating different, lower-cost approaches, contracting solutions, and pricing bases for decommissioning projects.
- Innovative cost reducing technologies or techniques are implemented for well P&A activities.
- Volume-based efficiencies from campaign or area-based approaches e.g. multi-operator well P&A and subsea infrastructure decommissioning campaigns, area-based operator collaborations to optimise schedules and contracts, etc.
- Regulations are complied with appropriately and consistently, to ensure safe and environmentally acceptable outcomes, at minimum cost.
- Continued and extended close working between the OGA and industry facilitates shared learning and knowledge, and increased collaboration.

Ultimately increased competence and cost effectiveness of operators and their contractors will deliver the targeted >35% savings relative to the 2017 baseline. The OGA supports and facilitates this through:

- Systematic use of benchmarks derived from actuals to proactively assess estimates during stewardship reviews with individual operators, as well as during Decommissioning Programme (DP) discussions.
- The introduction of Key Performance Indicators (KPIs) to facilitate performance measurement and improvement (see Section 4)
- Decommissioning stewardship expectations, being updated in 2019, support increasingly effective OGA-Operator cost-reduction engagements.
- The OGA-operator stewardship engagement process (see Appendix 2) is proving an effective, and increasing, contributor to understanding and managing decommissioning performance
- Operator stewardship reviews for more than 80% of 10-year forecast expenditure were implemented in 2018, increasing to more than 90% in 2019
- Creating metrics from the UKCS Stewardship Survey and publishing these, with focus on high cost elements
- Working with operators and industry groups to ensure effective sharing of learning
- Improvements to the decommissioning component of the UKCS Stewardship Survey to maximise consistency and value of data collected.
- Promoting the development of innovative, collaborative contracting solutions

New commercial offerings

New commercial offerings have emerged in the decommissioning market over the past two years, with businesses forming to provide specialist services, or forging strategic alliances offering turnkey solutions. Oil-sector price inflation is a significant cost risk to delivering sustainable cost reductions, and certain of the new offerings look to combine in-depth understanding of operator requirements with creative business models to achieve sustainably low-cost decommissioning, largely decoupled from the traditional industry cycle.



- Promoting enhanced supply chain capability
- Increasing market transparency through hosting of market intelligence platforms such as Oil & Gas Pathfinder
- Working with industry, the Oil and Gas Technology Centre (OGTC) and the National Decommissioning Centre (NDC) to promote the development and application of cost effective technologies and expertise

It is estimated that, in 2018, direct intervention by the OGA resulted in more than £100million in cost savings.

There are several key risks that need to be considered which may have an influence on future decommissioning costs, namely:

- The currently depressed supply chain market and strong competitive forces have contributed to the cost reductions, supplementing and contributing-to execution improvements. Decommissioning will continue for decades, over multiple economic cycles, with corresponding risks of less attractive price offerings.
- Subsea wells are disproportionately costly to abandon, relative to platform wells, so there is a strong incentive to reduce those costs. Recent cost trends have been very positive. However, since this activity typically uses equipment also used for other upstream activity (e.g. semi-submersible rigs), there is substantial risk from increased day-rates as offshore development activity increases.
- Should it prove problematic to reduce subsea well P&A costs, it will be difficult to compensate by reducing other decommissioning cost types.
- Operators may commence planning for decommissioning too late, thereby precluding access to cost saving options.
- Traditional development project and contracting approaches if adopted for decommissioning projects could unnecessarily over-engineer the solutions and increase the cost.
- Financing constraints may result in sub-optimal decovmmissioning timing due to competing exploration and development funding needs.
- A lack of investment in new technologies and transfer of existing technologies from other sectors may fail to capture cost reduction opportunities.
- Some operators may be optimistic in developing provisioning estimates and this could result in unrepresentative estimate values, knowingly or otherwise.

4. Key Performance Indicators

Key Performance Indicators (KPIs) have been developed and introduced with industry in support of the two objectives of 35% cost reduction relative to the 2017 baseline, and more than 90% of expenditure within 3 years being at least an AACE Class 3 estimate quality.

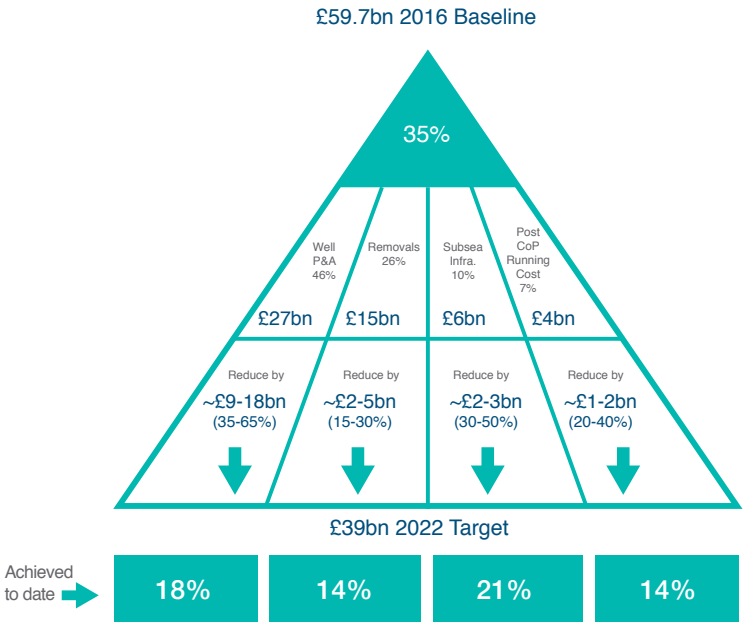
Four key activities (Post-CoP Running Costs, Well P&A, Removals, Subsea Infrastructure decommissioning) constitute approximately 90% of overall decommissioning cost, and it is essential to reduce the costs of several, if not all, of these if the overall >35% cost reduction target is to be realised. Decommissioning KPIs are therefore focussed on these four cost areas, with industry guided to calibrate its ambitions accordingly e.g. reductions of 35-65% for well P&A being potentially achieved from a combination of improved downhole barrier technology/ practices, rig-less expertise and campaign economies.

To-date reductions of 18%, 14%, 21% and 14% have been achieved for Well P&A, Removals, Subsea Infrastructure and Post-CoP Running Costs respectively.

Innovative laser technology for conductor cutting

Well abandonment represents a high fraction of the overall decommissioning cost and is an area of focus and innovation for operators/supply-chain/academia. As an example, the application of laser technology for cutting well conductors has been tested on wells/ platforms in the Southern North Sea. The trials suggest that the technology may have the potential to increase efficiency through eliminating issues with mechanical components (e.g. blade breakage, diamond wire pinching), and consequently reduce the duration and cost of the cutting operations. If/ when the technology matures, it could in principle be applied for the cutting of single and multistring well conductors/casings, and adapted for different deployment methods (rig/rigless/LWIV).

Figure 13: Decommissioning Key Performance Indicators



Forward priorities/commitments

OGA Priority

- Develop collaborative execution models
- Develop an enhanced decommissioning supply chain

P&A

1. Barrier technology
2. Maximise well P&A rig-less/thru tubing
3. Campaigns

Subsea

1. Scope aggregation
2. Technology development for bundle removal

Removals

1. Alternative technologies from heavy lift
2. Contracting models
3. Innovative transportation technologies

Post CoP Running Costs

1. Early execution of well P&A before CoP
2. Simulation technology to enhance planning and facilitate scope aggregation
3. Improved clean and flush technology

Several combinations of the above savings would result in a >35% overall decommissioning cost reduction. High potential lines of action are being progressed (see Figure 13) including focussed technology maturation in collaboration with operators, suppliers and the Oil and Gas Technology Centre (OGTC). Strengthened international standardisation of benchmarks and decommissioning performance measurement is being progressed to facilitate global comparisons and learning.

5. Benchmarks

The information in this section summarises cost performance for key cost drivers, based on actual cost experience (i.e. not including cost estimates/forecasts).

- Definitions of P_{10}, P_{50} and P_{90}, referenced in the graphs, are listed in Appendix 3.

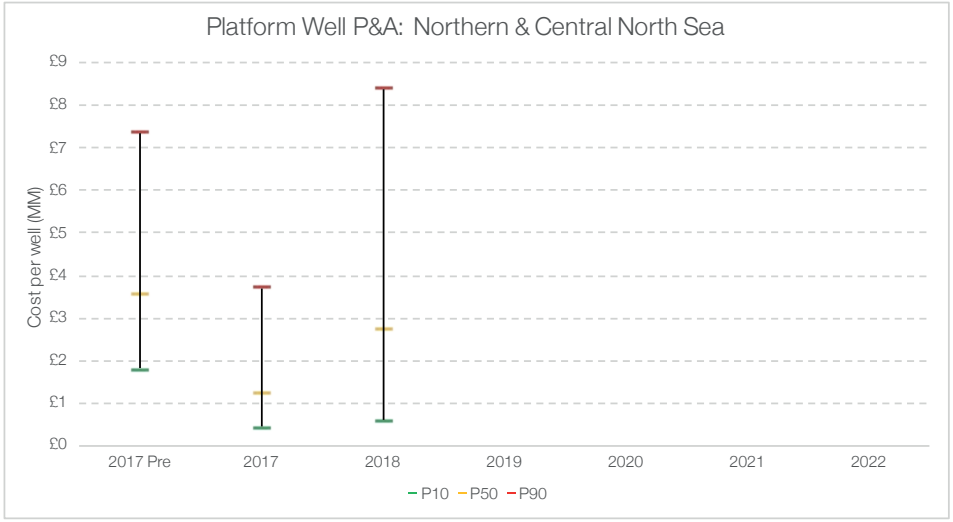
Cost performance continued to improve from the previous year. An exception was the unit cost of platform P&A activity, which increased relative to 2017, due to a combination of higher-cost Operators making up larger fractions of the work, and the impacts of costly platform-rig refurbishments. There are wide variations in operator performance, with certain operators having large fractions of their outcomes in the third and fourth cost performance quartiles, and other Operators' predominantly in the first and second quartiles. In addition, the costs associated with re-instating/upgrading obsolete integrated platform drilling rigs, and their subsequent poor operating performance, are challenges which must be addressed to allow substantial further cost reductions to be achieved – This is an area of industry and OGA focus.

Platform well P&A costs are still low relative to 2016, due to a combination of batch P&A methods, de-risking through wellbore surveys when setting mechanical reservoir plugs, improved casing milling performance and use of risk-based methods when defining scope.

Reduced subsea well abandonment costs

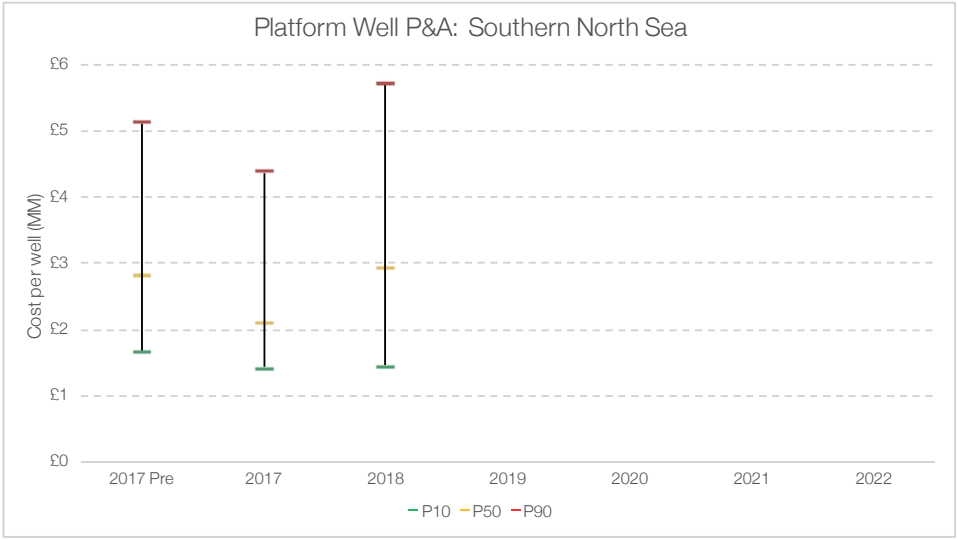
Well Plug and Abandonment (P&A) represents the largest fraction of decommissioning cost in the northern and central North Sea, and subsea well abandonments comprise the majority of this cost since, compared to platform wells, subsea wells are disproportionately costly to abandon. In 2018 operators nearly halved unit subsea P&A costs compared to the previous year, benefiting from extensive campaigning/batching of P&A opportunities, efficient logistics associated with such approaches, optimisation of well barrier and milling needs, wide-scale use of rig-deployed ROVs, and increased continuity and expertise of third-party personnel.

Figure 14: Change in platform P&A cost distribution: NNS & CNS



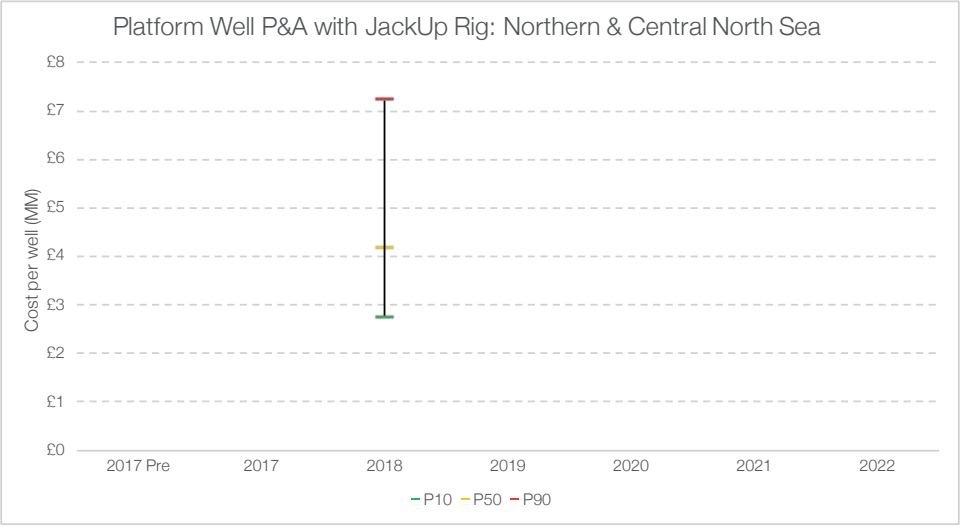
The 2017 reductions in unit NNS/CNS well P&A cost have not been sustained, largely due to reduced activity by lower cost Operators, and high impacts from platform-rig reactivation. Significant variation in the P&A costs delivered by different Operators was an issue referenced in the 2018 report, and narrowing this range around the lower values has still not been achieved. While higher than 2017, the latest costs are still 25% below those achieved when OGA cost benchmarking commenced.

Figure 15: Change in platform P&A cost distribution: SNS



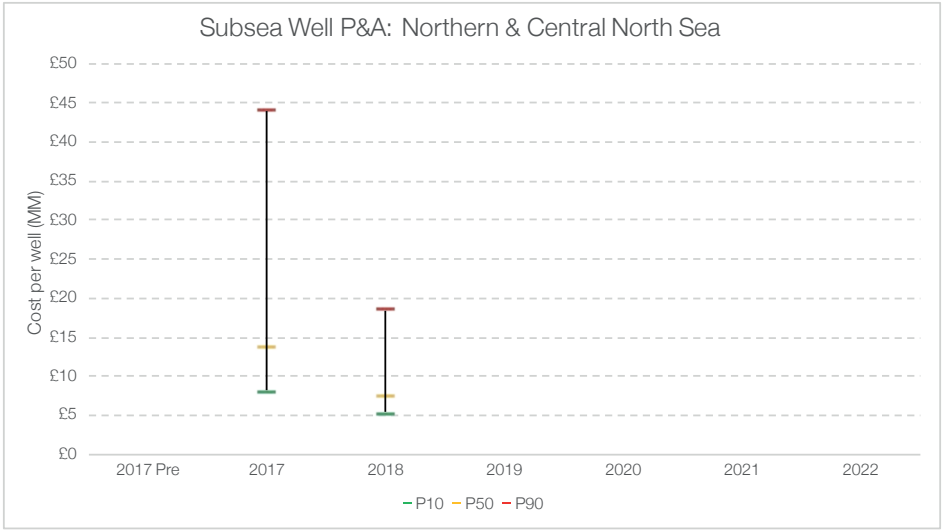
The 2017 reductions in unit SNS well P&A cost have not been sustained, largely due to reduced activity by lower cost Operators; unit costs have returned to earlier levels. Significant variation in the P&A costs delivered by different Operators was an issue referenced in the 2018 report, and narrowing this range around the lower values has still not been achieved.

Figure 16: Platform P&A Cost distribution using Jackup Rigs: NNS & CNS



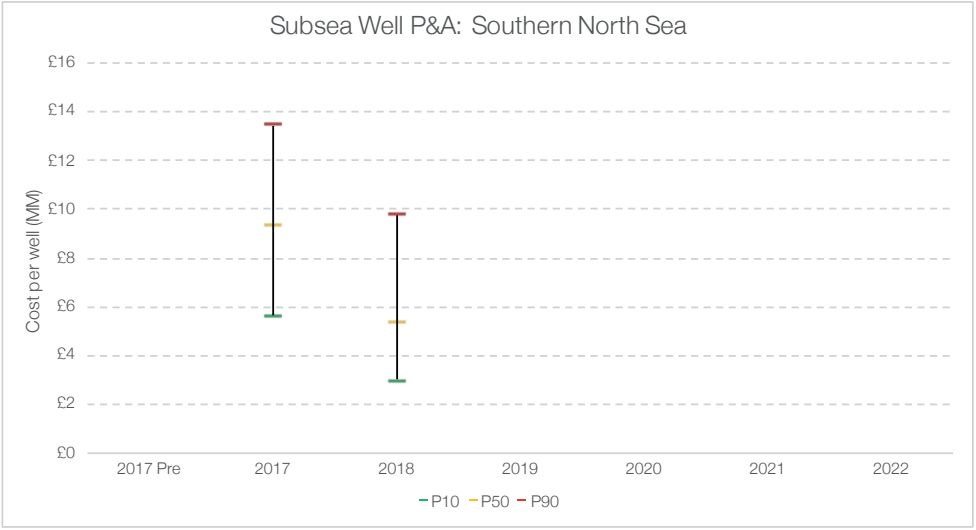
Certain platforms in the NNS and CNS do not have integrated rigs, and utilise jack-up rigs either in cantilever or tender mode when plugging and abandoning wells. There was previously insufficient data to generate benchmarking statistics for this category before, hence the absence of pre-2018 data points.

Figure 17: Subsea well P&A cost distribution: NNS & CNS



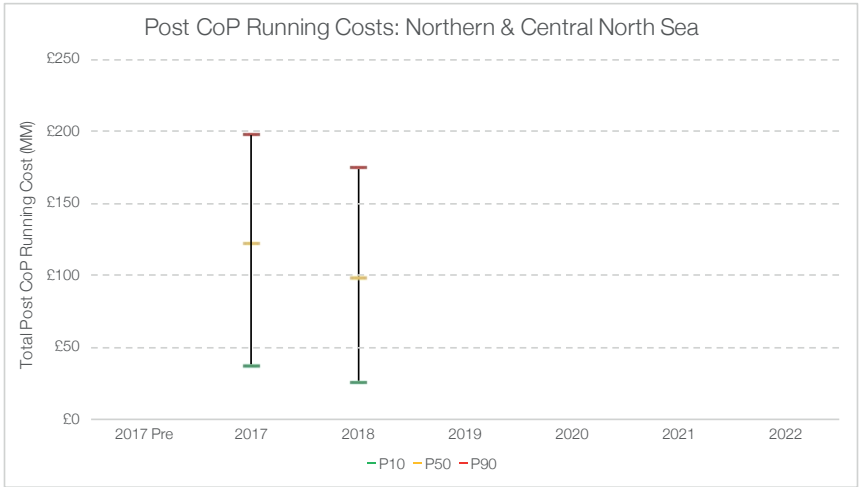
There was a significant increase in the number of NNS/CNS subsea wells abandoned in 2018 (6 wells in 2017 versus 26 wells in 2018), and costs have reduced substantially (45%) due to a combination of improved planning and execution practices, and lower rig/vessel rates.

Figure 18: Subsea well P&A cost distribution: SNS



There was also a significant increase in the number of SNS subsea wells abandoned in 2018 (7 wells in 2017 versus 13 wells in 2018), and costs have reduced substantially (40%) due to a combination of improved planning and execution practices, and lower rig/vessel rates.

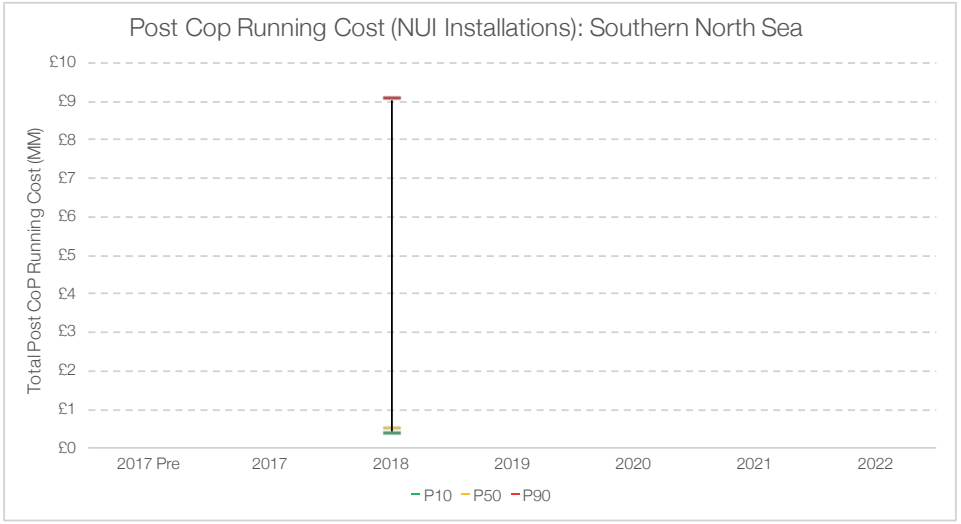
Figure 19: Large Platform Post-CoP Running Cost distribution: NNS & CNS



Platform Running Costs in the NNS have been reducing substantially, largely due to better optimisation of the late-life and warm/cold phases of decommissioning, with rapid reduction in running costs after cessation of production (CoP). Scheduling well P&A and Make Safe activities so as to minimise the inspection/maintenance-intensive warm phase, and then de-manning, has typically proven very cost effective.

Due to the infrequent and longer term nature of this benchmark, Figure 19 includes estimates for platforms still being decommissioned, where the relevant operator has a well defined plan and recent decommissioning experience with similar infrastructure. Even in these relatively advanced stage cases, cost decreases are being realised, albeit with the benefits diluted by the sunk costs.

Figure 20: Platform (Normally Unmanned) Post-CoP Running Cost distribution: SNS & IS



New benchmarks developed showing the distribution of Normally Unmanned Installations (NUI) post-CoP running costs in the Southern North Sea are shown above. While these costs are typically very low, they can be considerably impacted by poor commercial frameworks with host infrastructure or 3rd-party duty holders.

Appendix 1: Methodology

The 2018 UKCS Stewardship Survey was used as the data source, with decommissioning cost inputs provided by all operators for all current and proposed offshore facilities, pipelines, development wells, suspended open water exploration and appraisal wells and onshore terminals. Data was collected using the Oil & Gas UK Work Breakdown Structure (WBS).

The OGA's approach, unchanged from previous years, has been to develop a probabilistic cost estimate which takes into account the wide range of uncertainties in estimates submitted by operators. Estimate classes in the survey were requested with reference to the Association for the Advancement of Cost Engineering (AACE Recommended Practice No. 18R-97, see Figure 21) and AACE guidance followed for selecting the values from these ranges.

The estimate is comprised of various elements, not all having the same estimate classification. The estimate classification was requested from the operators responding to the UKCS Stewardship Survey and no adjustments were made to these operator self-assessments.

Figure 21: AACE Classification of estimates

	Primary Characteristic	Secondary Characteristic
ESTIMATE CLASS	**MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES** Expressed as % of complete definition	**EXPECTED ACCURACY RANGE** Typical Variation in low and high ranges at an 80% confidence interval
Class 5	0% to 2%	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	L: -3% to -10% H: +3% to +15%

The values within the 'Expected Accuracy Range' and used in the probabilistic distributions were selected at the higher end of the low (L) and higher end of the high (H) accuracy ranges shown above. For example, class 5 estimates were given an expected accuracy range of -20% / +100%. This was to address the possibility of estimating optimism from operators for decommissioning scope. This potential was assessed as being high for the following reasons:

- Estimates may be influenced by estimating bias
- Immaturity of decommissioning expertise within many UKCS operators
- The lack of industry experience generally with decommissioning

The project scope includes the decommissioning of all UKCS infrastructure including:

- Facilities and development wells still in place and yet to be decommissioned
- All facilities and development wells currently undergoing decommissioning, excluding work performed prior to and including 2016
- All sanctioned facilities and wells not yet in place
- Proposed project developments, not yet sanctioned or built, weighted by probability of occurrence/execution.
- All intra-field pipelines and export lines
- Suspended open water exploration and appraisal wells
- Onshore terminals

The estimate raw data has been collected using the Oil & Gas UK decommissioning Work Breakdown Structure (WBS) which has the following categories:

- Operator Project Management
- Facility Running/Owner Costs (Post-CoP Running Costs)
- Well Plug & Abandonment
- Facilities/Pipelines Making Safe
- Topsides Preparation

- Topsides Removal
- Substructure Removal
- Onshore Recycling
- Subsea Infrastructure (incl. subsea structures, pipelines, mattresses, etc)
- Site Remediation
- Monitoring

Where required, deflation factors have been taken from the “GDP deflators at market prices, and money GDP Statement”, published by HM Treasury from data provided by the Office for National Statistics (ONS) and Office for Budget Responsibility (OBR). Values are taken from the Spring statement each subsequent year.

2016-2017 deflation factor	:	1.97%
2017-2018 deflation factor	:	1.85%

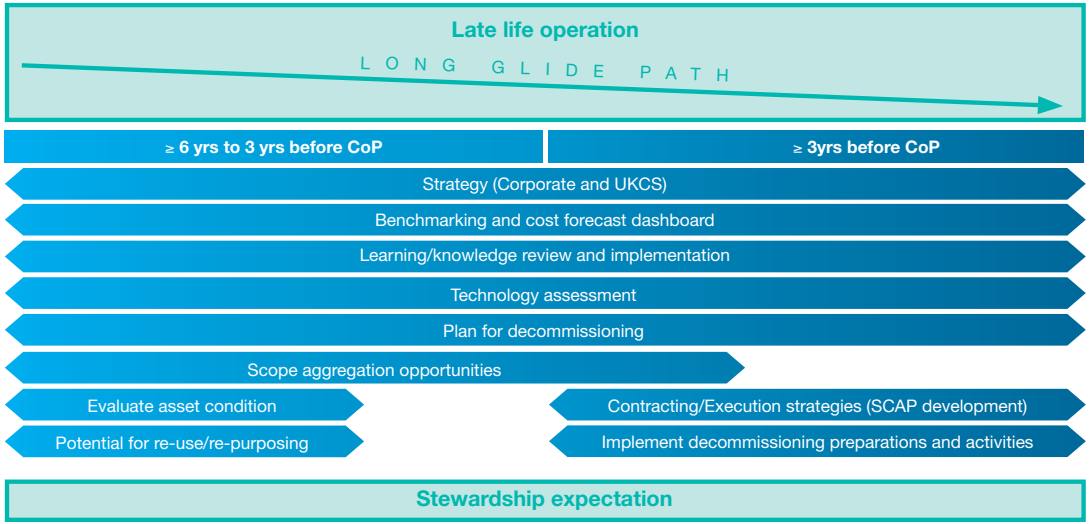
Accelerated reduction in removal costs

Platform removal costs have improved further, with old benchmarks being rendered obsolete by the rapid development of expertise and execution efficiency. A recurrent theme is increased supply chain ownership of the engineering and management of the removal process, ranging from in-depth sharing of data and extended competitive dialogue with multiple supply chain parties, to assigning the conception, engineering and execution of the solution to selected vendors. Another theme is team integration and effective implementation of learning through continuity of experienced personnel.

Appendix 2: Stewardship review process

The OGA interacts with decommissioning operators based on a 'long glidepath' strategy, by which early, structured engagements support operators to embed good practices in sufficient time to deliver cost effective decommissioning. The framework and requirements are set out in the OGA Stewardship Expectations SE-10 Cost Effective Decommissioning.

Figure 22: 'Long glidepath' cost reduction strategy



Six or twelve-monthly 'Tier 2' strategic engagements are scheduled with operators, ranked primarily on the timing and materiality of their decommissioning costs. The engagements are structured on a standard agenda, to ensure a comprehensive discussion and efficient follow-up of plans to mature cost reduction opportunities.

Figure 23: Standard OGA-operator stewardship agenda

Standard Decom Meeting Agenda

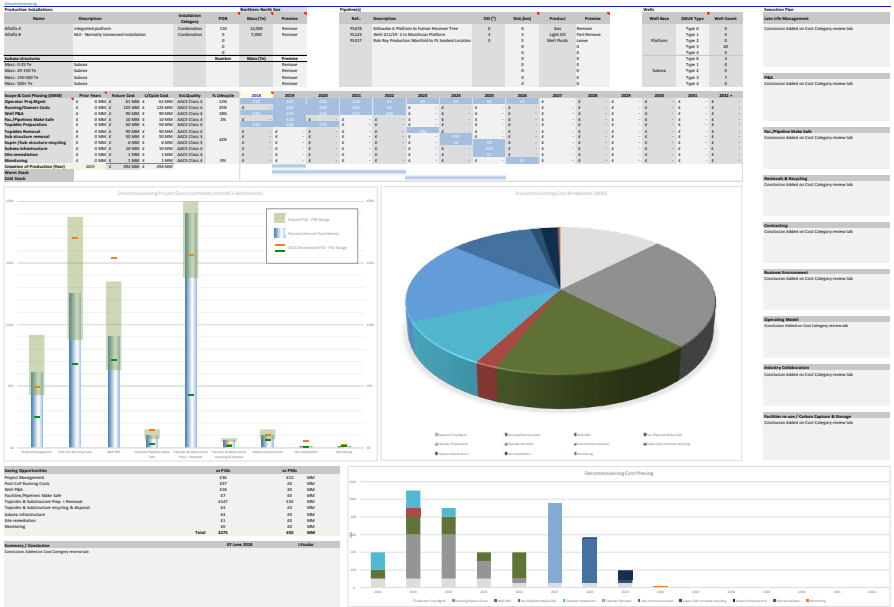
Oil & Gas Authority

1. Decommissioning portfolio	
• High-level decommissioning strategy	Operator
• Assets (incl. Open-water E&A wells)	Operator
• Schedule / schedule-changes	Operator
• Anticipated project outcome/end-state	Operator
• Estimated cost / cost-changes by cost-category	Operator
• Learning, & impact	Operator / OGA
2. Cost reduction opportunities	
• Expected magnitude of savings (by cost-category/activity e.g. P&A, technology)	OGA / Operator
3. Plan/schedule to mature cost reduction opportunities ('Glidepath')	
• Risks, Uncertainties, Decisions	Operator
• Supply Chain opportunities (incl. Supply Chain Action Plans) / Area Plans	Operator
4. Future engagement schedule	**All**

Changes from standard agenda to be agreed in advance, and meeting materials ideally to be provided 3 days ahead. Operator to circulate meeting notes/actions within 2 weeks of meeting.

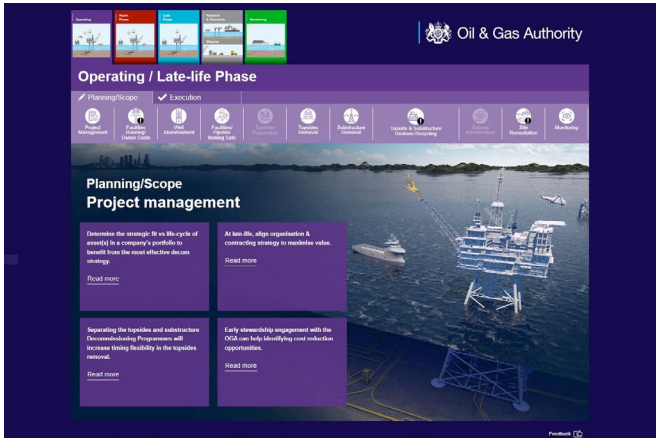
A ‘Decommissioning Dashboard’, using the operators’ own data as submitted through the UKCS Stewardship Survey, is used as the basis for performance/cost analysis and discussion. The Oil and Gas UK Decommissioning Work Breakdown Structure (WBS) is used as the basis for cost classifications.

Figure 24: Example Decommissioning Benchmarking Dashboard



In certain cases, the OGA may request operators to facilitate separate OGA reviews of certain decommissioning activities with key contractors involved. The purpose of this is to allow, with the benefit of hindsight, identification of unrealised savings or performance improvements which might not be apparent to the client/operator).

Figure 25: Illustration – OGA Decommissioning Learning website



Non-proprietary, non-confidential elements of this may then be shared with industry through:

- Encouraging the parties to increase awareness through presentations at relevant conferences, or through industry knowledge-sharing portals (e.g. L2P2.net)
- the OGA making other operators aware directly through the operator engagement process, and perhaps including follow-up in the agreed cost-reduction plan.
- the OGA informing industry directly through its decommissioning knowledge-sharing website - (https://www.ogauthority.co.uk/lessons-learned/)

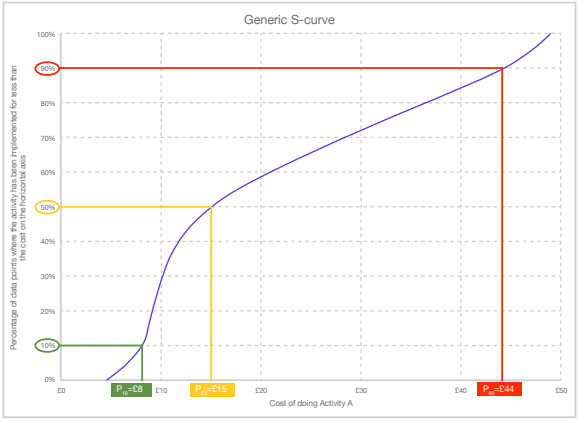
Appendix 3: Representation of Cost Uncertainty

The terms P_{10}, P_{50} and P_{90} are used extensively throughout this document, and in graphs used in the benchmarking section to illustrate cost performance of different cost elements.

Cost information is collected from all UK decommissioning operators. Comparable data is grouped (e.g. platform wells in the Southern North Sea), sorted from large to small, and then graphed as below. Reading from the vertical and horizontal axes then characterises the cost variances experienced for that parameter.

In the generic example (Figure 26), 10% of Activity A, as executed by all those contributing to the sample, was executed for £8 or less, 50% for £15 or less, and 90% for £44 or less. The terms P_{10}, P_{50} and P_{90} refer to these values i.e. the cost values below which 10%, 50% and 90% of these activities are executed.

Figure 26: Illustration – Example of 's-curve' used to characterise uncertainty

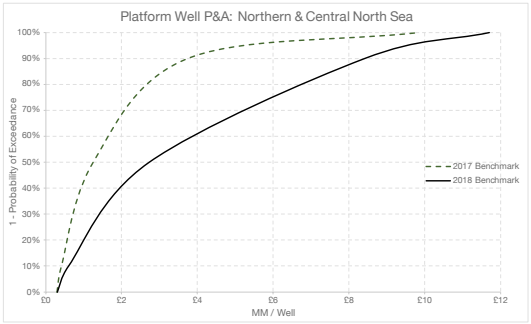


The P_{90} value, therefore represents the value at which 90% of cases were cheaper than this and figures at or above this are most expensive 10%. Conversely, figures below the P_{10} represent the cheapest 10%, and the P_{50} the value at which there are an equal fraction (i.e. 50%) of examples above and below.

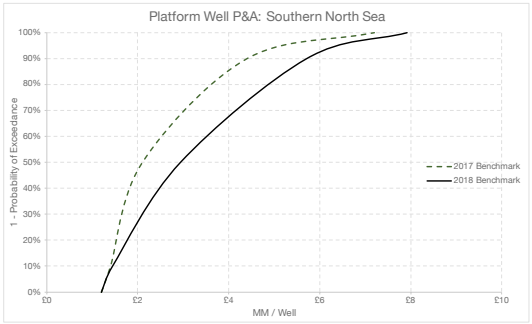
Appendix 4: Benchmarks shown in S Curve Format

Figure 27: Cost performance 's-curves' underlying graphics in Section 5

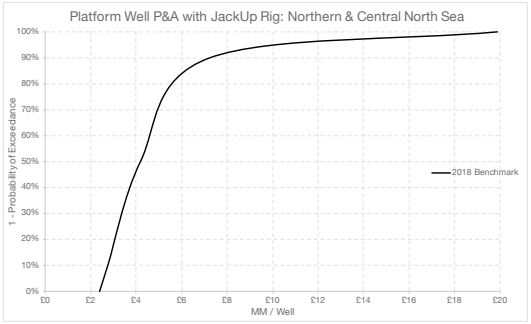
1. Platform well P&A (NNS/CNS)



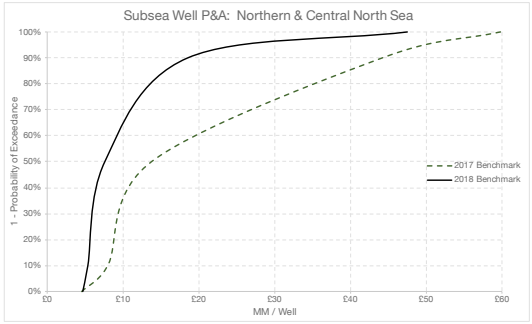
2. Platform well P&A (SNS)



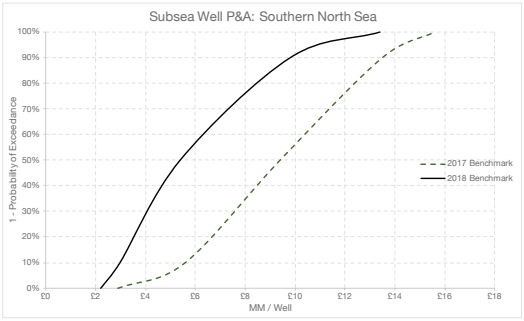
3. Platform well P&A via HDJU (NNS/CNS)



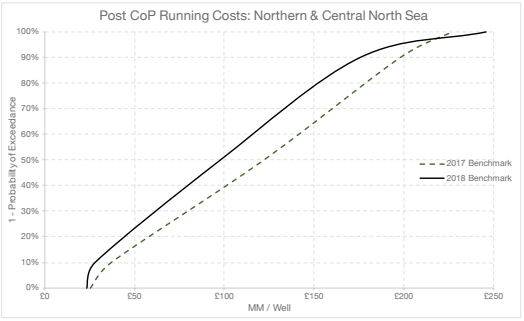
4. Subsea well P&A (NNS/CNS)



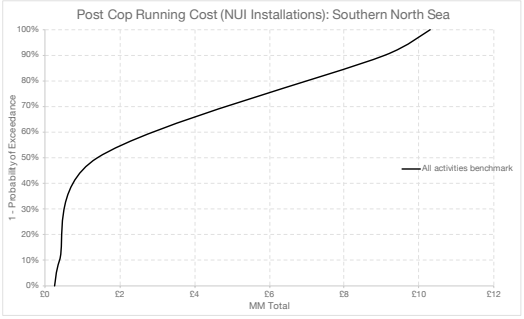
5. Subsea well P&A (SNS)



6. Post CoP Running cost (NNS/CNS)

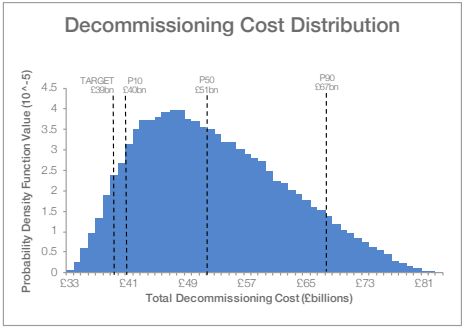


7. Post CoP Running cost for NUI (SNS)



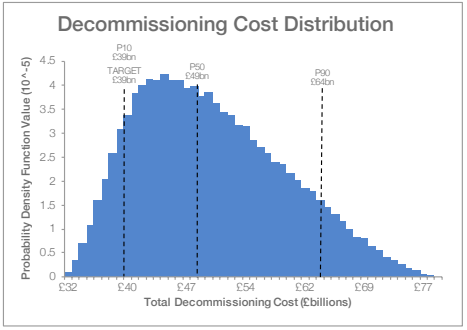
Appendix 5: Probabilistic Cost Distributions

Figure 28: Decommissioning cost distribution [Updated 2019 inventory, 2018 prices]



Full Portfolio	P_{10}	P_{50}	P_{90}
2019 Estimate	£40bn	£51bn	£67bn
2018 Estimate	£45bn[2]	£58bn[2]	£77bn[2]
2017 Estimate	£44bn[1]	£59.7bn[1]	£83bn[1]

Figure 29: Decommissioning cost distribution [Like-for-like comparison with 2017 estimate, 2016 prices]



Like-for-like	P_{10}	P_{50}	P_{90}
2019 Estimate	£39bn[1]	£49.4bn[1]	£64bn[1]
2018 Estimate	£43bn[1]	£55.7bn[1]	£73bn[1]
2017 Estimate	£44bn[1]	£59.7bn[1]	£83bn[1]
Change from 2017 to 2019	-£5bn[1]	-£10.3bn[1] **-17%**	-£19bn[1]

[1] Costs shown in 2016 prices, for expenditure in 2017 and after
[2] Costs shown in 2017 prices, for expenditure in 2018 and after

Oil & Gas Authority

Oil and Gas Authority is a limited company registered in England and Wales with registered number 09666504 and
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