Decommissioning Strategy and Method for Preparation of Preliminary Decommissioning Plan for Research Nuclear Facilities

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1. Introduction

The decommissioning of a nuclear facility should be preceded by a decommissioning strategy before the operation is permanently stopped. The major decommissioning strategies may vary depending on many factors such as the characteristics of the facility, the occurrence or nonoccurrence of accidents during facility operation, national policies, and the surrounding environment. At present, we have chosen strategic considerations such as the scope of the decommissioning, the decommissioning method, the final condition of the site, radioactive waste, stakeholder participation, and the cost of decommissioning [1].

2. Decommissioning Principles and Methods

2.1 Decommissioning Basic Principles

The purpose of a decommissioning project is to safely dismantle a nuclear facility, completely remove radioactive materials in the facility, and decontaminate the remaining structures and soils to an unlimited level of use. Through such a decommissioning plan, a method for safe, practical, and economical decontamination and decommissioning is proposed.

The dismantling work will be carried out in accordance with domestic regulations and international regulatory requirements and will be carried out within the scope of ensuring safety. The proposed dismantling method minimizes the exposure dose of workers and residents and the release of gaseous radioactive material according to the ALARA principle. Therefore, it is designed to ensure the safety of workers and residents, and to ensure safety for protecting the environments. In the decommissioning project, a radiation safety management strategy will be established to minimize the exposure of workers participating in the decontamination and decommissioning activities. Radiological protection plans and health physics activities were carried out according to the evaluation of the radioactive inventory evaluation, and to establish a strategy to ensure safety first [2].

For the dismantling method and work procedure of the research reactor, the structural and radiological conditions of the reactor and the overall dismantling safety should be reviewed, and the best method adopted. Spent fuel is safely stored temporarily in the spent fuel pool of the reactor room until it is discharged/ transported according to the planned spent fuel treatment and disposal standards. Once the spent fuel is discharged from the facility, it does not enter the dismantling work despite the principle of instant dismantling.

2.2 Decommissioning Method

2.2.1 Decommissioning Schedule

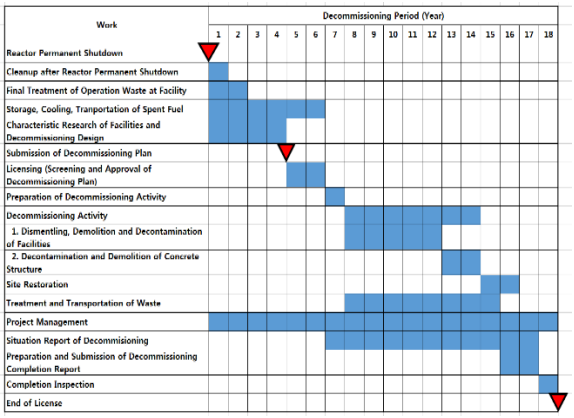

Fig. 1. Schedule for the Research Reactor and Related Facilities Decommissioning.

The decommissioning schedule of the research reactor is shown in Fig. 1. The cutting, dismantling and decontamination of the facilities including the buildings are subject to a preliminary decommissioning plan, chapter 8, and decontamination and decommissioning activities. All dismantling activities shall be carried out after submission of the decommissioning plan in accordance with domestic decommissioning laws, and after the examination and approval of the licensing authority have been completed.

2.2.2 Decommissioning Process. Dismantling preparation works are decontaminated solid waste, are equipped with temporary storage facilities, entrance and control facilities, changing rooms, ventilation facilities, and utilities for dismantling. In addition these are unnecessary interrupted utilities, are isolated from compartments and ventilation facilities, and so on. A research reactor consists of a reactor building, isotope production facility, irradiation material examination facility, cold neutron research facility, and accessory facilities [3]. The dismantling of Hanaro was planned in order of the accessory facility, cold neutron research facility, isotope production facility, irradiation material examination facility, and reactor building, and excludes the utilities required for dismantling, as shown in fig. 2. In the dismantling process of the research reactor, the order of dismantling from the facilities with a low radioactive level to the facilities with a high radioactive level was selected.

Fig. 2. Decommissioning Sequence for the Research Reactor and Related Facilities.

2.2.3 Method of decommissioning. In the case of reactor building, low pollution equipment will first be dismantled, such as the non-polluting secondary cooling system, and will be dismantled in order of high pollution, such as the primary cooling system and reactor. In the case of the nuclear fuel assemblies, they are cooled down in the spent nuclear fuel storage pool or in the reactor pool for a certain period of time and then completely discharged before the decommissioning of the reactor and related facilities is started [4]. The reactor assemblies are expected to have a high radiation level, and thus they are cut and packed in the field and managed as radioactive waste. For this cutting, a platform that can be shielded for remote cutting is installed in the upper part of the reactor pool, and will be cut and packed remotely there.

3. Conclusion

While preparing a preliminary decommissioning plan for a research reactor, the decommissioning strategies for the scope of dismantling, the dismantling method, the final condition of the site, the radioactive waste, stakeholder participation, and the cost of dismantling were considered. In this paper, the basic principles of the dismantling and dismantling methods were described. As the basic principles, these will be installed in temporary storage facilities, and utilities, such as ventilation systems for dismantling. For the decommissioning method the schedule, decommissioning process, dismantling of the main reactor body with high radioactivity, and so on are described. The order of dismantling is facilities with a low radiation level to facilities with a high radiation level, and the dismantling schedule was estimated to be 18 years after the permanent shutdown of the reactor.

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