

## Establishment of the Basic Concept of Decommissioning Project Management System

Hyo Jin An<sup>1)\*</sup>, Seung Kook Park<sup>2)</sup>, and Jin Ho Park<sup>1)</sup>

1) NUDECOMM, 401-1, E6, 111, Daedeok-daero 989, Yuseong-gu Daejeon, Republic of Korea

2) Korea Atomic Energy Research Institute, 111, Daedeok-daero 989, Yuseong-gu Daejeon, Republic of Korea

\*dks6948@naver.com

### 1. Introduction

Decommissioning of nuclear facilities occurs discontinuously, and the term is expected to be more than 10 years. Therefore, it is difficult to apply the experience and technology of decommissioning one facility to the next facility. These difficulties can be solved by creating and standardizing a decommissioning management system, and can also contribute to securing the ease of decommissioning.

Through this study, the possibility of securing the management system can be judged and the concept can be established. Also, it is possible to lay the foundation for the project management system.

### 2. Requirements for Project Management

All nuclear-related activities, including decommissioning, can be implemented more safely and effectively by applying the project management system, like other industries. The general requirements for establishing this are given in IAEA "Safety Standard Series" and "Specific Safety Guide" documents, by each facility. The requirements for each component are summarized as follows.

#### 2.1. Generals

The decommissioning project management system (DPMS) has the characteristics of an integrated management system and must be established before the decommissioning work begins. This should be applied with the same framework for the whole process.

#### 2.2. Organization, Man Power and Training

The organizational structure applied during decommissioning should be described in the decommissioning plan. The authority and obligations of each organizational unit should also be clearly stated. The relevant personnel should be major experts familiar with the facility from the time of driving, and it is more advantageous to use personnel with experience in both driving and decommissioning. To ensure safety, the personnel participating in decommissioning should conduct separate education and training.

#### 2.3. Execution of Project

The operation organization should establish an appropriate management system and maintain all recorded documentation, including it. The decommissioning work procedure should be defined step by step for the decommissioning work with the approval of the decommissioning operator, taking into account the safety assessment results and the occurrence of abnormal conditions. The ease of decommissioning must be secured by different approaches depending on the environment and conditions.

#### 2.4. Safety

Efficient management of safety and promotion of the culture are important. The radiation protection plan should demonstrate that it is optimized and that the exposure dose is within the given limits. For this, radiological hazards should be defined in the plan and a monitoring plan should be included. Plan for coping with the occurrence of abnormal conditions should not be overlooked. Physical protection of surrounding facilities and their monitoring should also be considered

#### 2.5. Radioactive Waste Treatment

The disposal ability of waste that is expected to occur during decommissioning should be judged. Minimization of waste and cross-contamination should also be considered.

#### 2.6. Quality Assurance

A suitable quality assurance program should be established by the operating organization prior to the start of the work, and the securing and maintenance of documented records and data, and their periodic review will be the focus.

### 3. Work Breakdown for Decommissioning Execution

The requirements outlined above focus on ensuring safety. However, the decommissioning project is equally important to its efficiency and economics. To this end, understanding the task of performing decommissioning work must be preceded, and it is efficient to understand in WBS (Work Breakdown Structure) format according to the procedure.

This study reflected the experience of decommissioning the Korea Research Reactor 1&2

(KRR 1&2) in Seoul and Uranium Conversion Plant (UCP).

### 3.1. Preparation and Planning

After the permanent suspension of driving, the group responsible for decommissioning should be appointed and the basic direction of the work should be established. Based on the decision of decommissioning policies such as immediate decommissioning and delayed decommissioning, and understanding of the decommissioning regulatory system, comprehensive consideration should be taken, including decommissioning work sequence, safety, treatment method, and cost and waste estimates. Thereafter, the status of the facility, including facility data and the physical and radiological conditions and the site environment of the facility should be investigated.

### 3.2. Establishment of Comprehensive Plan

Comprehensive decommissioning plan should include the "Facility restructuring plan", "Design of decommissioning", "Permission and PA (Public Address) of decommissioning project", and "Securing contracts and equipment".

When establishing a plan to change the structure of a facility, the facility's containment plan must be established by dividing it into the case of the external building and the case of the building. In addition, changes in the separation of radiation management zones according to the level of radiation to minimize the spread of radioactive material should also be considered. Finally, it is necessary to evaluate the need for new or changed facilities and decide how to install them.

Designing begins with a utility plan that includes various systems and devices. Then set up the construction scenario. The decommissioning sequence by the scenario determines the simultaneous decommissioning zone, which allows you to estimate the amount of generated waste in each zone, required manpower, duration of construction and the moving path of the dismantling object. In addition to the above, scenarios should include equipment and technologies required to dispose of debris. It then goes through a business design process that includes organizational design, personnel training, and cost forecasted by computer code. In addition, the work to be done in the decommissioning design phase is summarized in the table below.

Table I. Additional work in decommissioning design phase

	Contents
1	Assessment of decommissioning work efficiency
2	Establishment of decommissioning waste management plan

3	Assessment of industry safety in decommissioning
4	Assessment of radiation safety in decommissioning
5	Execution of radiation protection in decommissioning

Concerning the efficiency and safety assessments listed in the table, the situation in particular as well as in steady state should be considered sufficiently. With regard to radioactive stability, it is important to apply the ALARA concept, including when it is in normal and abnormal conditions, and establish protective activities accordingly.

For reference, in the establishment of decommissioning waste management plan, in order to establish a comprehensive and complete management plan for dismantled wastes, the wastes to be treated are classified according to physical conditions and detailed characteristics, and both treatment methods and transportation are different.

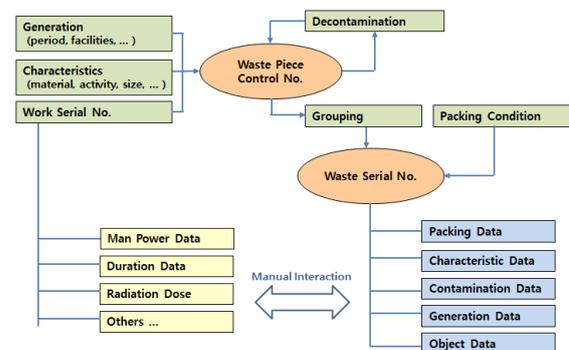


Fig 1. Example of waste management system

After the decommissioning design, the preliminary and final decommissioning plans reflecting the design results are prepared and submitted to the regulatory agency. Permission can be obtained through 3 to 4 times of questions and answers procedures. Next, the PA related to the project should be carried out, but the regulations for its contents are not defined.

Finally, the work is carried out after confirmation of the construction contract and the acquisition of equipment.

### 3.3. Execution of Decommissioning Works

In accordance with the decommissioning comprehensive plan established through the previous process, it should be carried out in the order of decommissioning work preparation, decommissioning work execution, and disposal of it.

Prior to the execution of works, it shouldn't be forgotten that work to remove the deposited suspended particles and residual contaminants, and measures to prevent the spread of contamination must be preceded.

### 3.4. Final works of Decommissioning

At this stage, the level of residual radioactivity in the site should be identified and evaluated after the decommissioning and removal of the building. This should demonstrate that the residual radioactivity is below the deregulation level. The residual radioactivity measurements follow the US MARSSIM principle.

After that, submission of final reports, restoration and opening of the site must be followed.

#### 4. Decommissioning Project Management System

Need for the construction of the decommissioning project management system was recognized through the previous understanding of the requirements and the work to perform. This is performed according to the characteristics of work, divided into Safety Management, Business Management, and Technical Management. Safety Management manages radiation safety and occupational safety, while Business Management manages strategy, business progress, and organization and personnel. Lastly, Technical Management includes managing data, dismantling technology and waste treatment.

In the management system, evaluation work must be performed simultaneously as well as the progress of the decommissioning project. Therefore, the function of the integrated information management system that can arrange the plan of decommissioning process and the status of decommissioning must be accompanied.

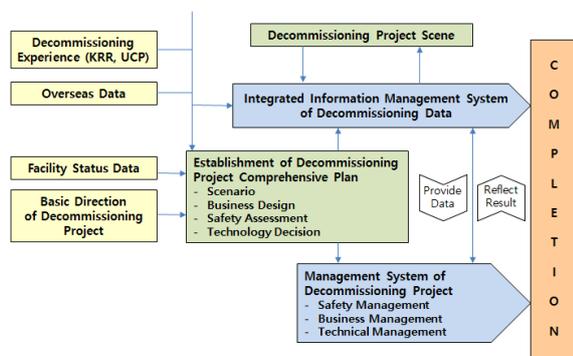


Fig 2. Conceptual basic diagram of DPMS

It is possible to evaluate the efficiency and safety of decommissioning by obtaining and organizing data on the dismantling status from the Integrated Information Management System and comparing it with the planning of the dismantling process. In other words, it is important to plan everything about the decommissioning work during the designing process and perform decommissioning according to this plan.

#### 5. Conclusion

It presents work to be managed through decommissioning project management system centering on IAEA project management requirements and decommissioning performance. It is expected that these results enable the development and standardization of decommissioning management systems for nuclear facilities.

#### REFERENCES

- [1] S. K. Park, "Management of the Decommissioning Information & Data and DECOMMIS Operation", KAERI/TR-4015, 2010.
- [2] J. H. Park, "Decontamination and Decommissioning Project for the Nuclear Facilities", KAERI/RR-2700, 2006.
- [3] IAEA, "Decommissioning of Facilities", GSR part 6, 2014.
- [4] IAEA, "Safety Assessment for Decommissioning", Safety Report Series No. 77, 2013.