Review of Contingency infrastructure for project management in NPP decommissioning

Gi-lim Kim*, Hyung-woo Seo , and Ji-hwan Yu
Korea Hydro & Nuclear Power Co.(KHNP) Central Research Institute, 70, 1312-gil, Yuseong-daero, Yuseong-gu, Daejeon, 34101, Republic of Korea
*Corresponding author: todaylover77@khnp.co.kr

1. Introduction

In addition to defining and managing activities for deliveries, it is usually possible to build a contingency infrastructure to prepare for unexpected cases to successfully manage project. Likewise, the decommissioning project of nuclear power plants should establish a contingency infrastructure from the decommissioning planning stage to manage abnormal events or unexpected cases occurring during decommissioning.

In this study, we reviewed what kind of decommissioning contingency infrastructure presented in the IAEA document and how it could affect the decommissioning project of nuclear facility.

2. Methods and Results

According to IAEA NW-T-2.8, decommissioning contingency infrastructure elements are classified into eight categories [1]:

a. Organization
b. Funding
c. Planning
d. Legislation and regulations
e. Information
f. Training
g. Stakeholder involvement
h. Modifications to exiting programs

2.1 Organization

Contingency organization consists of people who looking for problems and solutions to the decommissioning project. This organization is usually similar to the organization that plays a role in managing emergency during plant operation period. They should have the authority to take immediate action in the event of an unexpected issue, and also must have the expertise to review the cause and to present correct solutions.

2.2 Funding

Funding is the cost required to handle events caused by project risks. These risks include both pre-identified and unidentified risks, like Figure 1, and project managers could calculate appropriate contingency reserves for identified risks. For example, in the case of System, Structures, and Components (SSCs) dismantling or site remediation phase, the reserve for each work package could be calculated by considering the labor/equipment costs and radioactive waste treatment/disposal costs for dealing with unexpected radioactive contamination. In general, contingency reserve could rely on past experiences, otherwise risk management documents can be generated through risk analysis by experts to calculate the contingency cost for each risk. In this process, unknown risks that have not been analyzed should also be considered, and the management reserve is estimated by calculating a certain percentage of the budget for each decommissioning phase.

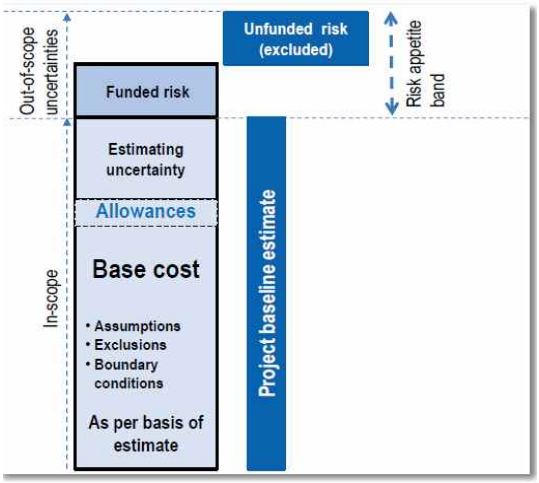

Fig. 1. Example of the elements of a project cost [2]

2.3 Planning

Unexpected occurrences of additional work, stakeholder intervention, changes in technology utilized in the work, and accidents could lead to situations in which planned scenarios at the beginning of the project cannot be carried out. In this case, the situation in which the problem occurred and the activities associated with it should be identified and the plan should be modified to avoid affecting the entire decommissioning flow as much as possible. For this, it is possible to identify activities that are likely to have unexpected events at the planning stage, and apply a method of granting a period of margin to the relevant work process. In addition, securing sufficient resources that can affect the work package could be one way.

2.4 Legislation and regulations

Changes in legal or regulatory requirements may affect the decommissioning project budget, schedule, and scope. If there are tasks that require approval from regulators and the review is prolonged, the project period may be delayed that much. In extreme cases, the project may be stopped. The decommissioning project is a large-scale project where various technical requirements and standards are applied. Therefore, it is necessary to review in advance how regulatory changes related to this could affect and prepare necessary countermeasures.

2.5 Information

Basically, in the decommissioning project, the operation history and records, contamination characterization, and configuration information of facilities or sites to be decontaminated and dismantled should be accurately identified. If inaccurate information exists or if information does not exist, unnecessary exposure or changes in work may occur during decommissioning. This is connected to the cost of failure in terms of project quality. If there is a nuclear facility operating close to the decommissioning target, like Kori-1 or Wolsong-1, it is necessary to check whether the SSCs of the facility have become physical independence. In addition, taking in account the impact of the decommissioning project on the operating plants (e.g., vibration, dust, etc.), information should be obtained to ensure the safety of adjacent plants. Normal project flow data is important, but in the event of an abnormal case during the project, information necessary to cope with it should be considered. Therefore, as much information as possible should be collected throughout the decommissioning project, and the data on uncertainty could be managed in the form of a risk register. Among them, the lessons learned of prior decommissioning facilities help reduce the range of uncertainty and estimate the range of contingency reserve.

2.6 Training

In the case of work within the radiation-controlled area or work dealing with radioactive materials, training is required to maintain radiation workers' exposure as low as reasonably achievable. In addition, new technologies or equipment could be used depending on the environment of the decommissioning work. In such cases, professional training should be conducted to ensure that the user performs the work safely, or simulated training like mock-up or virtualization shall be conducted. And if personnel with no experience in the decommissioning participate in the project, training to improve employee's mind-set are needed to help them understand changes in the working environment and characteristics of decommissioning.

2.7 Stakeholder involvement

Problems arising from the decommissioning process could affect not only the inside of the site but also the outside. Therefore, when problems arise, both internal and external stakeholders should be able to share information and communicate at an appropriate level at the necessary time. Appropriate communication and quality of information could give stakeholders confidence that decommissioning project is safely managed and transparent. In terms of decommissioning waste management, information provision and agreement between the parties should be made appropriately at the time of handover and acquisition.

2.8 Modification to existing programs

Various programs conceived at the planning stage of the project and introduced at the implementation stage may be modified or discarded if deemed necessary through the monitoring and control process. And if a new work package occurs as a result of an unexpected event, a program could be introduced to manage it. Since the introduction and change of the program can require new personnel, equipment, and technology to handle it, it is necessary to devise preliminary resource, contingency costs, training plans and schedule.

3. Conclusions

Contingency infrastructure requires additional costs, time, manpower, and materials as factors other than essential works to implement the decommissioning project. However, this allows the project to be safely and successfully terminated to a predictable extent. Preliminary settings in decommissioning could ensure non-radiation or radiation safety for workers, confidence in stakeholders, and reduce cost of nonconformance. The scope and level of each infrastructure's deployment will depend on the decommissioning environment and the project manager's judgement, considering cost-effectiveness.

REFERENCES

[1] IAEA, Managing the Unexpected in Decommissioning, NW-T-2.8, IAEA, Vienna, 2016.
[2] NEA, Addressing Uncertainties in Cost Estimates for Decommissioning Nuclear Facilities, OECD, 2017.