
JOINT INDUSTRY PROJECT

Guidance for UK Safety Case management during End of Life (EoL), decommissioning and dismantling



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This guidance is intended as additional advice, and is not a substitute for The Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015 or Guidance Document L154 [Ref. 1]; it has been written by the industry for the industry.



Foreword

The UK Oil & Gas Industry is beginning to see an increase in the number of installations moving towards decommissioning and final dismantlement. A fresh look at the identification and management of the hazards is required during this phase and the recording of this information in the installation's safety case as required by the UK Regulations.

When safety cases were introduced for UK offshore installations in the early 1990s, industry came together to understand the implications and share lessons learnt during their development. Once again, industry collaboration will allow operators to share and learn from each other on how best to plan and manage the final safety case for an installation.

Companies that have already gone through the process of dismantling their installations have shared their experiences in this guidance. Key learnings include the benefits gained from an early start to preparation as well as the communications needed about the approach to be taken. Detail is also given on the need to ensure a strong working relationship with the Verifier, as Safety and Environmentally Critical Elements (SECE) on the installation are likely to change, significantly and relatively quickly, as the decommissioning progresses.

This guidance will help those updating their safety case to present their approach to managing risks associated with late life operation of the installation and on into dismantlement.

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Abbreviations

ALARP	As Low As Reasonably Practicable
CMAPP	Corporate Major Accident Prevention Policy
COMOPs	Combined Operations
CoP	Cessation of Production
DSC	Dismantling Safety Case
E&P	Exploration and Production
EER	Escape, Evacuation and Rescue
EERA	Escape, Evacuation and Rescue Analysis
ENVID	Environmental Impact Identification Study
EoL	End of Life
ERP	Emergency Response Plan
FRA	Fire Risk Analysis (or) Assessment
HAZID	Hazard Identification Study
HAZOP	Hazard and Operability Study
HC	Hydrocarbon
HFE	Human Factors Engineering
HIRA	Hazard Identification (and) Risk Assessment
HLV	Heavy Lift Vessel
HSE	Health and Safety Executive
ICP	Independent Competent Person
IRPA	Individual Risk Per Annum
IMO	International Maritime Organisation
ITF	Industry Technology Facilitator
IVB	Independent Verification Body
JIP	Joint Industry Project
LOPA	Layers of Protection Analysis
MAH	Major Accident Hazard
MAR	Management and Administration Regulation (Offshore Installations and Pipeline Works)
MOC	Management of Change
NAVAID	Navigational Aids
NUI	Normally Unmanned Installation
ORA	Operational Risk Assessment
OSCR	Offshore Safety Case Regulations
OSC	Operational Safety Case
OSPAR	Oslo Paris Convention
P&A	Plug and Abandonment
PFEER	Prevention of Fire and Explosion, and Emergency Response
PLANC	Permits, Licences and Consents
PLL	Potential Loss of Life
POB	Persons on Board
PS	Performance Standards
PTW	Permit to Work
QRA	Quantitative Risk Assessment
Reg.	Regulation
SCE	Safety Critical Element
SCEIA	Safety Critical Elements Impact Assessment
SCR	Safety Case Regulations
SECE	Safety and Environmental Critical Element
SEMS	Safety and Environmental Management System
SIL	Safety Integrity Level
SIMOPs	Simultaneous Operations
SLV	Single Lift Vessel
SOLAS	International Convention for the Safety of Life at Sea
UKCS	United Kingdom Continental Shelf
WHERA	Work Health Environment Risk Assessment

Definitions

Platform declassification

The reclassification of hazardous areas post removal of bulk hydrocarbons (partial declassification) and residuals e.g. sludges etc. (full declassification, equivalent to cold suspension/cold stack).

Lighthouse mode

Nav aids are the only SECE present whilst asset is in cold suspension awaiting next phase of removal.

EoL

The period from the start of preparations for CoP through to completion of the offshore removal process, after which is onshore dismantle, disposal and surveillance.

Cold suspension / cold stack, manned or NUI

The platform / subsea structure has permanently ceased production. All wells have been permanently plugged and abandoned, and conductors cut below seabed at agreed depth. All process equipment decommissioned ready for removal, and no other source of hydrocarbons.

Part removal, manned or NUI

The platform / subsea structure has permanently ceased production. All wells have been permanently plugged and abandoned, and conductors cut below seabed at agreed depth. All process equipment decommissioned ready for removal. The topsides or major components / modules on the topsides have been removed.

Warm suspension / warm stack (fully live) manned or NUI

The platform / subsea structure has permanently ceased production. Hydrocarbon and/or pressure containment systems have not been decommissioned.

Warm suspension / warm stack (live wells) manned or NUI

The platform / subsea structure has permanently ceased production. All wells have not been permanently plugged and abandoned. Import and export pipelines and hydrocarbon / pressure containment systems have been decommissioned.

Warm suspension / warm stack (live process) manned or NUI

The platform / subsea structure has permanently ceased production. All wells have been permanently plugged and abandoned, and conductors cut below seabed at agreed depth. Import and export pipelines and hydrocarbon / pressure containment systems have not been decommissioned.

1 Introduction

This document is the output of a Joint Industry Project (JIP) led by ABB in collaboration with Genesis Oil and Gas and ITF to develop safety case guidance and technology solutions for End of Life (EoL) and decommissioning.

The document offers guidance to duty holders in maintaining compliance with the Safety Case Regulations (SCR) during EoL, decommissioning and dismantling, based on experience of recently completed and current decommissioning projects.

Readers should remain cognizant that there are other interfaces and activities carried out in parallel with the safety case as part of the decommissioning programme.

The focus of this guidance is the SCR 2015 [Ref. 2]. SCR 2015 has additional environmental requirements when compared with SCR 2005, although these requirements are not specifically included here.

The JIP grew from a desire to help operators reduce the costs associated with decommissioning. The 3 objectives of the project were to:

- Develop industry guidance to support EoL Major Accident Hazard (MAH) management and safety case production
- Understand the key systems, services and Safety and Environmental Critical Elements (SECE) that will be kept operational during EoL phases
- Investigate technology opportunities to help reduce facility running costs

The JIP team comprised a core team, including ABB, Genesis, duty holders Centrica E&P, Marathon Oil and Repsol Sinopec Resources UK Ltd, Engineering Consultants Amec Foster Wheeler and Marex Marine and Risk Consultancy, and industry trade body Oil & Gas UK.

Industry workshops (open to all) were held to launch the JIP, develop the methodology for collating information from industry (via technical exchanges), and reporting progress.

From the outset it was agreed the guidance would be developed from observations and learning from realised UKCS decommissioning projects.

To this end technical exchanges were held with 6 operators:

- Centrica E&P
- CNR International UK Ltd.
- Marathon Oil
- Repsol Sinopec Resources UK Ltd.
- Shell UK Ltd.
- TAQA Bratani Limited

Open workshops were regularly held with the wider industry and regulators, to ensure information was shared openly from the outset. The JIP's primary objective was to develop guidance by the industry for the industry. Over 100 delegates attended the 3 industry workshops throughout the development lifecycle of this guidance.



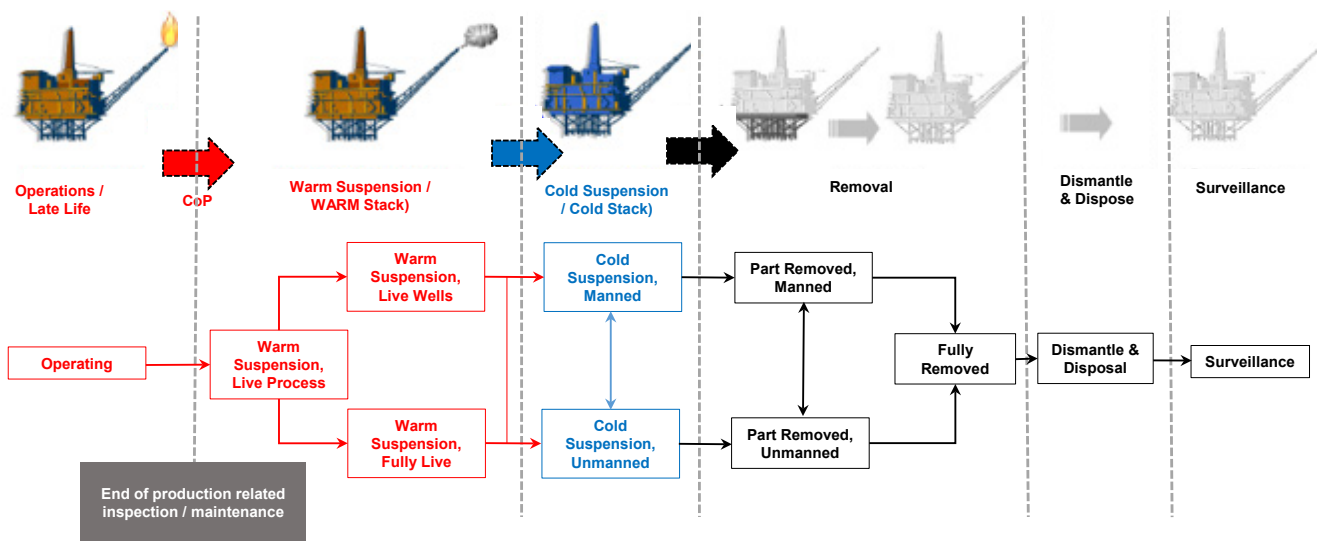
2 Background

For UKCS installations, there is a legislative requirement to maintain a live safety case. The safety case must be maintained throughout the EoL, decommissioning and dismantling activities. The safety case and supporting risk assessments demonstrate how the MAHs are being managed, and therefore define the SECEs required for the installation. These SECEs need to be maintained and verified throughout the lifetime of the platform, including decommissioning and dismantling.

The decommissioning programme covers the key decommissioning decisions, scope, cost and schedule from which the decommissioning / dismantling activity scopes are derived. EoL decisions on the decommissioning scope will have an impact on the safety case.

The terminology adopted in this guidance for the different phases of late life and decommissioning is in line with Oil & Gas UK guidelines on late life / decommissioning inspection and maintenance, November 2015, OP111 (i.e. operations / late life, warm suspension / warm stack, cold suspension / cold stack, removal, dismantle & dispose, surveillance) illustrated in figure A [Ref. 4]. This terminology is also used in the late life planning portal, (L2P2), safety case road map [Ref. 5].

Figure A: Offshore decommissioning workflow [Ref. 4].



(Note: There are also decommissioning regulatory building block diagrams (and roadmaps) on the decommissioning section of the OGA website).

Decommissioning is a significant financial liability in the UKCS, with much of the liability being associated with well Plug and Abandonment (P&A).

For an installation, millions of pounds can be spent within the decommissioning phase maintaining these SECEs and safety systems. There is currently little specific guidance on how to manage SECEs during the decommissioning phase. It is probable that the demands on the system will change as decommissioning progresses. The JIP has found that there is no standardised approach by operators in SECE management and safety case requirements.

Although the safety case spans from late life to decommissioning, in many E&P operators the management of late life operations and decommissioning projects are distinct silos. The safety case that is used during late life is based around the hazards and requirements of the operational phase of the installation. During decommissioning, the nature of these hazards will change significantly and the associated potential consequences may change the SECEs required.

The JIP has also investigated potential innovations to reduce facility running costs whilst maintaining safe operation. The findings of those discussions will be issued in a separate report.

3 Scope, application and regulatory compliance

This guidance is intended to help duty holders with UKCS offshore installations to maintain compliance with the SCR when preparing their platforms for decommissioning. It is not intended as a substitute for the SCR or SCR guidance, e.g. L154 [Ref. 1], but to offer guidance in maintaining compliance during EoL, decommissioning and dismantling based on recent experience of offshore operators. This guidance should be read alongside SCR 2015 [Ref. 2] and existing guidance (L154). Early engagement and continued pro-active communication with the Competent Authority via your focal point inspectors is recommended at all stages of decommissioning and dismantling to share information on planned activities and potential contentious issues. It is important to recognize that decommissioning and dismantling may introduce additional hazards.

SCR 2015 requires consideration of environmental hazards which will need to be addressed in any safety case updates. Specific environmental requirements for decommissioning are defined in the decommissioning “environmental statement”, which underpins the environmental requirements of SECEs.

This guidance comes from technical exchange discussions with a number of offshore duty holders about their experience of decommissioning in the UKCS to identify good practice. Some of the duty holders have significant experience of decommissioning, whereas others are still at the planning stage, so in these cases the discussions reflect their intended plans.

The guidance presents different approaches duty holders take in modifying their safety cases to cover decommissioning operations and dismantling. It also highlights potential advantages and disadvantages of the different approaches.

The regulation numbers quoted in this guidance refer to SCR 2015, with the exception of those in the case studies in section 6 where submissions were made under the SCR 2005 regime. A dismantling safety case submission is a Reg. 20 not a Reg. 24 (2) material change.

This guidance relates to submissions made under SCR 2015. Differences from submissions made under SCR 2005 will be minimal because the regulations for the ‘revision of safety case’ and ‘safety case for dismantling fixed installation’ are essentially the same under the SCR 2015 as under SCR 2005. Differences in submissions to the regulator made under SCR 2015 may arise from changes which have been made to the operational safety case to meet the additional requirements of SCR 2015.



4 Good practice approach to safety case compliance

This section offers practical advice on maintaining compliance with the SCR during EoL, decommissioning and dismantling. It includes information on different removal methodologies, and formulating a safety case strategy and plan. It also details regulators and stakeholders with whom engagement will be required during decommissioning, and ways to manage the major safety and environmental hazards and SECEs.

4.1 Project removal methodology

Offshore decommissioning activity will inevitably increase in the North Sea as existing field infrastructure approaches the end of its productive life. The physical process of taking offshore platforms out of service safely and securely is a sensitive, complex and technically formidable undertaking. These structures may remain in one of several different statuses e.g. unmanned / manned, and will range from a few thousand to tens of thousands of tonnes, before final removal.

The dismantling challenge involves the removal of heavy structures from some of the most inhospitable offshore environments. It is important to understand the full range of removal methods available, as this has the potential to reduce the overall cost of decommissioning.

There are three recognised platform removal methods. Table 1 below highlights their advantages and disadvantages.

—
Table 1: Platform removal methods.

Piece small	Piece small is the removal of the platform in small sections. SECEs will potentially need to be operational for longer periods of time resulting in increased facility running costs.
Reverse installation (or piece large)	Piece large is the removal of the platform in larger sections or modules. This can allow re-use of assemblies up to the size of complete modules. SECEs will potentially need to be operational for a shorter period of time resulting in lower facility running costs over piece small.
Single lift	Single lift is the removal of the platform topsides or jacket in a single unit. Using single lift, the full platform topside or jacket is lifted and transported to shore for onshore disposal. The platform can remain in an unmanned state and lifted with minimal decontamination offshore. A down side of this method is that significant, costly strengthening work may be required which will require an offshore workforce.

The Petroleum Act requires all topsides of an installation to be removed and sets out the requirements for subsea infrastructure. However, OSPAR 98/3 [Ref 7] provides a derogation pathway for the assessment of concrete support structures and parts of large steel jackets to remain in place.

4.2 Safety case strategy and plan

The decommissioning project has to:

- Establish the general order and timeline of milestones
 - e.g. CoP, well P&A, warm stack, cold stack, NUI status / lighthouse mode, conductor recovery etc.
- Decide on the removal methodology / strategy
 - e.g. piece small, reverse installation or single lift

Regarding the requirements of SCR 2015, at this point the duty holder has two considerations:

- The implications of maintaining a live safety case during the decommissioning project lifecycle, which accurately reflects the progressive prevention, mitigation, reduction, elimination, and (re)introduction of MAHs throughout the lifecycle
- The requirements of regulations such as SCR 2015, PFEER, MAR etc. (see section 4.3.2 and addendum)

4.2.1 Elements of the safety case strategy

The safety case strategy can be used as a vehicle:

- For site operators, safety case manager / authors and assessors to plan and record the safety aspects of their intended scope, the structure of deliverables / assessment and studies to be undertaken during the decommissioning programme lifecycle
- To define the systematic assessment of hazards and establish design and operational measures
- To allow demonstration of full lifecycle regulatory compliance including International legislation, if applicable
- To allow planning and scheduling of safety case delivery
- To allow the provision of information relating to decommissioning of equipment outwith the installation boundary, e.g. pipeline and subsea infrastructure

The safety case strategy should also address the decommissioning programme lifecycle and its milestones or phases. It should include regulatory / stakeholder engagement sessions, prime contractor organisations management and Safety and Environmental Management System (SEMS) interfaces, as well as regulatory breakdown of phasing e.g. determining the type of safety case submission required, i.e.:

- Reg. 5 PFEER risk assessment
- Reg. 22 SCR combined operations
- Reg. 24(1) minor modification originated / actions from thorough review or transition case observations
- Reg. 24(2) SCR material changes etc.

The safety case strategy should set out the proposed timeline and a phased approach to the management of MAH and SECEs, and detail the impact on the safety case. Figure B overleaf gives an example of a strategy timeline showing different phases of decommissioning, alternative removal methodologies and suggested times where a safety case submission may be required. The safety case strategy should take into consideration milestones, sub-contract appointments and their interface with the strategy.

Some suggested milestones for consideration include:

- Decision on EoL duty holder / operator
- Cessation of Production (CoP): Warm suspension / warm stack (fully live or live wells)
- Well P&A: Warm suspension/warm stack (live process)
- Platform declassification: (removal of bulk hydrocarbons (partial declassification) and residuals e.g. sludges etc. (full declassification / cold suspension / cold stack)
- Conductor recovery: Part removal
- NUI status and / or lighthouse mode

These have the potential to coincide with safety case submissions. The duty holder needs to logically define clear boundaries at which a material change will occur, for example engineering down and clean, removal of bulk hydrocarbon via completion of well P&A, new utilities provision, NUI status / lighthouse mode, topsides removals and jacket removals etc.

Sub-contract appointments and interfaces must be identified in order to capture their intentions, approach or strategy to completion of the worksopes. Some suggested Primary Contractor Organisations include:

- Decommissioning services
- Well P&A services
- Platform operations services
- Subsea services
- Removal services
- Marine warranty surveyor
- Independent verification body, well examiners and / or the vessels inspection authority

Strategies and approaches for the safety case to address include topsides and jacket removal methodologies and advice on the supporting marine spread.

The strategy should consider the onshore dismantlement, recycling and disposal locations, advising on compliance with road, sea and rail regulations, advising on UK or non-UK sites (trans-frontier boundary impacts) as well as summarizing the intent of re-use, recycle or disposal.

Additionally the safety case needs to cover jacket removal and must reflect the company's position on e.g.:

- Derogation [Ref 7]
- Full removal using single lift, piece small or piece small with refloat or cutting method
- Cutting pile removal / relocation (as required)
- Debris management
- Seabed surveys
- Pipeline strategy (removal or rock dump)

Furthermore there are several supporting activities / documents (e.g. HAZID, HAZOP, ENVID, EERA, SIMOPs, HFE, PS, SECE Management, ORAs etc.) which underpin the safety case; these need to be explained within the strategy and scheduled into the safety plan / timeline to ensure delivery in line with integrated project plan and expectations.

One approach to the safety case strategy is to manage the elements above by dividing them into manageable project phases / stages / gates / schedule milestones or as suited to a company's project management process.

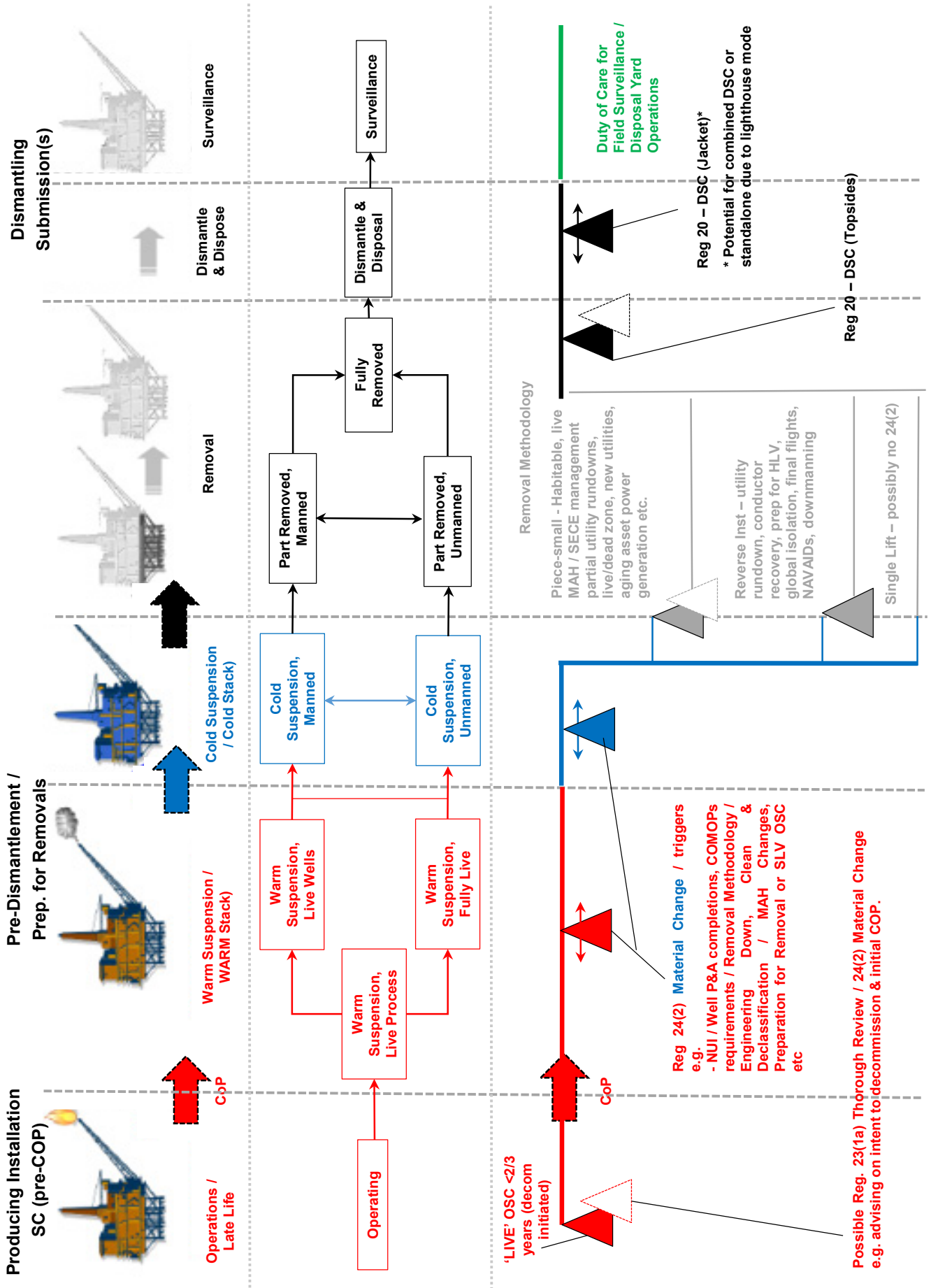
A specimen is given below:

- Stage 1 Well P&A (Pre CoP)
- Stage 2 Well P&A (Post CoP)
- Stage 3 Engineering down of existing systems to a defined condition / level of cleanliness
- Stage 4 Installation/ modification of new equipment and utilities
- Stage 5 Removals preparation (module separation / strengthening etc.)
- Stage 6 NUI / lighthouse phase
- Stage 7 Offshore topsides / jacket / pipeline removals activities
(including sea fastening / rail / road compliance)
- Stage 8 Onshore dismantling, resale, recycle and disposal
- Stage 9 Duty of care / monitoring / assessment phase and ongoing liabilities
(as applicable)

In this example, (assuming a safety case has already captured the initiation of the P&A works prior to CoP), safety cases may be submitted to the regulator for the end of stage 2. The removal of well connectivity takes away significant risk from the platform topsides. The safety case should outline the risk reduction resulting from P&A activity, and highlight changes to the platform risks and barriers in addressing stages 3-4 and preparation for stage 6 (if applicable). Further submissions would then be required to address remaining stages.

The timeline for project phases / stages / gates should include a plan for installation safety case submissions, reflecting changes to the basis upon which the original case was accepted (i.e. physical modifications and operational management changes of sufficient significance) and to the status of the platform, in line with the regulatory requirements associated with Reg. 24 of SCR 2015.

Figure B: Safety case strategy timeline.



4.3 Regulatory and stakeholder engagement

The duty holder of the installation should engage the regulatory bodies and stakeholders throughout the project lifecycle to present forthcoming proposals and seek timely buy-in.

The Competent Authority will assess the duty holder's safety case against the assessment principles for Offshore Safety Cases [Ref 8] and the safety case assessment templates on the HSE website:

<http://www.hse.gov.uk/osdr/safety-cases/index.htm>

4.3.1 Stakeholders

The duty holder should seek early engagement with the Competent Authority and other related regulatory bodies as appropriate to the phase of the decommissioning programme lifecycle. The bodies and stakeholders who should be consulted will be in line with the organisations Permits, Licenses, Authorisations, Notifications and Consents (PLANC) register and includes, but is not limited to, the following:

Safety case related (approval and regulatory purposes):

- OSDR - Offshore Safety Directive Regulator, consisting of:
 - BEIS - Department for Business, Energy & Industrial Strategy [Combined former Departments for Business, Innovation and Skills (BIS) and Energy and Climate Change (DECC)]
 - Health and Safety Executive (HSE) Energy Division
- EA – (UK) Environmental Agency
- HCA – Helideck Certification Agency
- IMO – International Maritime Organization
- MCA – Maritime and Coastguard Agency
- NLB – Northern Lighthouse Board
- SEPA – Scottish Environmental Protection Agency
- THLB – Trinity House Lighthouse Board
- UKHO – United Kingdom Hydrographic Office / Admiralty

Other (consultation and information purposes):

- Crown Services Commission
- DEFRA – Department for Environment, Food and Rural Affairs, consisting of:
 - Department of the Environment, Transport and the Regions (DETR)
 - Ministry of Agriculture, Fisheries and Food (MAFF)
 - Scottish Executive Environment and Rural Affairs Department (SERAD)
- DIUS - Department for Innovation, Universities and Skills (Replaced the DTi – Department of Trade and Industry)
- DfT – Department for Transport
- JNCC – Joint Nature Conservation Committee, supported by:
 - Countryside Council for Wales (CCW)
 - English Nature (EN)
 - Scottish Natural Heritage (SNH)
- NFFO – National Federation of Fishermen's Organizations
- SFF – Scottish Fishermen's Federation

Depending on the removal and disposal strategy, one or more of the stakeholder organisations above, or their international equivalent, will need to be informed and/or consulted, having responsibility or jurisdiction over the proposed disposal route or within the proposed destination country.

4.3.2 Legislation/ regulations / guidance

Cognizance is required of legislative guidance and regulations. Appendix 1 contains a list of regulations applicable to decommissioning, which is reasonably comprehensive at the time of writing (May 2017).

Many of these documents are available on the HSE website: <http://www.hse.gov.uk/offshore/law.htm>

4.4 Safety and Environmental Management System (SEMS)

The SEMS is an essential element of any offshore safety case under the offshore installations SCR 2015 [Ref. 2].

This section of the guidance should be read in conjunction with the following documents where the general requirements of a SEMS are outlined:

- Safety case guidance L154 [Ref. 1], Reg. 8 (paras 131 – 142), schedule 3 (paras 370 – 391)
- PFEER guidance [Ref. 9] Reg 5 (Paras 50 – 71)
- Management system and verification – safety case assessment template (<http://www.hse.gov.uk/osdr/safety-cases/index.htm>)

Sufficient detail should be provided, with supporting arguments, to demonstrate that the Corporate Major Accident Prevention Policy (CMAPP) and SEMS can be effectively implemented during each phase of an Installation's life cycle.

That detail should include:

- Arrangements in place for the effective implementation of the SEMS
- Workforce involvement in the development of amendments to the safety case
- Engagement with the workforce on the safety case
- Methodology adopted for MAH identification
- Organisational structure
- The role of PFEER assessment, e.g. Regs. 5 & 19
- Safe systems of work (Management of Change (MOC) [including organizational change], Permit to Work (PTW) etc.)
- Internal emergency response plan

Prior to submission of the dismantling safety case, the installation may undergo material change to its mode of operation which will be covered under Reg. 24(2) of SCR 2015. The duty holder must make clear how successful implementation of the SEMS can continue.

Examples of issues that duty holders have encountered with the SEMS during decommissioning and dismantling include:

- Moving from an electronic to a paper-based maintenance management system during decommissioning
- Moving from an electronic to a paper-based PTW system (when offshore information had not been transferred onshore before the server was switched off)

4.5 Live dismantling safety case

Prior to the execution of final dismantling, the duty holder must have acceptance of a dismantling safety case from the Competent Authority under Reg. 20 of SCR 2015. The particulars to be addressed are given within SCR 2015 schedule 8.

The duty holder should give detail on matters such as expected dates of dismantling, the expected POB at all times as well as verification arrangements. Revisions to the dismantling safety case can be submitted under both Reg. 24(1) and 24(2).

4.5.1 Combined Operations (COMOPs)

Although general reference should be given to the requirement for COMOPs in the dismantling safety case, the specifics of COMOPs detailing the interface of SEMS between both duty holders will be given in the Reg. 22 notification.

COMOPS can only be between installations as defined by Reg. 3 of MAR.



4.5.2 Connected activity with a vessel (not an installation)

If working in connected activities with a vessel that is not classed as an installation under MAR Reg. 3, (classed as SIMOPS), sufficient detail should be provided, with supporting arguments, to demonstrate that the CMAPP and SEMS can be effectively implemented. It is good practice still to provide evidence of how SEMS and emergency response arrangements between installation and vessel have been interfaced. PFEER Reg. 4 outlines that the duty holder has a general duty to all personnel on board not just their own employees. Where large numbers of external personnel (e.g. from HLV) who are to work on the installation to be dismantled are not under the employ of the duty holder, it needs to be outlined how the SEMS can be effectively implemented in this situation.

Which safe systems of work to use?

Experience gathered from the technical exchanges found that one of the following models was adopted:

- Retaining the duty holder's safe systems of work throughout decommissioning
- Moving from the duty holder's safe systems of work to the contractor's safe systems during decommissioning

Each of these models has its own advantages and potential disadvantages, discussed here in more detail:

Retaining the duty holder's management system

The duty holder needs to consider whether the arrangements are in place for the effective implementation of the SEMS, including whether there are sufficient resources available to implement.

Advantages of this model are:

- Duty holder and existing personnel are familiar with and maintain control of the SEMS
- There is no necessity to amend the safety case to capture changes to the SEMS
- There is no requirement for bridging documents to demonstrate how the different management systems are being co-ordinated

Disadvantages of this model are:

- Contractor personnel (may be a large number) are not familiar with the duty holder's systems, so potentially a large number of personnel need training in the existing systems
- Management systems designed for production operations may not work well for the different activities carried out in decommissioning / dismantling

Duty holder adopts contractor's management system

Advantages of this model are:

- Contractor personnel are familiar with their systems of work, so only the existing duty holder personnel (smaller than number of contractor personnel) need training in the contractor's system
- The contractor's systems of work are designed around the activities carried out in decommissioning / dismantling, so should be more suitable than the existing duty holder's systems

Disadvantages of this model are:

- The safety case will need to be amended (SCR 2015 Reg. 20 submission) to align the contractor's safe systems of work elements with the duty holder's elements in the safety case. (This may not be straightforward if the contractor's SEMS has a different number of elements from the duty holder's SEMS)
- The duty holder retains the duty of care and has to demonstrate that this is being fulfilled even when the contractor's work systems are being used
- Where more than 1 company's safe systems of work are running simultaneously bridging documents need to be in place to demonstrate how the different management systems are being co-ordinated (i.e. how interfaces are being managed)

The arrangements in place to effectively implement the above need to be included within the safety case. The duty holder has legal primacy regardless of whose management system is being used.

4.6 Major safety and environmental hazard management

A key component of the safety case is the demonstration that major safety and environmental hazards have been assessed and appropriate measures are in place to prevent, detect, control and mitigate their consequences. Furthermore, that these measures are maintained, audited as appropriate and independently verified. Specific phases of decommissioning will involve gradual changes to the risk from major safety and environmental hazards, or occasionally step changes to the MAHs present on an installation. The following sections discuss these changes. It is important to recognize that decommissioning and dismantling may introduce additional hazards which will require assessment.

4.6.1 Risk assessment management

During the preparation for a change to an installation, such as entering the next phase of decommissioning, the potential hazards require to be identified (e.g. in a HAZID study), risk assessed, and arrangements put in place to manage the risks. For manned production installations, the main MAHs are often reviewed in a Quantitative Risk Assessment (QRA). Typically, the process hydrocarbon fire and explosion hazards require detailed assessment for each platform, whereas some other hazards, such as ship collision, are based on more generic data and are only influenced by coarse factors, such as the location of a platform. The latter hazards typically do not change frequently and can be assessed in standalone studies.

Operators are likely to find that gradual changes to conditions on the installation can be risk assessed using the current methodology, such as a QRA.

The QRA could be updated as part of a management of change process, or at a set frequency.

Operators may find that a step change to activities on an installation justifies a changed methodology. For example, the step change of completing isolation and flushing activities will reduce the risk from jet fires and explosions. At some point the risk of process fire and explosion will be so low that a QRA may not be a useful tool for risk assessment. (Although other sources of fire and explosion may remain). The remaining MAHs, such as diving, ship collision and helicopter crash can be managed to ALARP without the QRA. Each of these hazards may justify a standalone review.

This change of methodology from quantitative to qualitative assessment in itself may not automatically trigger a material change to the safety case, if the change is well planned and the remaining hazards are still controlled.

However, if the justification for this change is based on a significant risk reduction, this may be indicative of material change. The decision to retire the QRA is best taken in discussion with the HSE.

The process of identifying hazards and risk controls allows the duty holder to determine which controls are safety and environmentally critical. This assessment does not require a QRA.

Decommissioning and dismantlement may bring new hazards, so the hazard identification process should allow for additional risk as well as reduced risk. New hazards can include heavy lifting, on site dismantlement, increased crane lifts, man riding on cranes and walk to work (flotel).

New major safety and environmental hazards typically need SECEs to be created and maintained by a revised planned maintenance schedule, e.g. dynamic positioning gangway.

4.6.2 Control of work

Discussions with duty holders revealed that control of work changes are needed during decommissioning and although complete changes from one system to another are straightforward, operation of multiple control of work systems (e.g. for a connected vessel and a platform) requires careful thought, planning and documentation. A key risk to be managed is unfamiliarity and lack of resource to implement a new SEMS, either on the operator or contractor side (see section 4.5.2).

4.6.3 SECE management

Following the identification of major safety and environmental hazards at a particular project phase, a review of the safeguards or controls will establish which ones are safety or environmentally critical. These would be recorded within the installation performance standards. A detailed assessment may be required to establish the required extent, effectiveness, reliability and testing requirements for any particular SECE. SECE functionality may be provided by existing systems, new systems, temporary systems or may be redundant due to other changes to safety and environmental management. Removed SECE functionality may be reintroduced in a later project phase. For example, during the dismantlement phase temporary escape routes, emergency lighting and aids to navigation may be provided.

It is foreseeable that during decommissioning, some areas of the installation will have a lower hazard potential than during the production phase. Where the hazard assessment or another detailed study has identified a reduced set of required SECEs, this should be reflected in the performance standards and safety case. This change should not be interpreted as a reduction in safety, but as a response to a reduction in the inherent hazards associated with that project phase. Typically, this does not reflect a change to the hazard management methodology or safety and environmental management system.

Any change to the installed (permanent or temporary) and maintained SECEs requires good justification, supported by a revised performance standard and verification scheme. If the justification is a significant change in risk, this is indicative of material change.

Even when performance requirements do not change, reliability and longevity of SECEs should be considered for EoL phases. The duty holder must ensure that systems perform reliably on a long-term continuous use basis, taking cognizance of temporary systems.

For example, the following SECEs may change:

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Table 2: Examples of changes in SECEs.

SECE	Change post cleaning and flushing
Fixed gas detection	Not required due to elimination of hydrocarbon gas
Fire detection	Reduced in scope, but still required
Lifeboats	Capacity suitable for the (reduced) POB
Structure	Required. No change

Operators may find that the operational safety case includes all of the activities to be undertaken under the decommissioning project phases except for dismantlement. For example, P&A, structure upgrades, flushing and purging, isolation of equipment are all standard activities offshore. Permanent dismantlement, downgrading or removal of equipment relied upon in the safety case (i.e. SECEs) represents a clear point of change to the safety case and requires suitable justification as described above.

4.6.4 Human factors considerations

The EoL activities involve procedures that could be categorised as non-standard for the existing crew on the platform and also involve more parties (sub-contractors) than during production operations. There is the potential for conflict between onshore demolition personnel and offshore crew who are used to working to different regulations. The EoL stage could also have a psychological effect on the platform crew as they might associate it with end of opportunities, resulting in lack of motivation and decreased productivity.

Due to these factors, there is an increased potential for human error during the decommissioning stage. The duty holder should therefore ensure a structured methodology is in place for identifying safety critical tasks and underlying human failure analysis of safety critical tasks during EoL activities. Although the duty holder's human factors strategy might already be included in the live production safety case, the decommissioning safety case should acknowledge the increased potential for human error and demonstrate that adequate consideration has been given to human factor principles in major accident risk evaluation. Some of the human factors aspects that require specific attention are training and competency, manning levels and workload, safety critical communications, and crew morale.



5 Lessons learnt from technical exchanges

Many useful learning points came out of the technical exchange meetings. Not all of these are directly related to the offshore safety cases, but may be useful for decommissioning so are included here:

- a. Be pro-active in communicating with the regulator, i.e. engage early on with the regulator, sharing plans for decommissioning to get feedback
- b. Ideally plan for decommissioning early, developing a baseline plan; to try and reduce wasted effort and costly mandatory revisions to OSC and supporting studies
- c. The high level 'decommissioning programme' plan should be supplemented by individual topic plans e.g. safety case plan. The rate of change of drawings and documents (safety case, risk assessments, emergency route drawings etc.), which can be rapid, should be planned for
- d. Align decommissioning phases with the project gates / work breakdown structure
- e. Decommissioning should be viewed as part of the operational life cycle of the asset, not as a separate project in isolation
- f. Engage contractors early to avoid last minute changes in how activities involved in decommissioning are carried out (e.g. number of vessels) as these might require a safety case rewrite. (The challenge is to freeze the engineering scope)
- g. Prioritise communication internally between relevant parties to ensure awareness of each team's activities which may impact on the decommissioning process
- h. Try and alter corporate procedures to include decommissioning aspects rather than creating project-specific procedures for decommissioning which may be in conflict with the corporate operational procedures
- i. It is important to maintain the correct safety culture and awareness of process safety risks during decommissioning when there may be significant changes in POB and crews. (Weekly sessions can provide a mechanism for engagement and communication, particularly about process safety hazards)
- j. Duty holder-ship may be transferred to contracted parties during decommissioning, but a high level of due diligence is required to ensure that the contractor is fulfilling the duty holder's obligations. The duty holder remains legally responsible
- k. Ensure there is interaction between the different verifiers (ICP, marine warranty surveyor etc.) so that all equipment is covered by verification and there are no gaps
- l. It can be advantageous to have fully autonomous platform Technical Authorities (TAs) who are dedicated to (and therefore focused on) the asset / decommissioning
- m. Avoid adopting a lesser standard for different phases in the lifecycle, (e.g. helicopter flights in later phases may be from a different regulatory sector - there are different standards for emergency breathing systems for offshore helicopter occupants in different sectors. They must comply with the UK regulations regardless of where they are flying from)
- n. A report listing obsolescent equipment and what is available for re-sale can be useful if an operator wishes to reuse equipment on one of its other assets
- o. Rigorously test emergency response arrangements ahead of offshore campaigns, recognizing that for the operators ERP the arrangements during dismantling may be quite different from the producing installations they support

6 Case studies

The following case studies describe in more detail 2 companies' experience of decommissioning and how they managed the safety case submissions.

Note: In these examples safety case submissions to the regulator were made under the 2005 SCR, so regulation numbers refer to SCR 2005.

Case study A

The installation discussed in this case is a single, gravity based jacket. Dismantlement is via a single lift.

With removal being achieved via a single lift, decommissioning phases did not follow a staged model as is sometimes the case. Bulk de-oiling, de-energising and being effectively fully de-activated is the primary aim prior to a single lift as full dismantlement will take place onshore. In this case, the full plug and abandonment of wells and achieving Cessation of Production (CoP) occurred broadly concurrently. The decommissioning phase was regarded more in relation to preparation for dismantlement and included phases of 'engineering up' to ensure the installation was at a suitable standard for the planned dismantlement method. Consequently, manning levels were maintained at a maximum for the plug and abandon, de-oiling and de-energising scopes. Down manning occurred once these phases were complete, and from this point on only operations personnel were present until being fully demanned ahead of the lift.

Regarding the transition from production to decommissioning stages in the asset's lifecycle, the operator avoided using key, industry recognised milestones in the process (i.e. hydrocarbon free, engineer down and clean, warm stack, cold stack etc.). As discussed, the well P&A and CoP phases overlapped considerably. This in turn supported the required change in mind-set for the operations personnel, moving from a production centric environment to one targeted at decommissioning. There was no obvious point at which operations switched from production to decommissioning, and in some cases decommissioning can see new equipment needing to be installed.

Although not employing recognised decommissioning milestones, the operator did manage the phasing from production to dismantlement in the same way as it would have with any other project with the same stage gate process and associated approval routes. This approach supported the required mind set of all involved, and engaged effectively with the existing and familiar management framework in place.

The decommissioning methodology and safety case management philosophy both enabled the operator to submit one material change to the production safety case at the commencement of the decommissioning phase. The second and final safety case submission was under Reg. 11 for the dismantlement phase. It is key to note that this campaign was conducted under the 2005 regulations where a positive impact to the risk profile did not attract a material change. It was observed that the significant reduction in hydrocarbon inventory did not have a negative impact on risk, did not modify the installation beyond its original intent and did not increase the POB and therefore was not considered to be a material change. Under the 2015 SCR it is likely that the outcome of that decision would be different.

The proposal made to the regulator reflecting this approach was made after extensive communication between the two parties, outlining the activities to be conducted and the management of MAH throughout. To support the formal safety case submission schedule, the operator also submitted revisions of the case informally, including summaries of changes to the case. This open communication of Reg. 14(1) changes was performed so as to facilitate the understanding of the dynamic decommissioning work, and to keep the regulator fully informed at all stages in the process. Using this approach it is important that the safety case management focal point(s) in an operator is kept fully informed of changes before, and as, they occur.

The change in risk profile associated with the asset entering the decommissioning phase, resulted in the operator retiring the QRA. The dynamic nature of the decommissioning activities and their corresponding manning profiles meant that the QRA and associated IRPA and PLL metrics were no longer representative of the condition of the installation. After retiring the QRA, installation risks were managed qualitatively. Regarding the other supporting safety studies, the existing HAZID and HAZOPs were reviewed and modified as the decommissioning phase progressed. These were enhanced with scope-specific HAZIDs and HAZOPs where required.



These safety studies fed into the operator's stage gate project management process which requires ALARP justification at each key milestone. As the decommissioning phase was managed in the same manner as any other internal project, the ALARP demonstration throughout decommissioning was managed effectively.

Changes in MAH profiles meant that the operator reviewed the relevance of SCEs regularly, in cooperation with the ICP. Frequent meetings with the ICP to review changes to SCEs, performance standards and Written Schemes of Examination (WSE) were a measure of the high rate of change experienced throughout the decommissioning phase. All changes to the MAHs, SCEs and performance standards were documented and included within the safety case, which in turn were communicated to the regulator.

The operator advises taking early action with regards to safety case management and establishing the methodology to be followed. It is crucial that early engagement with the regulator occurs to ensure a cooperative approach is maintained throughout the process and the safety case fulfils the original intent.

Case study B

The installation discussed in this case is a single, 8 legged steel jacket. Topside dismantlement was via reverse installation of circa 30 modules.

In order to manage the decommissioning activities involved in the reverse installation dismantlement, the operator amended the safety case four times for submission to the HSE. The revisions covered:

- Engineering down and clean (Reg. 14(2))
- Wells P&A hydrocarbon free, conductor removal, platform declassification, preparation for removal e.g. including final utilities rundown, structural strengthening, global isolation and downmanning (Regulation 14(2))
- Topsides removal including splicing, lifting operations and sequencing, vessel type and usage, structural reconciliation etc. (Reg. 11)
- Jacket removal (Reg. 14(2) against case submitted for Reg. 11)

A key point to note regarding this timeline of programmed submissions was the agreement gained from early engagement with the regulators. There was no requirement for the submission of:

- A transition safety case demonstrating SCR 2015 compliance (timeline delivery dependent)
- Periodic thorough review SCR05 Reg. 13 (timeline delivery dependent)
- COMOPs notification under interpretation of MAR3(1)(d)

The operator defined clear milestones / phases so interpretation of the SCR guidance to plan out safety case amendments made submissions clear and concise. The safety case is either operational (production / non-production) or has entered the dismantlement phase. Subsequently, material changes to the safety case were either via Reg. 14(2) (material change) or Reg. 11 (safety case for dismantling a fixed installation).

It is worth noting that the term 'hydrocarbon free' was used in this case study throughout the decommissioning programme. During discussions with various operators within the UKCS it was clear there was some hesitation over using this term in the management of MAHs. The key element in the use of the term was clear definition, derived from the chosen reclassification criteria. Project understanding was obtained through essential communication to all parties involved from the outset. This was not to be confused with the projects / service contractor's criteria for level of cleanliness.

The operator also utilised work completed by the OSPAR commission in order to plan the decommissioning activities and programme. The decommissioning programme was managed by a dedicated team outwith the operations team, with dedicated technical authorities assigned to the programme once CoP was achieved. This required a working relationship to be established between the operations and decommissioning team and their service contractors to ensure conflicts of interest were managed to a minimum.

As per case study A and for the same reasons (dynamic nature of the decommissioning programme), the operator retired the QRA post declaration of CoP. This was done in agreement with the regulator, with the risks being managed qualitatively. Each phase that the asset moved through during decommissioning and into dismantlement had associated supporting safety studies i.e. HAZID, HAZOP, PFEER, EERA, ERP, SECEs / PS, HFE, WHERAs etc.

During the topside design phases the Decommissioning Service Contractors (DSC) design, installation and commissioning activities sought verification by utilizing the existing IVB. As the IVB was for operations their design ICs were required to be engaged. During the topsides removal phase, the projects required both the involvement of the design and operational IVB.

As the Removal Service Contractor (RSC) introduced multiple HLVs to the field, the duty holder required the engagement of a marine warranty surveyor for the verification and assurance of vessel suitability whilst providing the overarching approvals of heavy lifts. Additionally, the vessels had their own Independent Inspection Authority (IIA) to verify vessel systems and equipment.

New marine-specific MAHs were being introduced as a result of HLVs in the field. Following such a risk management methodology allowed the continued demonstration of ALARP throughout the decommissioning programme.

The impacts to SCEs were managed in each phase through completion of a performance standard impact assessment which was conducted after every HAZID, HAZOP or PFEER assessment was carried out (per phase). This was effectively managing the SCEs in line with changes to the MAHs as they occurred. This process meant that SCEs were either reduced in performance requirements or eliminated altogether. In some instances new SCEs were identified in line with the scopes of work that the removal or dismantlement contractors were introducing to the site.

Recommendations made by the operator in this case included the recognition of the decommissioning phase as part of the installation's normal lifecycle and not as a separate project, i.e. avoid adopting different or lesser standards than is normally the case during operations. This recommendation extends to the revision of corporate procedures to include decommissioning requirements, rather than creating project-specific documents that had the potential of contradicting the corporate position.

Ongoing early engagement and continued open communication with the regulator was identified as a key contributor to the success of the safety case management process.



7 References

1. L154, The Offshore Installations (Offshore Safety directive) (Safety Case etc.) Regulations 2015. Guidance on Regulations, First edition, 2015
2. The Offshore Installations (Offshore Safety directive) (Safety Case etc.) Regulations 2015, 2015 No. 398
3. The Offshore Installations (Safety Case) Regulations 2005, 2005 No. 3117
4. Guidelines on Late-Life / Decommissioning Inspection and Maintenance, Issue 1, November 2015, OP111, Oil & Gas UK
5. Late Life Planning Portal (L2P2), Safety Case Road Map T000161, Rev 0, 19th August 2016
6. OPO71; Guidelines for the suspension and abandonment of wells, Issue 4, July 2012
7. OSPAR 98/14/1 E Annex 33; OSPAR Decision 98/3, Disposal of Disused Offshore Installations
8. Assessment Principles for Offshore Safety Cases (APOSC), HSE, March 2016
9. L65: Prevention of fire and explosion, and emergency response on offshore installations. Approved Code of Practice and guidance, HSE, 3rd Edition, 2016

8 Appendix 1: Decommissioning Regulations List

Cognisance of the following legislative guidance or regulation is required (at the time of writing, May 2017, this is a reasonably comprehensive list of regulations applicable to decommissioning):

- 454, OGP Human factors engineering in projects, August 2011
- Admiralty & Maritime Law Guide, International Convention on Tonnage Measurement of Ships, 1969
- BEIS Guidance
- BS 2573:1983, Rules for the design of cranes. Specification for classification, stress calculations and design criteria for structures.
- BS EN 13000:2010+A1:2014, Cranes. Mobile cranes
- BS EN 13852-1:2013, Cranes. Offshore cranes. General-purpose offshore cranes
- BS EN 1838: 2013, Lighting applications. Emergency lighting
- BS OHSAS 18001, Occupation Health and Safety Management System Requirements
- CAA 2008/03, Helideck Design Considerations - Environmental Effects
- CAP 1145, Safety review of offshore public transport helicopter operations in support of the exploitation of oil and gas.
- CAP 437, Standards for Offshore Helicopter Landing Areas, Civil Aviation Authority
- CMPT, A Guide to Quantitative Risk Assessment for Offshore Installations
- Coast Protection Act 1949
- Convention on International Trades in Endangered Species (CITES) 1973
- Dangerous Substances in Harbour Areas Regulations 1987
- DECC 04/11, Standard Marking Schedule for Offshore Installations
- EC No 1013 / 2006, Safe Waste Shipments within the EU and with non-EU Countries
- Environment Protection Act 1990
- Environmental Permitting (England & Wales) Regulations 2010
- ERRV Management Guidelines, Oil & Gas UK Ltd
- European Agreement concerning the International Carriage of Dangerous Goods by Road
- Export Control Act 2002
- Export Control Order 2008
- Export of Radioactive Sources (Control) Order 2006
- HS(G)253, HSE Books, The Safe Isolation of Plant and Equipment
- HS(G)65, HSE Books, Successful Health and Safety Management
- HS001, Guidelines for the Management of Competence and Training in Emergency Response for Offshore Installations, Oil & Gas UK
- HS006, O&G UK Industry Guidelines on a Framework for Risk Related Decision Support
- HS013, OGUK, Guidelines for First Aid and Medical Equipment on Offshore Installations
- HS067, Oil & Gas UK Ltd, Guidelines for the Management of Aviation Operations, 2011
- HSE (undated 2), GASCET (Guidance for the topic assessment of the major accident hazard aspects of safety cases).
- HSE Publication March 2006, Assessment Principles for Offshore Safety Case (APOSC) requirements
- IEC 60079, International Electrotechnical Commission
- International Convention for the Safety of Life at Sea, SOLAS Convention 1974
- International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STWC) 1978
- International Safety Management (ISM) Code
- International Ship and Port Facility Security (ISPS) Code 2004
- International Standard for the Safe Management and Operation of Ships and for Pollution Prevention
- ISBN 92-2-109450-2, Accident prevention on board ship at sea and in port. An ILO code of practice, Geneva, International Labour Office, 2nd edition, 1996
- ISBN 978-92-801-4214-3, International Maritime Dangerous Goods (IMDG) Code
- ISO 12021:2014, Respiratory Equipment – Compressed Gases for Breathing Apparatus
- ISO 14001:2004, Environmental Management System Requirements
- ISO 1838: 2013, Lighting Applications - Emergency Lighting

- ISO 199001-2:2004, Petroleum and natural gas industries -Specific requirements for offshore structures – Part 2: Seismic design procedures and criteria
- ISO 19901-7:2013, Petroleum and natural gas industries -- Specific requirements for offshore structures -- Part 7: Stationkeeping systems for floating offshore structures and mobile offshore units
- ISO 19902: 2007, Petroleum and natural gas industries – Fixed offshore structure
- ISO 1993-1-1:2005, NA:2008 Eurocode 3: Design of Steel Structures Part 1-1: General Rules and Rules for Buildings
- ISO 9001:2008 International Organization for Standardisation, Quality Management System Requirements
- L101, HSE Books, Safe Work in Confined Spaces – ACoP, Regulations and Guidance
- L123, HSE Books, Health Care and First Aid on Offshore Installations and Pipeline Works
- Marine and Coastal Access Act 2009
- Marine (Scotland) Act 2010
- Maritime Labour Convention (MLC) 2006
- MARPOL 73/78, MARPOL Convention (International Convention for the Prevention of Pollution from Ships)
- MCAA Regs
- Merchant Shipping (Oil Pollution Preparedness, Response and Cooperation Convention) Regulations 1998
- MSC/Circ.645, International Maritime Organization - Guidelines For Vessels With Dynamic Positioning Systems
- Offshore Chemical Regulations 2011
- Offshore Installations and Pipelines Works (Management and Administration) Regulations (MAR) 1995
- Offshore Installations (Emergency Pollution Control) Regulations 2002
- Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015
- Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995
- Offshore Petroleum Activities (Oil Pollution Prevention and Control) Regulations 2005
- Offshore Petroleum Production and Pipe-lines (Assessment of Environmental Effects) Regulations 1999
- OGUK Publications, Medical Aspects of Fitness for Offshore Work; Guidance for Examining Physicians
- Oil & Gas UK Guidelines
- OIS 4/2013, Offshore Information Sheet, Offshore installation moorings, HSE
- OIS No. 3/2006, HSE Offshore Information Sheet, Guidance on Risk Assessment for Offshore Installations
- OP071, Guidelines for the Suspension and Abandonment of Wells 2012
- OPITO Publication, OIM Controlling Emergencies Standard
- OPO13, Oil & Gas UK Ltd, Guidelines for Ship / Installation Collision Avoidance, 2010
- OSD Technical Policy, On Safety Case Assessment relating to Structural Integrity, November 2009
- OSD Technical Policy, Relating to Extreme Weather Hazards, HSE, Rev 3 August 2005
- OSD Technical Policy, Relating to Seismic Events Hazard, HSE December 2006
- OSD Technical Policy, Relating to Structural Response to Ship Impact, HSE, December 2006
- OSPAR Decision 98/3 on the Disposal of Disused Offshore Installations
- OSPAR 06/23/1-E, Annex 16, OSPAR Convention For The Protection Of The Marine Environment Of The North-East Atlantic Recommendation 2006/5, Summary Record, On a Management Regime for Offshore Cuttings Piles
- OSPAR Convention, The Convention for the Protection of the marine Environment of the North-East Atlantic 2010
- OTH 86 219, "North Sea Seismicity", DoE / Principia Mechanica Ltd, 1986
- OTO 1999-052, Effective Collision Risk Management for Offshore Installations, HSE
- OTO 95 038, Review of Probable Survival Times for Immersion in the North Sea"
- OTR 2002/0005, HSE Seismic Hazard; UK Continental Shelf'
- PARLOC 2001, The Update of Loss of Containment Data for Offshore Pipelines, Mott MacDonald Oil & Gas Division
- Petroleum Act 1987
- Pipelines Safety Regulations 1996
- Pollution Prevention and Control Act 1999
- Radioactive Substances Act 1993
- Radioactive Waste Regulations 1993
- Regulations relating to the recycling of waste (Waste Regulations)
- RR 509, Ageing Plant - Management of Equipment Containing Hazardous Fluids or Pressure
- RR 684, Structural Integrity Management Framework for Fixed Jacket Structure, HSE Research Report
- RR053, Ship/Platform Collision Incident Database (2001), HSE
- RR220, Ship collision and capacity of brace members of fixed steel offshore platforms, HSE Research Report
- RR684, Structural Integrity Management Framework for Fixed Jacket Structures, HSE Research Report
- SI 1974 c. 3, Statutory Instruments, Health and Safety at Work Act 1974
- SI 1976/1542, Offshore Installations - The Offshore Installations (Emergency Procedures) Regulations 1976
- SI 1989/No 971, Offshore Installations (Safety Representatives and Safety Committees) Regulations
- SI 1990 c. 43, Statutory Instruments, Environmental Protection Act 1990
- SI 1991 No 2839, Statutory Instruments, The Environment Protection (Duty of Care) Regulations 1991
- SI 1992 No 3004, Statutory Instrument, Workplace Health, Safety and Welfare Regulations 1992
- SI 1992 No 588, Statutory Instruments, The Controlled Waste Regulations 1992 (as amended)

- SI 1995 No 340, Statutory Instrument, Offshore Installations and Pipeline Works (Management and Administration) Regulations (Northern Ireland) 1995
- SI 1995 No. 743, Statutory Instrument, Prevention of Fire and Explosions and Emergency Response Regulations 95
- SI 1996 No. 825, Statutory Instrument, Pipeline Safety Regulations 1996
- SI 1996 No. 913, Statutory Instruments, Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996 (DCR)
- SI 1998 / 17, Statutory Instrument, Petroleum Act 1998
- SI 1999 No 2001, Statutory Instrument, The Pressure Equipment Regulations 1999
- SI 1999 No 3232, Ionising Radiations Regulations 1999
- SI 1999 No 3242, Statutory Instrument, The Management of Health and Safety at Work Regulations 1999
- SI 2002 No 2677, Statutory Instruments, The Control of Substances Hazardous to Health Regulations 2002
- SI 2002 No 2776, Statutory Instrument, The Dangerous Substances and Explosive Atmospheres Regulations 2002
- SI 2004 No 204, Statutory Instruments, Special Waste Amendment (Scotland) Regulations 2004
- SI 2007 No. 734, Statutory Instrument, The Rules of the Air Regulations 2007
- SI 2012 No 148, Statutory Instruments, The Waste (Scotland) Regulations 2012
- SI 2014 No 861, The Transfrontier Shipment of Waste (Amendment) Regulations 2014
- SI 2015 No 483, Statutory Instruments, Control of Major Accident Hazard (COMAH) Regulations 2015
- SI 2307:1998, Statutory Instrument, The Lifting Operations and Lifting Equipment Regulations 1998
- Special Waste Regulations 1996
- The Greenhouse Gas Emissions Trading Scheme Regulations 2005
- The Offshore Installations (Emergency Pollution Control) Regulations 2002
- The Offshore Petroleum Activities (Conservation of Habitats) (amended) Regulations 2001
- Trans-frontier Shipment of Waste Regulations 1993
- Waste Management Licensing Regulations 1994

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