Strategy of the Kori-1 Final Decommissioning Plan Base on IAEA Safety Assessment Methodology

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1. INTRODUCTION

Kori unit 1, the Korean oldest commercial NPP, was permanently shut down in 2017 without a second extended operation. Within five years after its shutdown, KHNP, the licensee, should submit a final decommissioning plan (FDP) to the regulator with incorporating the results of the public hearings in order to get approval for decommissioning.

The safety assessment is one of essential part of the PDP because it describes how exposures of workers and the public are kept as low as reasonably achievable (ALARA) below the relevant limits during decommissioning. However, there is no specific assessment guideline for FDP yet. For this sake we have carried out the review and analysis of IAEA safety assessment methodology and its exposure pathway to apply to the FDP.

In this article, the IAEA approach for safety assessment is reviewed taking into accounts the requirement of the related regulatory notice. Also, potential radiological exposure pathways are investigated for analysis of exposure doses of workers and the public due to normal decommissioning activities.

2. DEVELOPMENT OF THE FDP

2.1 Relationships with Regulatory Requirements

Fig. 1 shows the relationships between the regulatory requirements and the IAEA approach related to the safety assessment. For example, HAZARD Identification and Screening, the third step of the IAEA process where existing and future hazards (both radiological and non-radiological) under normal and accident conditions during decommissioning are identified and estimated matches with the regulatory requirements 2), 5) and 6).

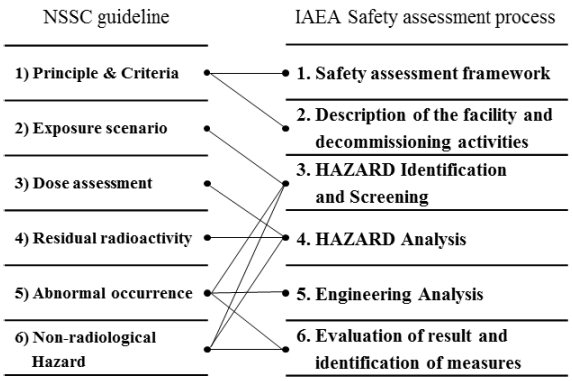

Fig. 1. Comparison of the NSSC with IAEA.

2.2 Practical considerations

To identify hazards, method(s) appropriated for a specific facility should be selected among HAZOP, checklist, and brainstorming [2]. Then, the hazard is analyzed in terms of the severity of risk.

Since the dismantlement of a facility may include various activities, risks for workers and the public should be assessed based on the dismantlement activities in question. For example, for cutting activities, the risk from airborne particles should be assessed in an appropriate manner by taking into accounts work time, distance and the number of worker. Generally, the risk assessment requires that parameters, which are not available, be assumed reasonably.

3. EXPOSURE PATHWAY

3.1 Pathways to Workers and the Public doses

Decommissioning is different from operation in terms of causes for doses incurred. For instance, decommissioning includes cutting of radioactively contaminated materials in which radioactive dusts and gas are dispersed into work space. Thus, for the safety assessment, it is necessary to estimate the

amount of radionuclides released under the assumed normal conditions by considering residual radioactive inventory, dismantling activities and schedule of decommissioning

The radiological waste disposal strategies are under the established through collaboration with KEPCO E&C. In accordance with the IAEA methodology, the assumed exposure pathway is developed [3]. The dismantled wastes will be temporarily stored in the building which was not designed for waste storage, that is, the concrete wall and ceiling of the building do not have sufficient shieling effects. Fig. 2 shows a variety of exposure pathways resulting from the release of radionuclides and radiation during dismantling activities.

3.2 Airborne particles modeling approaches

The kerf volume and the kerf area of components of interest are important factors for dose evaluation, because radioactive contamination is limited to the material surface in contaminated components, and activated products are uniformly distributed in the activated components. The kerf width is actually decided by the choice of the cutting tool applied. The kerf length depends on the type of the container in which the component will be stored. Shapes of components such as piping and ducts also affect the kerf lengths. Therefore these factors need to be considered during decommissioning activities.

4. FUTURE WORK

For the sake of decommissioning in a safe manner reasonable assumptions are very important to evaluate the dose of workers and the public. The assumptions required for the evaluation of each activity shall be reviewed as well as analysis methods for each activity should be developed. Furthermore, practical waste management strategy should be established.

REFERENCES

[1] Nuclear Safety and Security Commission, Regulations of Nuclear Facilities Decommissioning Plan, Notice 2015-8.

[2] Safety Assessment for Decommissioning, IAEA Safety Report Series No.77.

[3] Safety Assessment for Decommissioning of a Nuclear Power Plant, IAEA Safety Report Series No.77. Annex I, Part A

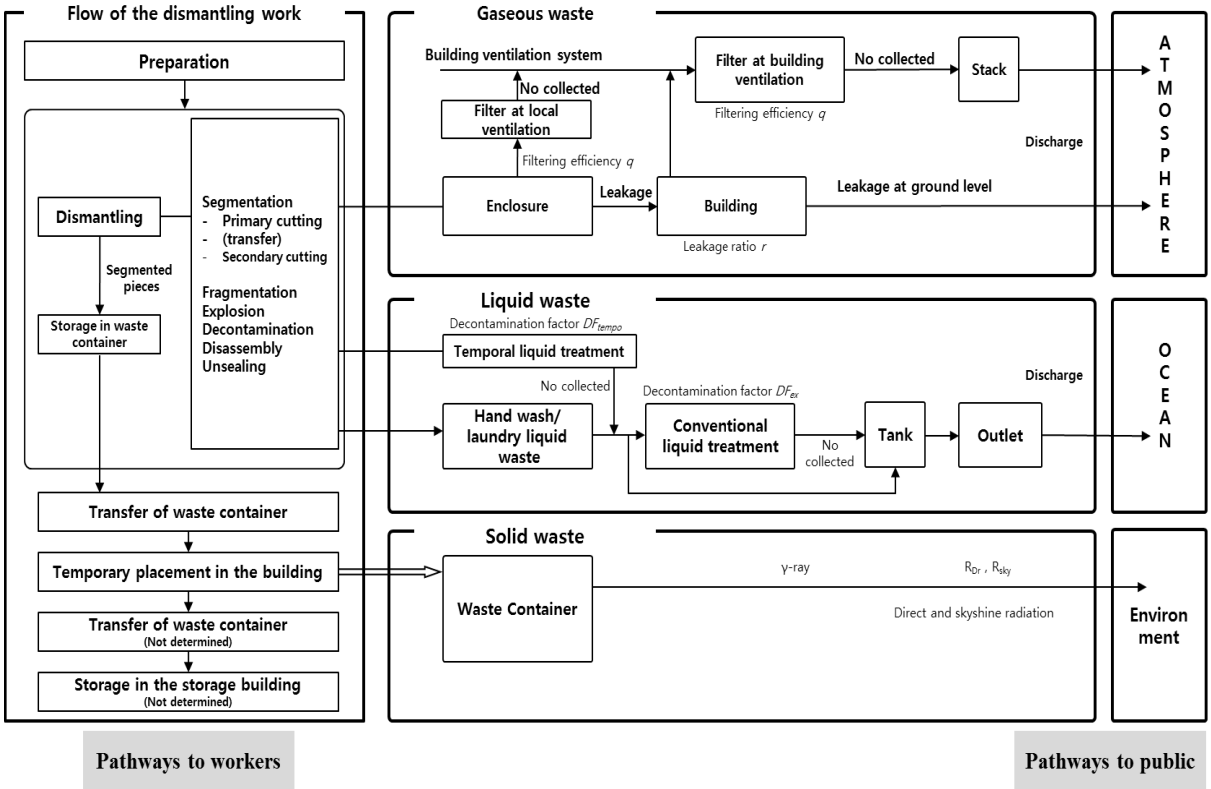

Fig. 2. Relationship of dismantling processes and pathways.