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# COST ESTIMATE CLASSIFICATION SYSTEM – AS APPLIED IN DECOMMISSIONING FOR THE OFFSHORE PETROLEUM EXPLORATION AND PRODUCTION INDUSTRIES



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TCM Framework: 7.3 – Cost Estimating and Budgeting

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Any terms found in AACE Recommended Practice 10S-90, *Cost Engineering Terminology*, supersede terms defined in other AACE work products, including but not limited to, other recommended practices, the *Total Cost Management Framework*, and *Skills & Knowledge of Cost Engineering*.



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## 1. PURPOSE

As a recommended practice (RP) of AACE International, the *Cost Estimate Classification System* provides guidelines for applying the general principles of estimate classification to project cost estimates (i.e., cost estimates that are used to evaluate, approve, and/or fund projects). The *Cost Estimate Classification System* maps the phases and stages of cost estimating together with a generic scope definition maturity and quality matrix, which can be applied across a wide variety of industries and scope content.

This recommended practice provides guidelines for applying the principles of estimate classification specifically to decommissioning for offshore petroleum exploration and production (E&P) industries. It supplements the generic cost estimate classification RP 17R-97 [1] by providing:

- A section that further defines classification concepts as they apply to decommissioning in the offshore E&P industries.
- A chart that maps the extent and maturity of estimate input information (project definition deliverables) against the class of estimate.

As with the generic RP, the intent of this document is to provide common terms to improve communications among all the stakeholders involved with planning, preparing, evaluating, and using project cost estimates specifically for decommissioning in the offshore E&P industries.

The overall purpose of this recommended practice is to provide the offshore E&P industry with a decommissioning definition deliverable maturity matrix that is not provided in 17R-97. It also provides an approximate representation of the relationship of specific design input data and scope deliverable maturity to the estimate accuracy and methodology used to produce the cost estimate. The estimate accuracy range is driven by many other variables and risks, so the maturity and quality of the scope definition available at the time of the estimate is not the sole determinate of accuracy; risk analysis is required for that purpose.

This document is intended to provide guideline, not a standard. It is understood that each enterprise may have its own project and estimating processes, terminology, and may classify estimates in other ways. This guideline provides a generic and generally accepted classification system for the E&P industries that can be used as a basis to compare against. This recommended practice should allow each user to better assess, define, and communicate their own processes and standards in the light of generally accepted cost engineering practice.



## 2. INTRODUCTION

For the purposes of this document, the term *petroleum exploration and production industries* is assumed to include firms encompassing "all the steps involved in finding, producing, processing, transporting, and marketing of oil and natural gas." [2]

The term decommissioning is defined as a group of activities that "takes place after deactivation and includes surveillance and maintenance, decontamination, and/or dismantlement. These actions are taken at the end of the life of a facility to retire it from service with adequate regard for the health and safety of workers and the public and protection of the environment. The ultimate goal of decommissioning is unrestricted release or restricted use of the site." [3]. This may include remediation of the site to its natural state. Decommissioning often occurs at the last stage of an asset's life cycle, known as the termination phase per the *Total Cost Management (TCM) Framework* [4] definition. Decommissioning is not expected to generate revenues or other improvements, but to consume capital from the enterprise during the termination program or project.

The economic life of an offshore structure may be extended by reducing operating costs (e.g., through divestment, unitization, or improved production efficiency) or by increasing hydrocarbon throughput through investment. However, all offshore structures will ultimately reach the end of their economic life and require decommissioning and removal. [5] Strictly considering offshore oil and gas facilities, decommissioning refers to "the process of removing the infrastructure and equipment used in the exploration and production of oil and gas in the marine environment." [6]

The common thread running through the decommissioning industry is the need to comply with statutory requirements, which include technical assessment, accounting standards [7], circular economy opportunities, public consultation, safety of the operations, and environmental appraisal. Due to concerns related to environmental issues, governments around the world have acted to establish increasingly stricter rules to discipline offshore decommissioning activities, putting pressure on the costs and budgets of oil and gas companies. Part of the information related to the statutory requirements makes up the key deliverables to determine the degree of project definition and thus the extent and maturity of estimate input information.

This recommended practice is intended to cover the decommissioning of E&P assets, including fixed platforms, wells, subsea systems, floating facilities, pipelines, and other long-term associated offshore structures. Temporary facilities or equipment deployed during early-phase seismic or exploration activities fall outside the scope of this document. This RP is limited to offshore decommissioning activities, and neither covers studies that require asset valuation methods, such as divestment options, nor downstream production facilities.

Decommissioning contrasts to the original engineering, procurement and construction estimates which are covered in AACE RP 87R-14, Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Petroleum Exploration and Production Industries [8]. A decommissioning project may require some investment in adjacent or connecting operating facility modification projects that the team may need to coordinate with and for which RP 87R-14 may apply.

This guideline reflects generally accepted cost engineering practices, including those outlined in the *Total Cost Management (TCM) Framework*, and uses AACE terminology. [9] This RP provides a general and generic framework that covers all decommissioning phases. Despite its comprehensive scope, it is advised cautious application in the following situations:

- When applying this RP to decommissioning cost estimates that may or will supply information for financial accounting, reporting and assurance (e.g., bonding), the estimator should consult the entity's financial department. Liability associated with the retirement of a tangible, long-lived asset, such as a fixed offshore platform, is considered an asset retirement obligation (ARO). The Financial Accounting Standards Board (FASB) [10] and the International Financial Reporting Standards Foundation (IFRS Foundation) [11] are independent organizations that establish standards for ARO (or provision, as called in IFRS IAS 37) [12] recognition, respectively, in the United States and the rest of the world.
- When applying this RP to decommissioning cost estimates that may or will be used to address regulatory agencies' requirements and reporting, the estimate development process must consider and comply with local authorities and legislation requisites.
- When addressing disputes arising from interface with parties such as governments (over requirements and scope), business partners (over relative responsibilities), and so on.

Overall decommissioning activities, and specifically related to E&P offshore assets, are covered by international standards of code of accounts such as International Cost Management Standard (ICMS) [13] with a level 2 category 'End of Life (EC)' which consolidates lower-level activities such as disposal inspection, decommissioning and contamination, demolition and reclamation, etc., and ISO-19008 Standard Cost Coding System (SCCS) specific for oil and gas production and processing facilities [14]. The latter uses a faceted classification based on physical assets

identified in a physical breakdown structure (PBS), decommissioning activities identified in a standard activity breakdown (SAB), and resources identified in a code of resource (COR), that includes decommissioning features, such as SAB phases for shutdown, decommissioning, and removal.

Historical cost databases and external benchmarks are commonly used for developing and validating estimates, particularly at early stages of the project. Organizations are encouraged to assess the benefits of integrating these standards into their estimating practices.

## 3. COST ESTIMATE CLASSIFICATION MATRIX FOR DECOMMISSIONING IN THE E&P INDUSTRIES

A purpose of cost estimate classification is to align the estimating process with project stage-gate scope development and decision-making processes.

The decommissioning industry does not hold a universally accepted concept of stage-gates in front-end definition as widely recognized in the capital project world. In capital projects, the length of each stage is a function of the project definition effort required in that stage, culminating in a cost estimate. The cost estimate accuracy improves within each succeeding stage as the scope is better defined and the risks treated.

In the absence of a universally standardized stage gate approach for decommissioning projects, this RP aligns estimate classes to the cessation of production (CoP) landmark. CoP is a universal asset life cycle milestone that is common to the industry. This document describes three key phases, and two intermediate transition stages aligned with five estimate classes (plus one long-term class) to maintain consistency with other industry-accepted classification system RPs. [15]

### 3.1. Decommissioning Scope Development Phase

*3.1.1. Prospective Phase*

The prospective phase typically begins before the assignment of an exclusive decommissioning project team and effort, up to 20 or more years before CoP. This phase has an extensive time duration and can be divided into two subphases, described below.

3.1.1.1. Prospective Long-Range

The first subphase typically begins at early economic evaluations that can be performed at the exploration and appraisal phases, and extends through the capital investment or initial operating phase of the asset. During this subphase, estimate requirements are commonly driven by long-range capital budgeting, asset life-cycle planning, financial assurance mechanisms (e.g., bonding), and the recognition of liabilities associated with the retirement of long-lived assets (e.g., ARO/provisions).

An owner should develop a cost estimate supporting ARO to meet legal and accounting obligations. Due to the impossibility of understanding the platform's future structural conditions, including the risks and uncertainties associated with the decommissioning process, the cost estimate supporting ARO must rely substantially on assumptions. A sample cost data source for this phase is available through BOEM [17]. It provides p50, p70, and p90 decommissioning cost estimates to determine whether supplemental financial assurance is needed. Nevertheless, the cost estimate should follow good practices and well-known methodologies.

Special attention must be given to how changes in the project's scope definition and technology are managed. Refer to Section 8, *Classification for Long-Term Planning and Asset Life Cycle Cost Estimates*, for further information.

3.1.1.2. Prospective Mid-Range

The project enters the next subphase when the owner conducts a strategic assessment of the asset termination, and a pre-decommissioning project effort begins, approximately five years before CoP. Many internal and external uncertainties are still present, although not as potentially disruptive as in the previous subphase. One of this stage's goals is to assess termination options for the asset, such as removal, divestment, or alternative uses in a high-level appraisal. This stage encompasses early discussions with local authorities to support more detailed decommissioning planning. This stage also includes discussions with operations, including those of adjacent and connecting facilities that will continue in operation, which in some cases, may need to be modified.

This subphase excludes specific decommissioning activities, but addresses initial decommissioning issues and sets the conditions required for later project initiation. This subphase can result in material changes to the previously assumed decommissioning scope. Depending upon the organization's procedures and applicable standards, an adjustment to the decommissioning estimate may be required.

*3.1.2. Transition between the Prospective and the Retrieval Phases*

During this first transition stage, about five years from CoP, a project team is typically designated exclusively for the decommissioning effort. Some of the transition phase's objectives are performing early project activities and retrieving critical documentation to develop a conceptual plan for decommissioning, including interface with any work on adjacent or connecting facilities. In this sense, plausible decommissioning alternatives are further developed and analyzed.

Operators begin addressing issues with local government entities, such as regulators, maritime authorities, environmental agencies, and other legal entities or interested parties. These interactions can result in scope development, adjustments to cost estimate requirements.

At the end of this phase, the operator selects a preferable decommissioning alternative for further development. Previous information provided for accounting purposes may be updated, depending on the organization's policies.

*3.1.3. Retrieval Phase*

The retrieval phase is less than five years from CoP, and the designated project team performs the last planning-related decommissioning activities before project sanction. All the required documentation is retrieved, and the selected decommissioning alternative is further developed and analyzed.

Operators are addressing issues and commitments with the local government entities, such as regulators, maritime authorities, environmental agencies, and other legal entities, to qualify for decommissioning execution and submit a final version of the decommissioning plan to support project sanction. These efforts result in estimating requirements to support project sanction. Some organizations may use information available at this stage to compare or reassess ARO provisions.

Estimates in this phase can be used as the initial baseline and support for change control by owners until superseded by the updated project control estimate developed in the next phase.

*3.1.4. Transition Between the Retrieval and the Investigative/Execution Phases*

The second transition stage, within 2 years before or after CoP, can occur before the bidding process or at the beginning of the awarded decommissioning contract.

Stakeholders may initiate preliminary detailed engineering to address relevant issues, update project information based on technical site visits, and conduct surveys to reduce any significant remaining scope uncertainties.

All new information will typically be used by the contractor to develop a detailed control baseline and to update the owner's previous control baseline to monitor variations to the budget and form part of the change management program.

*3.1.5. Investigative/Execution Phase*

The investigative/execution phase, the last stage, occurs when decommissioning activities are under execution by the contractor, and the removal scope is considerably detailed. Typically, estimates in this stage are requested to address discrete sections of the project, such as a subcontract for bidding or an owner and contractor bid checking, supporting change management, or analyzing and resolving claims and disputes.

**3.2. Cost Estimate Classification Matrix**

Table 1 provides a summary of the characteristics of the six estimate classes. The maturity level of project definition is the sole determining (i.e., primary) characteristic of class. In Table 1, the maturity is roughly indicated by a percentage of complete definition; however, it is the maturity of the defining deliverables that is the determinant, not the percent. The other characteristics are secondary and are generally correlated with the maturity level of project definition deliverables, as discussed in the generic RP [1]. The specific deliverables, and their maturity or status are provided in Table 3. The post sanction (post funding authorization) classes (Class 1 and 2) are only indirectly covered where new funding is indicated. Again, the characteristics are typical but may vary depending on the circumstances.

| | | *Primary Characteristic* | *Secondary Characteristic* | | |
|---|---|---|---|---|---|
| **ESTIMATE CLASS** | **Approximate Stage Timing and Phase** Expressed as time before/after the start of cessation of production (CoP) and scope development phases | **APPROXIMATE MATURITY LEVEL OF SCOPE DEFINITION OF DELIVERABLES** Expressed as percentage of project definition | **End Usage** Typical purpose of estimate | **METHODOLOGY** Typical estimating method | **Expected Accuracy Range** Typical variation in low and high ranges at an 80% confidence interval |
| **Class 10** | Decades before CoP Phase: Prospective Long-Range | 0% to 2% | Asset life cycle planning, initial ARO, economic studies | Capacity factored, parametric models, adjusted industry benchmarks, judgement or analogy | N/A |
| **Class 5** | > 5 years before CoP Phase: Prospective Long-Range / Prospective Mid-Range | 0% to 2% | Asset life cycle planning, initial ARO, ARO reviews, economic studies | Capacity factored, parametric models, adjusted industry benchmarks, judgement, or analogy | L: -20% / –50% H: +30% / +100% |
| **Class 4** | ≈ 5 years before CoP Phase: Transition Prospective to Retrieval | 1% to 15% | Preliminary budget indication, initial regulatory requirements, ARO reviews | Parametric models, or rough semi-detailed unit costs | L: -15% / –30% H: +20% / +50% |
| **Class 3** | < 5 years before CoP Phase: Retrieval | 10% to 40% | Funding authorization, ARO reviews, regulatory requirements | Semi-detailed unit costs, detailed costs with scope adjustments | L: -10% / –20% H: +10% / +30% |
| **Class 2** | 2 years before or after CoP Phase: Transition Retrieval to Investigative/Execution | 30% to 75% | Bid support, project control | Detailed unit cost with forced detailed take-off | L: -5% / –15% H: +5% / +20% |
| **Class 1** | From CoP onward Phase: Investigative/Execution | 65% to 100% | Check estimate or bid/tender | Detailed unit cost with detailed take-off | L: -3% / –10% H: +3% / +15% |

**Table 1 - Cost Estimate Classification Matrix for Decommissioning in the Offshore Petroleum Exploration and Production Industries**

This matrix and guideline outline an estimate classification system that is specific to decommissioning in the offshore E&P industries. Refer to Recommended Practice 17R-97 [1] for a general matrix that is non-industry specific, or to other cost estimate classification RPs for guidelines that will provide more detailed information for application in