Guidance for UK Safety Case Compliance for Offshore Installations in Late Life, Decommissioning and Dismantling, based on industry experience

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The UK Oil & Gas Industry is beginning to see an increase in the number of offshore installations moving towards decommissioning and final dismantlement. A fresh look at the identification and management of the hazards is required during this phase and is required to be recorded in the installation's safety case by the UK's Offshore Installations (Offshore Safety Directive) (Safety Case etc.) Regulations 2015, (commonly known as SCR 2015) [2015, No. 398].

ABB Consulting has led a Joint Industry Project (JIP) with industry collaboration allowing operators to share and learn from each other on how best to plan and manage the final safety case for an installation. This has resulted in the development of a document entitled 'Guidance for UK Safety Case Management during End of Life (EoL), Decommissioning and Dismantling' [McKay, 2017].

The guidance has been prepared by a core team including operators and an industry trade association. The document offers guidance to duty holders in maintaining compliance with the Safety Case Regulations (SCR 2015) during EoL, decommissioning and dismantling, based on experience of recently completed and current decommissioning projects. It is intended to assist companies which are approaching and starting to plan for this phase of operation of their installations.

As part of the JIP, companies have willingly shared their experiences so that others do not have to go through the same learning curve. The JIP was highly commended in the 2017 IChemE global awards in the 'Team' category, for demonstrating collaboration and sharing information.

Key learnings from this experience include the benefits gained from an early start to preparation, as well as the communications needed about the approach to be taken. Detail is 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 decommissioning progresses.

The guidance document is not intended as a substitute for SCR 2015, or the HSE guidance on SCR 2015 [L154, 2015], but to offer practical lessons learned on maintaining compliance during EoL, decommissioning and dismantling based on current experience of offshore operators. The guidance should be read alongside SCR 2015, and existing guidance [L154, 2015].

Readers should also remain cognisant that there are other interfaces and activities being performed in parallel to the management of the safety and environmental hazards as part of the decommissioning programme.

Keywords: Late life, Decommissioning, Dismantling, Offshore Safety Case, Guidance, Safety Case Regs, SCR 2015, Compliance.

INTRODUCTION

The JIP developed from a desire to help operators reduce the costs associated with decommissioning as it was identified that without effective management several submissions of the safety case may be required to address material changes. The three 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 during this phase of operation.

The primary objective of the JIP was to develop guidance by the industry for the industry. It has also investigated potential innovations to reduce facility running costs whilst maintaining safe operation. It is intended to publish the findings of those discussions in a separate report.

Decommissioning of the early integrated installations was a learning process for both the duty holders submitting the safety case and the regulator assessing them. A series of breakfast briefings and workshops were held which identified the issues and challenges in complying with SCR 2015 in late life and decommissioning. It became apparent that what was wanted was a more consistent approach from both the regulator and duty holders. Since the first safety cases were developed industry and the regulator have always worked together to develop guidance and understanding of what was expected from each side. This was true in the early 1990s, when the regulations changed in 2005, and again when they changed in 2015.

ABB Consulting therefore approached those who had gone through the process of decommissioning and asked if they were willing to share their experience and major learnings in a series of technical exchanges, to allow guidance to be developed on how to move efficiently from an operational safety case to the final dismantling safety case. A core team was established to manage the technical exchange sessions and write the guidance based on the information gathered in these. The core team consisted of representatives from the JIP partners (ABB and Genesis Oil and Gas), operators (Centrica E&P, Marathon Oil

and Repsol Sinopec Resources), trade body (Oil & Gas UK) and consultants (Amec Foster Wheeler and Marex Marine and Risk).

Half-day technical exchange sessions were held with six operators: Centrica E&P, CNR International UK, Marathon Oil, Repsol Sinopec Resources UK, Shell UK and TAQA Bratani. The sessions involved three people from the JIP core team: one from ABB, one from Genesis, and one with operational experience (Centrica, Marathon or Repsol), plus representatives from the operator. The sessions focussed on the themes identified in the breakfast briefing workshops, using a list of questions which had been raised in these workshops and further developed by the core team.

SCOPE/JIP OUTPUT

The output from the JIP was a document containing guidance on how to maintain a safety case compliant with the regulations [2015 No. 398] during late life, decommissioning and dismantling, based on the experiences of operators who have gone, or were going through the process of dismantling their installations. This document 'Guidance for UK Safety Case Management during End of Life (EoL), Decommissioning and Dismantling' is available free for anyone to download.

Companies concerned with decommissioning offshore installations and maintaining safety case compliance are encouraged to download a copy of the guidance from:

the ABB website:

http://www04.abb.com/global/seitp/seitp202.nsf/0/a19ab4ec56947022c12581cc00535c8a/$file/89078420.pdf

or the Oil & Gas UK website:

https://oilandgasuk.co.uk/wp.../Guidance-for-UK-Safety-Case-Management_.pdf

The intention of the document is to provide practical guidance for companies who are starting to plan the decommissioning of their fixed offshore platforms. It does not cover floating platforms, such as FPSOs (Floating Production Storage and Offloading units), as the technical exchanges did not cover these types of assets. The aim was to provide information on areas duty holders should consider when they are planning and implementing the decommissioning and dismantling of their installations. The information is broad but is not exhaustive, as it is based on the experience of a limited set of operators with experience to date. However, it provides useful guidance on points to consider during planning and implementation of decommissioning and dismantling activities.

The focus of the guidance is SCR 2015, although in the examples used as case studies safety case submissions were made under SCR 2005 [2005, No. 3117]. SCR 2015 has additional environmental requirements when compared with SCR 2005, although these requirements were not specifically included in the guidance document.

CONTENTS OF THE SAFETY CASE GUIDANCE

The guidance [McKay, 2017] is a 32-page document containing the following sections:

1. Introduction
2. Background
3. Scope, application and regulatory compliance
4. Good practice approach to end of life / decommissioning safety case compliance
5. Lessons learnt from technical exchanges
6. Case studies
7. References

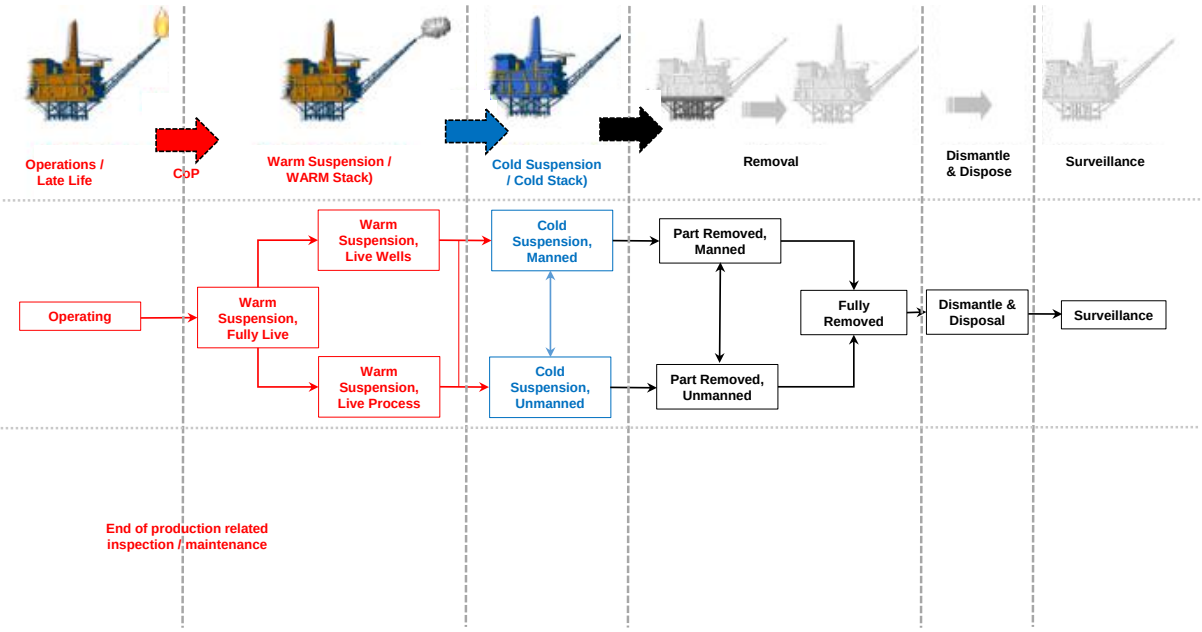
Appendix 1: Decommissioning regulations list.

Further detail on some of these sections is included below.

GUIDANCE SECTION 2: BACKGROUND

This section defines the terminology for the different phases of late life and decommissioning which is used in the guidance. The terminology is in line with the Oil & Gas UK guidelines on late life / decommissioning inspection and maintenance, November 2015, OP11 [Oil & Gas UK, 2015] as illustrated in Figure A below:

Figure A: Offshore Decommissioning Workflow [Oil & Gas UK, 2015]:



GUIDANCE SECTION 3: SCOPE, APPLICATION AND REGULATORY COMPLIANCE

This section defines the scope and origin of the guidance, and highlights that the regulation numbers referred to in the guidance refer to SCR 2015, with the exception of those in the case studies where submissions were made under the SCR 2005 regime.

GUIDANCE SECTION 4: GOOD PRACTICE APPROACH

This is the main section of the guidance, and offers practical advice on maintaining compliance with the SCR during EoL, decommissioning and dismantling.

Section 4.1 considers different removal methodologies, such as piece small, reverse installation or single lift. Table 1 below highlights some of the advantages and disadvantages of these three recognized removal methods.

Table 1: Platform Removal Methods [McKay, 2017]

Piece small	Piece small is the removal of the platform in small sections. SECE 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. SECE 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.

Section 4.2 discusses how the decommissioning project has to:

- Establish the general order and timeline of milestones,

  e.g. CoP, well Plug and Abandonment (P&A), warm stack, cold stack, Normally Unmanned Installation (NUI) status / lighthouse mode, conductor recovery etc.;

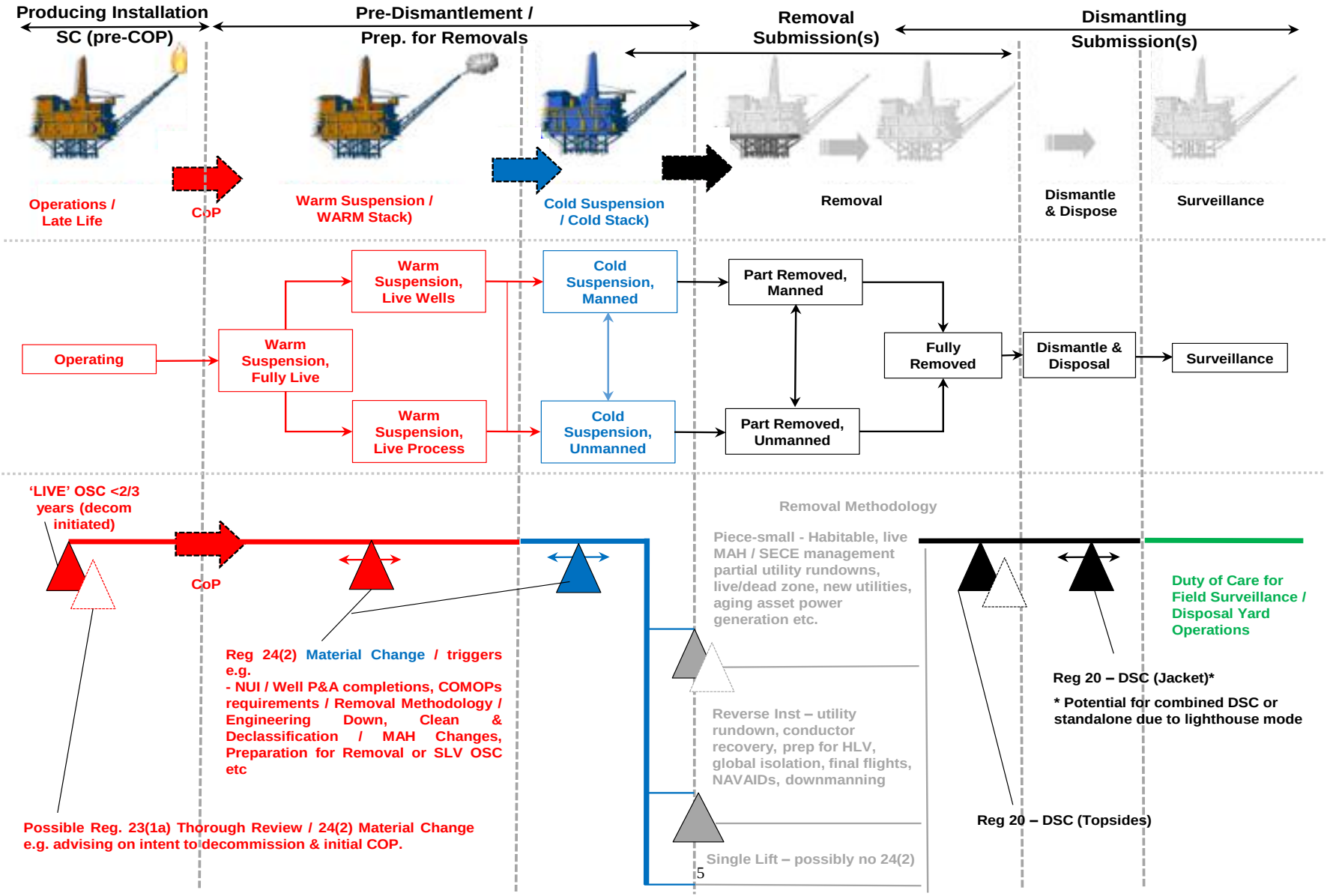
- Decide on the removal methodology / strategy e.g. piece small, reverse installation or single lift

The elements which need to be considered in formulating a safety case strategy and plan are then discussed further, and an example of a safety case strategy timeline is presented (Figure B below). This provides one example of how the various

elements can be managed by dividing them into manageable project phases /stages / gates / milestones or as suited to a company's project management process.

The timeline illustrates how the safety case is an operational safety case (with relevant material changes) up until submission of the dismantling safety case (i.e. the operational safety case remains valid until dismantling begins).

Figure B: Safety Case Strategy Timeline [2017, McKay]



Section 4.3 details regulators and stakeholders with whom engagement will be required during decommissioning. This is supplemented by a list of decommissioning regulations in Appendix 1, which presents a list of legislative guidance and regulation of which cognizance is required (current at the time of preparing the guidance, i.e. May 2017).

Many of the stakeholders are as expected (e.g. the Offshore Safety Directive Regulator), while others are less obvious (e.g. Helideck Certification Agency, Northern Lighthouse Board, Scottish Fishermen's Federation).

Section 4.4 discusses the Safety and Environmental Management System (SEMS), an essential element of any offshore safety case, and the detail that should be included:

- 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;
- Organizational structure;
- The role of PFEER assessment (Prevention of Fire and Explosion, and Emergency Response), e.g. Regulations 5 & 19 [PFEER, 1995];
- Safe systems of work (Permit to Work, PTW), Management of Change (MOC) [including organizational change] etc.);
- Internal emergency response plan.

It also discusses issues that duty holders have encountered with their SEMS during decommissioning and dismantling, for example, moving from an electronic to a paper-based maintenance management system, or from an electronic PTW system to a paper-based one.

Sections 4.5 and 4.6 discuss ways to manage the major safety and environmental hazards and SECE, and how the hazards and SECE may change through the different phases of decommissioning. Issues around combined operations (COMOPs), and issues found when using duty holder's or contractor's safe systems of work are discussed.

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 Regulation 22 notification [2015, No. 398].

Regarding safe systems of work, experience gathered from the technical exchanges found that either one of the following models was generally adopted:

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

The advantages and disadvantages of retaining the duty holder's safe systems of work or adopting the contractor's management system are discussed in more detail in section 4.5 of the guidance.

Section 4.6 discusses risk assessment management and SECE management in further detail, and in particular the role of risk assessments in identifying hazards when preparing for a change to an installation. Towards the EoL operators tended to move from quantitative to qualitative risk assessments and this change is considered further in section 4.6.

Operators may find that a step change in activities on an installation justifies a changed risk assessment methodology. For example, the step change of completing isolation and flushing activities and moving to a hydrocarbon free process system 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 the most appropriate 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, however, justify a standalone review. If the decision is taken to move away from QRA, a meeting and discussion with the HSE prior to submission of the safety case should be considered.

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. It is foreseeable that during decommissioning, some areas of the installation will have a lower hazard potential than during the operational/production phase.

The following table gives some examples of SECE which may change post cleaning and flushing:

Table 2: Examples of Changes in SECE [2017, McKay]

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) Persons on Board (POB)
Structure	Required. No change

Activities undertaken during EoL or decommissioning can involve procedures which are non-standard for the existing crew on the platform, and can also involve more parties (e.g. sub-contractors). There may therefore be an increased potential for human error during decommissioning. The duty holder should ensure a structured methodology is in place for identifying safety critical tasks and underlying human failure analysis of these safety critical tasks during EoL and decommissioning activities.

GUIDANCE SECTION 5: LESSONS LEARNT FROM TECHNICAL EXCHANGES

This section includes a list of lessons learnt by operators while making changes to their offshore safety cases and while carrying out decommissioning and dismantling activities. Not all of the learning points are directly related to offshore safety cases, but may be useful for decommissioning, so are included in the guidance.

The following are some of the key lessons learnt:

- Be pro-active in communicating with the regulator. Engage with the regulator early on, sharing plans for decommissioning to get feedback.

  For instance, it is important that the duty holder understands the regulator‘s interpretation of what constitutes a material change, and, therefore, a safety case submission.

- Ideally plan for decommissioning early, developing a baseline plan to try and reduce wasted effort and costly mandatory revisions to operational safety cases and supporting studies.

  Operators typically start to develop their decommissioning plans two to three years before cessation of production. It is essential that the duty holder’s safety case submission is complete and addresses all decommissioning activities including changes in vessel movements. If the number and /or the size of vessels attending the installation changes significantly and has not already been addressed (potentially as a sensitivity study), the duty holder may have to make multiple safety case submissions to the regulator, incurring additional effort and costs.

- Engage contractors early to avoid last minute changes in how activities involved in decommissioning are carried out (e.g. number and size of vessels) as these might require a safety case rewrite. The challenge is to freeze the engineering scope.

  Freezing the engineering scope allows the appropriate risk assessments to be carried out, and is key to smooth submission of safety case changes.

- It is important to maintain the correct safety culture and awareness of process safety risks during decommissioning when there may be significant changes in crew make up and numbers. (Weekly sessions can provide a mechanism for engagement and communication, particularly about process safety hazards).

  As personnel leave an installation to join other operating platforms, and decommissioning contractors are employed, there is a risk that the safety culture, ingrained in the operator’s personnel is not adequately transferred to the new personnel. While contractor personnel will be familiar with their own safe systems of work, they need training in the duty holder’s safety regime. The process safety hazards present during operation will be different from those encountered in decommissioning.
  Avoid adopting a lesser standard for different phases in the lifecycle of an installation.

  For instance, companies may wish to arrange helicopter flights from a different regulatory sector in later phases of decommissioning. However, these different sectors have different standards from the UK for emergency breathing systems for offshore helicopter occupants. They must comply with the UK regulations regardless of where they are flying from.

- Ensure there is interaction between the different verifiers (Independent Competent Person, ICP, marine warranty surveyor etc.) so that all equipment is covered by verification and there are no gaps.

  The verification scheme in place is agreed between the duty holder and the verifier, and presented to the regulator. By thinking through the activities required in decommissioning, duty holders may recognise that the verification scheme may not need to appear the same as the original operational verification scheme. They can then have a

verification scheme in place which minimises material changes, and allows for rapid changes as the preparation for dismantling progresses.

SECE may be removed or reduced in scope during decommissioning. However, SECE may also be added, for example as additional vessels may come alongside for extended periods of time during decommissioning, which may introduce additional SECE relating to dynamic positioning, anchoring, gangway etc.

When creating decommissioning procedures, try and alter corporate procedures to include decommissioning aspects rather than creating new, project – specific procedures which may be in conflict with the corporate operational procedures and will be less well known by core crew.

GUIDANCE SECTION 6: CASE STUDIES

This section of the guidance includes case studies and describes in more detail two companies' experience of decommissioning and how they managed their safety case submissions.

The installations were significantly different from each other. – One being a single, gravity – based jacket; the other being a single, eight legged steel jacket. The dismantling methods adopted were also different. In one case dismantling was achieved via a single lift; in the other, dismantling was carried out via reverse installation of circa 30 modules.

In case study A, the duty holder retained their own safe system of work throughout decommissioning. Changes in MAH profiles meant that the operator reviewed the relevance of SECE regularly, in cooperation with the ICP. Frequent meetings with the ICP to review changes to SECE, 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, SECE and performance standards were documented and included within the safety case.

In case study B, the duty holder adopted the contractor's safety management system. The impacts to SECE were managed in each phase through completion of performance standard impact assessments which were conducted after every HAZID, HAZOP or PFEER assessment (per phase). This effectively managed the SECE in line with changes to the MAHs as they occurred. This process meant that SECE were either reduced in performance requirements or eliminated altogether. In some instances new SECE were identified in line with the scopes of work that the removal or dismantlement contractors were introducing.

Further details on both these case studies are included in the guidance.

CONCLUSIONS

This paper discusses the 'Guidance for UK Safety Case Management during End of Life (EoL), Decommissioning and Dismantling'; a document which offers practical advice on maintaining compliance with the safety case regulations (SCR 2015) during EoL, decommissioning and dismantling of offshore platforms.

As part of the JIP, companies willingly shared their experiences so that others do not have to go through the same learning curve.

The guidance provides a list of lessons learnt by operators while making changes to their offshore safety cases and while carrying out decommissioning and dismantling activities, which may be useful for other operators engaged in decommissioning.

The paper emphasises that the guidance document is not intended as a substitute for SCR 2015, or the HSE guidance on SCR 2015 (L154), but offers practical lessons learned on maintaining compliance during EoL, decommissioning and dismantling based on present experience of offshore operators. The guidance should be read alongside SCR 2015, and existing guidance (L154).

Companies concerned with decommissioning offshore installations and maintaining safety case compliance are encouraged to download a free copy of the guidance.

REFERENCES

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