

Review of the Practical Cost Estimations for Decommissioning of Nuclear Facilities

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1. Introduction

Decommissioning cost estimation is not a new practice and in fact has been ongoing since the early 1970s. Only recently have efforts been made to standardize cost estimation formats to facilitate reviews and ensure completeness. The cost for decommissioning of nuclear facilities is no longer a simple arithmetic calculation based on power and size, but has been based on the actual inventories of materials and radioactivity for each unit together with a realistic project organization and planning. This paper is intended to discuss from a literature point of view and facilitate the cost estimation for decommissioning of nuclear facilities.

2. The current practices of cost estimation for decommissioning of nuclear facilities

2.1 Approaches to cost estimation

Figure 1 shows the categorized approaches to cost estimating. The activity-dependent costs are complemented by period-dependent costs. Collateral costs are included. All costs are adjusted for industrial standard contingencies to achieve a best estimation.

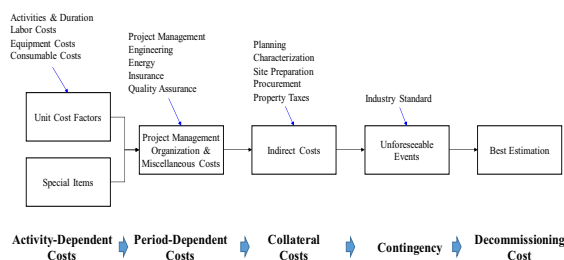


Fig. 1. A schematic flow for decommissioning estimation.

2.2 Elements of cost estimation

There are four basic elements to a cost estimation: basis of estimation, structure of estimation, work breakdown structure and schedule and uncertainty analysis.

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2.4 Schedule of cost estimation

The duration of a decommissioning project affects its cost importantly through the period-dependent costs and the selected technology for the activity-dependent work. The project schedule is an integral part of a detailed cost estimation. These two interrelated elements must be maintained in balance when preparing an overall cost and schedule estimation.

3. Major drivers of decommissioning costs

3.1 Major cost drivers

There are categorized cost drivers from literature: general circumstances, basic project assumptions, cost estimation model, assumptions for waste management, and technical assumptions.

3.2 Observations on completeness

A basic attribute of any estimation is that it is a complete representation of the work to be performed. Decisions regarding the adequacy of funds to pay for decommissioning can only be based on a sound, comprehensive cost and schedule analysis. While all estimators attempt to deal with absolute values related to the planned activities to be performed and the anticipated schedule to be met, the reality of the situation is that the work involves some uncertainty. Some of the uncertainty within the defined project scope can be accounted for by allowances based on best available information. Other uncertainties within the defined scope can be accounted for by contingency funds that are fully expected to be incurred and spent. Uncertainties dealing with probabilistic events are best handled within a risk analysis based on experienced judgement of the lowest, most likely, and highest cost of each item of the baseline cost. The risks analysis allows the estimators to visualize the importance of the major drivers through the sensitivity analysis.

3.3 Observations on accuracy

No estimation can be 100% accurate since the estimator is attempting to anticipate virtually every planned activity, problem area and potential resolution for issues that can change from numerous external causes. Allowances, contingencies and risk analyses are used to account for these potentially changing conditions to ensure sufficient funds will be available to safely perform the work. Most countries accept this fact and allow for periodic updates every three to five years not only to account for inflation, escalation and regulatory changes, but also to incorporate new technologies and techniques to improve the safety and cost effectiveness, and to shorten the schedule.

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