

Risk Informed Economic Assessment for the Decommissioning Project

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1. Introduction

The purpose of the economic assessment of a project is to see if it is feasible to move on to the next stage. By the way, the methodologies so far we have used are just to demonstrate the net present value of the project is greater than or equal to “0”. With this methodology, the value could be calculated with a fixed discount rate and capacity factor reflecting all the risks in the course of the project life. Hence, risks brought up in the life of the project have not been considered in a proper manner.

In this article, we introduce the methodology to embrace the risks as expenses factors on top of capital, maintenance and operation costs. In order to assess the project value with regard to risks in a different manner, it is essential to know what the risk management are.

2. Risk Management

Risk management is a series of process to minimize the impact of unfortunate events or to maximize the realization of economic values such as identification, evaluation, prioritization and coordination. Thus it is necessary to consider the integrated approach to maximize risk reduction (ISO 31000). In this article, we extract risks which can be brought about in the course of decommissioning process and suggest how to reflect those risks as cost factors.

3. Decommissioning Risks

Generally decommissioning consists of four periods: Preparation for decommissioning activities, Safe Storage, Decontamination and Dismantlement (D&D), and Site Restoration before final operation license termination. There are so many risks in each period. We extract a few risks as examples to demonstrate the risk informed economic assessment.

3.1 Preparation for decommissioning activities

Plant systems, structures, and components (SSCs) were investigated in a comprehensive manner to identify if they are needed to support plant operations (e.g., Spent Fuel Pool cooling). In this process, although the SSCs are not required to support plant decommissioning, they should be further evaluated whether to be included in the plant lay-up program in case of potential future use during plant decommissioning. In this stage, the risks below can be happened

- *Spent fuel storage on site or interim equipment, etc.*
- *Estimation of decommissioning cost and schedule*
- *Mobilization of quality human resources*

3.2 Decontamination and dismantlement

Approximately 12 to 18 months before the start of decontamination and dismantlement (D&D) activities, the administrative and engineering organization should be mobilized. Some activities should be carried out during the first several months of D&D period; there are some risks below we have to consider,

- Mobilizing administrative and engineering organization
- Preparation of engineering specifications and procedures, etc.

4. Risk Informed Economic Assessment

4.1 Current NPV(Net Present Value) methodology

Traditionally, we have used the NPV in consideration of Free Cash Flow of Firm (FCFF) on the basis of the Earning Before Interest and Tax (EBIT).

$$NPV = \sum_{n=1}^N \frac{FCFF_n}{(1 + k_0^L)^n} - IC$$

$$FCFF = EBIT(1 - tax) - NIFA - AWC$$

$$EBIT = Revenue - O\&M\ Cost - Depreciation$$

$$k_0^L = k_e^L \frac{S}{V} + k_a(1 - t) \frac{B}{V}$$

$$\beta_S^L = \beta_S^U \left\{ 1 + (1 - t) \frac{B}{S} \right\}$$

$$k_e^L = R_f + [E(R_m) - R_f] \beta_S^L$$

where, NIFA is the Net Investment to the fixed Asset and AWC is Additional Working Capital and IC is investment costs. β refers to the risks the incumbent project has.

In the risk informed economic assessment, the calculation of FCFF should consider risks and their probabilities.

Example: Risk informed cost Table

Risks	Cost (USD)	Probability (%)	Expected cost(USD)
Mobilization of quality human resources	1000	10	100
Comprehensive final radiation survey	500	5	25
Total	1500	15	125

$$FCFF = EBIT(1 - tax) - RIC - NIFA - AWC$$

where, RIC is the risk informed cost

5. Conclusion

The risk informed economic assessment we suggest is a new horizon to calculate the value of the project. On the other hand, the traditional way has its limit to assess the value in a reasonable way as long as it skips the risks informed cost. We will continue to develop the methodology of the risk informed costs assessment to value the project as practically as possible.

REFERENCES

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