

Training Requirements for Personnel in Nuclear Power Plant Decommissioning

Gi-lim Kim^{a*}, Hyung-woo Seo^a, Sang hyun Lee^a and Ji-hwan Yu^a

^aKorea 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

There are a total of 30 Nuclear Power Plants (NPPs) in Korea. Two of them are in transition phase after permanent shutdown. Twenty-four NPPs are in operation and four are under construction. Each unit has a different operating period. In addition, according to the energy policy and dismantling strategy, decommissioning schedule of each unit is expected to proceed in various way. At the time of each NPP decommissioning project, proper human resource management and training are needed in consideration of this background. Therefore, this study identified the necessary educational and training requirements for management of decommissioning personnel.

2. Methods and Results

This section describes considerations for training decommissioning personnel based on IAEA technical report [1].

2.1 Decommissioning Training Requirements

In Korea, a number of NPPs are in operation, so many people who participate in the decommissioning project are expected to include a number of people with experience in operational phase. However, human resource with working experience at nuclear power facility during construction or operation and knowledge to be used in decommissioning will be reduced for various reasons from the time of permanent shutdown of that plant; personnel transfer, contract termination, turnover, retirement, and so on. Also, as interest in decommissioning of nuclear facility has been increasing since the permanent shutdown of Kori-1 in 2017, it is expected that the number of people with knowledge and expertise in the related industry will increase over time.

Fig.1 shows the following factors related to the above requirements:

- Retention of knowledge (KM)
- Training on aspects relating to the configuration and operating history of the plant (TP)
- Training on specific aspects of decommissioning (TD).

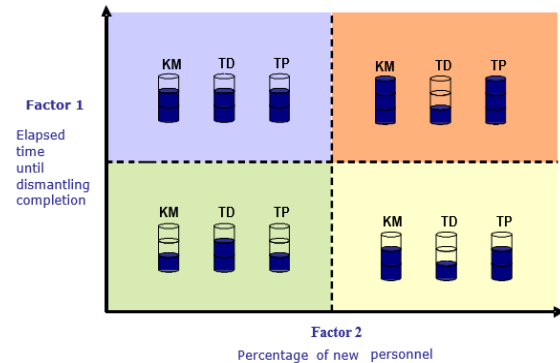


Fig. 1. Relative training needs of personnel as a function of elapsed time for decommissioning [1]

At present, Kori-1 is planning to apply immediate dismantling strategy (lower left-hand green quadrant of Fig. 1) [2]. In this case, there will be sufficient knowledge to be used in decommissioning. It means that KM factor is not being as significant. Besides, there is a high possibility that personnel with experience working at NPP subject to decommissioning will be deployed. This possibility means that TP factor is relatively less important in training. On the other hand, since that personnel have relatively little experience or knowledge on decommissioning, training should be focus on TD factor.

Meanwhile, if other nuclear facility chooses a deferred dismantling strategy (upper right-hand orange quadrant of Fig. 1), personnel having expert knowledge on decommissioning could participate in the project. It requires a significant amount of training on the facility, focusing on KM and TP factor. TD factor is not being as significant.

2.2 Retention of knowledge

Large-scale project management has a low probability of success due to its many considerations and complexity. Knowledge management for decommissioning project should be conducted from the time of construction of the target NPP to the time of decommissioning. The correct categorization and digitization of the relevant data make it available to personnel who utilize that knowledge in a timely manner.

For example, after the permanent shutdown of the Trojan plant (1993), Portland General Electric (PGE) began developing a project management tool in 1996 to train plant professional project management personnel and to implement successful and cost-effective

decommissioning projects [3]. This project management tool minimized the loss of information resulting from human resource changes by keeping the knowledge utilized during decommissioning and serving it to users.

2.3 Training on aspects relating to the configuration and operating history of the plant

Training can be an effective tool for communicating information about facilities subject to decommissioning to workers who involved in the project. It can also increase work efficiency by providing customized training to personnel (e.g., temporary workers or subcontractors) who are difficult to access knowledge management systems or who participate only in some decommissioning processes without experience in plant operations. Among the information on facilities subject to dismantlement, the main details necessary from the perspective of education and training shall be as follows:

- Updated configuration of the facility
- Installation operational history
- Inventory of radioactive wastes
- Inventory of non-radioactive hazardous wastes
- Updated radiological characterization of the facility

2.4 Training on specific aspects of decommissioning

Decommissioning of nuclear facility has some features as Table I. The training of decommissioning project members should be considered with focusing on these characteristics.

Table I: Decommissioning feature for training [1]

Decommissioning Feature	Training Emphasis
One-off activities / Use of temporary structures to assist dismantling	Focus on individual tasks and achieving goal
Project completion orientated management objectives	Focus on project management skills and "completion culture"
Much smaller stable resource pool topped up as/when required using highly mobile contractors	Focus on ensuring and maintaining a reliable supply of fully competent workers, and contractor management
Change of regulatory focus	Focus on change management issues and multiple simultaneous tasks
Changed nature of radiological risk,	Focus to ensure correct blend of training to cater

industrial risk more significant	for both industrial and radiological risk issues
Working environment can be uncertain	Focus on pre-job preparations, job hazard analysis & risk assessment
Training programs designed for a few years of use	Emphasis changed to radiological and industrial safety training

Decommissioning-specific training is essential for those who have no experience in decommissioning nuclear facility. Through this training, project members will have the focused thinking for the decommissioning culture. The training might use the mock-up or OJT method used during the operation period. In addition, customized training will be required when decommissioning is carried out by applying new technologies and methods.

Therefore, it is necessary to analyze the pros and cons and improvements of the educational training results achieved. It will enable more efficient project progression by reflecting the lessons learned from this analysis.

3. Conclusions

The requirements for training are variable depending on the life cycle of each NPP and the requirements for manpower input. Therefore, training plans for decommissioning should be established in consideration of their strategies and human resource conditions. It improves the quality of members of the decommissioning project and ensure that they have the capabilities appropriate for the purpose. Proper teamwork formation and communication will improve the quality of the decommissioning project.

Furthermore, considering the timing of decommissioning projects for each facility, the next nuclear facility project will be more successful if relevant industries continue to manage appropriate knowledge and human resources during the period between individual decommissioning projects.

REFERENCES

- [1] IAEA, Decommissioning of Nuclear Facilities: Training and Human Resource Considerations, Technical Report Series No.NG-T-2.3, International Atomic Energy Agency, Vienna, 2008.
- [2] KHNP, Kori Unit-1 NPP Permanent Shutdown and Decommissioning Q&A, Korea Hydro & Nuclear Power Co., 2018.
- [3] C.Wood, Methodology for Decommissioning Project Management: Trojan NPP Experience,, TR-112143, The Electric Power Research Institute, 1999.