



FORWARD

This handbook has been developed by a working group within the Decommissioning Forum which is a part of Norsk olje og gass.

The Handbook is owned by Norsk olje og gass.

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1. Introduction

Norwegian Oil & Gas has recognised that decommissioning in the Norway Continental Shelf (NCS) is becoming a major part of the industry and needs coordination in order to provide timely advice to the Norwegian Government and provide a consistent voice from the industry on decommissioning matters.

The Norsk Oil & Gas Decom Forum has had several strategic focus areas where groups have been working on these and one of them covered the requirement for a standard WBS/CBS structure for estimation of decommissioning.

After a review, the group working on the standard WBS/CBS structure decided the most logical way forward was to implement the OGUK guideline for decommissioning cost estimation. One of the major reasons behind this was the aim to have one common standard for both the UKCS as well as NCS so allowing a better understanding of estimates as well as a better basis for benchmarking.

The result is that the first issue of this Decommissioning cost estimation guideline is based on the OGUK guideline for decommissioning cost estimation, October 2019.

As experience in decommissioning develops across operators, it is recommended that these Guidelines are reviewed periodically. Norwegian Oil and Gas will work closely with OGUK in relation to any reviews of the standard guideline on decommissioning cost estimation.

Abbreviations used in this document are listed in Appendix 1.



2. Objectives of the Handbook

This handbook are advisory and should not be regarded as prescriptive: they are intended to outline best practice, based on industry experience. The objectives of the handbook are to provide:

- A template or framework against which operators can independently develop comprehensive decommissioning cost estimates with a high degree of consistency
- A common basis for data provided to OGUK as may be required for their Annual Decommissioning Insight Report
- A basis for establishing greater confidence in decommissioning costs estimates used in asset valuations for purposes of asset acquisition or disposal (Security Agreements, etc)
- A better means of comparing estimates from different sources (eg third parties such as operators, partners, contractors, etc)
- A potential framework for future benchmarking

3. Application of the Handbook

This handbook is intended to assist in the development of decommissioning cost estimates for offshore oil and gas facilities on the NCS.

Decommissioning cost estimates are required throughout the development life cycle for:

- Initial field economics
- Calculation of the decommissioning provision/asset retirement obligation (ARO) during the field life
- Decommissioning security agreements towards the end of field life
- Planning the cessation of production and the preparation of the decommissioning plan
- Comprehensive decommissioning cost estimation for the decommissioning project

The level of definition will change as the project progresses through the project life cycle.

These guidelines are not intended to provide the specific estimating methodology employed, although market rates and escalation must be clearly stated for a cost estimate to be properly understood. Each operator has internal cost estimation procedures that will be applied.

This document aims to provide a high-level overview of the elements that make up the scope of a decommissioning project, and the activities within each element for which costs should be allowed. Although the list of items shown within the WBS is comprehensive, every decommissioning project is unique and there may be other activities required. This WBS is intended to act as a guide only. It is not intended to be a detailed project management tool and operators retain the freedom to deviate from the WBS to ensure fitness for purpose for any given project, or to fit business needs.

The following pages give a brief description of the work items that fall under each element of the WBS. It should be noted that these categories are not sequential and may not be part of a continuous process. Some categories may be concurrent, but not all may be required.

It is recognised that the given cost elements will frequently be represented as activities embedded within a conventional WBS. This document does not attempt to outline the overall hierarchical structure, standards such as ISO 190081 are a recognised starting point for this.

4. Work Breakdown Structure – Scope Definition

4.1 Project Management

Throughout the various elements of a decommissioning project, operators will need a core team to manage the day-to-day activities and as such project management remains integral to all elements of the WBS. This core team will fluctuate over time in proportion to workload and when different areas of specialisation are required.



This element of the WBS includes the preparation of the Comparative Assessment (CA) when required for derogation to OSPAR, Impact Assessment (IA), and Decommissioning Plan (DP) as well as any supporting studies required throughout the project. These studies are undertaken by personnel within operators and practitioners who gather information to make robust decisions for decommissioning projects from safety, technical, environmental, societal and economic perspectives.

Decommissioning projects cover a broad range of activities. As a result, there are many regulations and regulators involved throughout the process to ensure safe and effective decommissioning. Management of the permits, licences and consents relating to the decommissioning project is crucial in supporting the schedule. This is covered under this section of the WBS.

Activities included in this element are establishing the core project management team, partner and stakeholder interaction, studies to support the DP and scope definition, method development, any required updates to the QRA, and preparing the DP.

Company overheads related to the project, project insurances, compliance and verification costs, contributions to any Trust Funds, project tendering and any paid study work should also be included in this WBS element.

In relation to cross border projects, especially covering UKCS, the following additional types of costs should also be included in this section:

- Preparation of Comparative Assessment (CA)
- Preparation of any additional decommissioning programmes
- Completion of close out reporting to the regulator
- Fees payable to the regulators regarding review of Decommissioning Programme
- Any other fees payable to various organisation in support of permit applications

The contractors awarded scopes of work throughout a decommissioning project will have project management with their associated activities. This “contractor project management” should be included in each respective WBS element as necessary.

4.2 Post Cessation of Production Running costs

When a producing facility has reached the end of its economic life, operators can apply to the MPE for Cessation of Production (CoP). In this application, operators are required to satisfy the regulator that all economic development opportunities relating to a field have been exhausted (including alternative use).



Post-CoP running cost refers to operational expenditure after the termination of production on the platform. CoP does not mean that all work on an installation is stopped. Activity on a facility

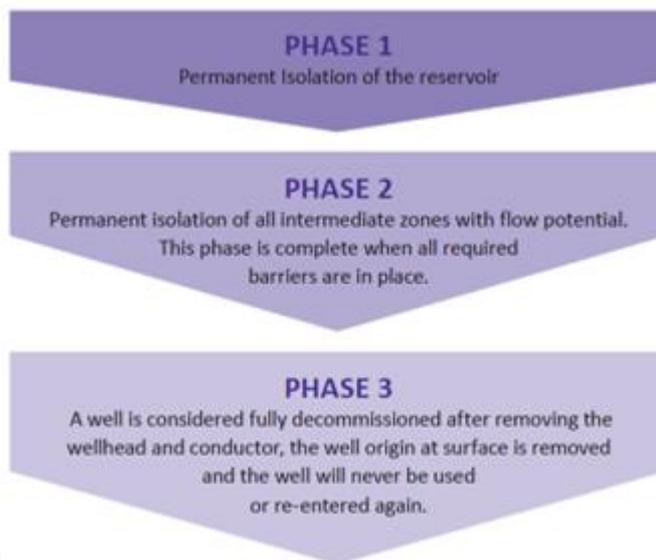
will continue until all major hazards have been removed, e.g. isolation of wells or removal of hydrocarbons. Costs associated with this element of the WBS will stop when the topsides are removed.

Post cessation of production activities and costs will include the platform offshore and onshore support teams, diesel and other fuels, integrity management, inspection and maintenance activities and other costs associated with routine operation of the installation such as power, water, air, etc. Logistics (flights, supply vessels, etc.) and accommodation costs for the continued operation of the installation should be allocated to this WBS element.

There are occasions where even though native production has terminated an installation may need to remain operational to provide support to other infrastructure. This may be as a pumping conduit for hydrocarbons or to maintain important utility systems to support other infrastructure. Costs for these types of activities would typically be allocated to operational expenditure rather than the decommissioning project as abandonment expenditure.

4.3 Well Decommissioning

Well decommissioning is the permanent isolation of any rock formations with flow potential and the restoration of a seabed to its previous status. There are three phases of well decommissioning:



Well decommissioning is conducted by a team of highly skilled personnel who will engineer specific activities for each well bore and then carry out the decommissioning work scopes. These work scopes are normally carried out using one of the following methods:

- Subsea wells: Using a jack-up or semi-submersible drill rig, or in some instances Lightweight Well Intervention Vessels (LWIV)
- Platform wells: Using a jack-up, the existing drilling rig on an installation (which may require upgrades to make it fit for purpose); or using purpose-built, modular equipment installed specifically for well decommissioning

Each well is different and a thorough review of the well records from previous operations is essential in ensuring a successful well decommissioning campaign. Issue 6 of the OGUK Well

Decommissioning Guidelines also provides best practice guidance based on recent North Sea activity.

Activities included are any necessary rig reactivation and upgrades, the completion of studies to support well programmes, de-risking by conducting well integrity tests, well suspension (spread rate/duration), and any activities to support phases 1, 2 and 3 of the well decommissioning. For example: drilling fluids and services, cementing services and products, logging services, wellhead and tree services, casing milling, casing/tubing retrieval services, rig placement surveys, fishing services, conductor recovery, cleaning, recycling and associated waste management, and vessel hire. The onshore and offshore wells project team and any logistics to support specific well decommissioning activities should also be included in the WBS element.

4.4 Facilities and Pipelines Permanent Isolation and cleaning

The platform and pipelines used to recover and transport the hydrocarbons must be isolated and cleaned. This involves ensuring any pressure sources are neutralised and that the installation is free, as far as reasonably practicable, of hydrocarbons and contaminants.



Topsides cleaning activities involve the flushing of process equipment from platform wells and topsides pipework. It may also include entering pressure vessels on the installation to manually clean or to remove any solid material. The level of cleaning required on an installation depends on the removal methodology, as there may be opportunities to carry out much of the cleaning and decontamination as part of the onshore disposal.

In compliance with regulations, pipeline cleaning programmes are designed to ensure the hydrocarbon content and any deposits within the pipeline are sufficiently cleaned, taking into account the future DP and without prejudicing any opportunities for potential reuse.

Facilities and pipeline isolation and cleaning activities included in this WBS element are draining, flushing, purging, venting, physical isolation, cleaning, pipeline pigging, recycling and associated waste management. The cleaning activities associated with flowlines which are tied into wells is also to be included in this WBS element.

4.5 Topsides Preparation

Once all sources of energy have been isolated, preparations can be made to manage the topsides in its interim status. Activities to upgrade or re-engineer the facilities on the platform are included in this part of the scope. Such as; power upgrades to the installation to meet the decommissioning requirements; crane upgrades; module process/utilities separation; dropped object surveys; and subsequent remedial actions. Additionally, if a structure is to become a Not Normally Attended (NNA) for any period of time, navigational aids may be installed during this phase.



4.6 Topsides Removal

During a decommissioning project, all topsides must be removed. There are three principal methods for achieving this:

- Single-lift – Using a large lift vessel to remove the topsides as a single unit and transport onshore
- Reverse installation – Separation of modules on the installation and removed by the lift vessel one by one



- Piece-small removal – Breaking the topsides into small pieces offshore and transporting the waste to shore for disposal

Selection of the removal method will generally be on the basis of the removal contractors' proposals although operators should determine a removal strategy for the topsides to eliminate unnecessary work in other WBS elements. Hybrid options of the above could also be adopted should they be feasible.

Once the methodology for removal is confirmed the topsides can be prepared for lifting. Structural engineers and lift experts are required for this phase of the work scope. Their activities may entail lift-point installation or re-instatement and structural strengthening for transportation. Other activities included are vessel operations, sea-fastening, transportation and load-in.

4.7 Substructure Removal

Once the topsides have been removed, the removal of the substructure can take place. Substructures vary considerably in terms of their shape and size depending on the water depth and the size of the topsides they were designed to support.



Substructures can be either concrete gravity based (CGB) or steel piled jacket structures (SPJ). CGBs are large reinforced concrete structures which are constructed in near-shore locations and floated to site. SPJs are steel structures which consist of a lattice of steel circular hollow sections welded together. These jackets are fabricated onshore and can be installed from a barge, made buoyant and floated to site, or installed using a lift vessel.

The removal CGB and SPJ substructures may be subject to CA conducted as part of WBS element 1. All removal activities relating to these structures should be included in this element of the WBS. CGB removal activities may include appurtenance removal. Removal of SPJ structures can be conducted either by single-lift or by cutting the structure into sections and transporting back to shore to for recycling. Prior to cutting and lifting, tasks such as reinstatement of lift points and strengthening for transportation will be carried out by contractors. Activities such as pile cutting, and removal of associated mud mats should be allocated in this WBS element.

Activities included in this WBS element are removal preparation, structure removal, vessel hire and operations, sea-fastening, transportation and load-in. The removal of FPSO's including associated moorings and anchor chains should also be included in this WBS element.

4.8 Topsides and Substructure Onshore Disposal

Once topsides and substructures are transported to shore, they are managed under the waste hierarchy, considering re-use, recycling or disposal. Owners of oil and gas infrastructure have a duty of care which enforces the responsible handling of infrastructure from construction to final disposal.



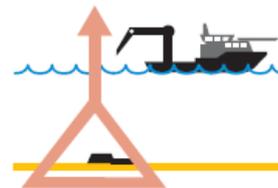
Due to the nature of oil and gas production, some of the materials and fluids in a facility being decommissioned may be contaminated (e.g. NORM or LSA). Therefore licences, controls, mitigations, handling and disposal methods have been established to manage and dispose of such wastes. Once the infrastructure is onshore, the disassembling and processing takes place on licensed sites in accordance with an approved waste management system.

Activities included are cleaning and handling of hazardous waste, regulatory approvals for transboundary shipments of waste, dismantling, re-use, recycling and associated waste management.

Scrap value credits for re-used or recycled materials are sometimes shared with operators by the disposal contactors. Any savings associated with scrap value should be considered in this WBS element.

4.9 Subsea Infrastructure

Included in this element are removal or remediation (i.e. trench and burial or rock cover) activities for pipelines, cables, bundles, risers, mattresses and subsea structures. Vessel hire and operations, sea-fastening and transportation, load-in, recycling and associated waste management must also be considered. Prior to any removal activities, pipelines may require to be cleaned. Flushing and cleaning activities are included in WBS element 4.



4.10 Site Remediation

Once the decommissioning of the wells, topsides, substructures, pipelines and associated subsea infrastructure have been completed, operators are required to ensure that the seabed is made safe for other users of the sea. This involves the removal of any debris remaining around the facility as agreed within the DP.



Activities included are oil field debris clearance around structures and pipeline corridors, and recycling and associated waste management.

4.10 Post Decommissioning Monitoring

Monitoring programmes are required for any infrastructure that is left in place as agreed in the DP. Surveys will be conducted to check the status of infrastructure and assess changes over time to ensure no increased risk to other users of the sea. The programme requires the first monitoring three years after site remediation followed by another survey three years later. However, if there are significant drill cuttings piles there may be requirement for further surveys.



Activities included are the maintenance of any navigation aids that have been installed and establishing monitoring programme for any facilities or infrastructure that remains.



5. References

OGUK Guideline on Decommissioning Cost Estimation, published October 2019

Appendix 1 – Abbreviations

Abbreviation	Definition
ARO	Asset Retirement Obligation
CA	Comparative Assessment
CBS	Cost Breakdown Structure
CGB	Concrete Gravity Based Structure
CoP	Cessation of Production
DP	Decommissioning Programme
EA	Environmental Assessment
FPSO	Floating Production and Offload
LWIV	Lightweight Well Intervention Vessel
LSA	Low Specific Activity
MPE	Ministry of Petroleum & Energy
NCS	Norwegian Continental Shelf
NNA	Not Normally Attended
NORM	Normally Occurring Radioactive Material
OGUK	Oil & Gas UK
OPEX	Operational Expenditure
SPJ	Steel Pile Jacket
QRA	Quantitative Risk Assessment
UK	United Kingdom
UKCS	United Kingdom Continental Shelf
WBS	Work Breakdown Structure

Appendix 2 – High Level Decommissioning Work Breakdown Structure

