

Proposal of Decommissioning Planning for Kori Site

KiHo Cho*, YoungJu Son, EunHee Lee, JaeYeon Jung, and ChangLak Kim
 Korea Electric Power Corporation International Nuclear Graduate School, 658-91, Haemaji-ro,
 Seoseng-myeon, Ulju-gun, Ulsan, Republic of Korea
 *khcho@email.kings.ac.kr

1. Introduction

Recently the decommissioning of nuclear power plants has been accelerated in accordance with the government's policy of phasing out of nuclear energy. In 2017, Kori Unit 1 was permanently suspended for the first time, and lately Wolsong Unit 1 was permanently shut down. With this trend, it is anticipated that the existing nuclear power plants will be permanently suspended from 2020 without any extension of Operating License. In order to dismantle the commercial NPPs, the owner (KHNP in Korea), should submit the final decommissioning plan and related documents within 5 years from the day of shut down to get approval for decommissioning from regulatory body, in accordance with Nuclear Safety Act article 28 and Para.1 of article 41-2 of the Enforcement Decree of NSA(Presidential Decree). In this study, the decommissioning plan for Kori unit 1 of KHNP is analyzed. Then possible alternative is presented. Through this, we propose an effective decommissioning plan for Kori unit 2, 3 and 4, which are expected to shut down in every year.

2. Current Schedule

For decommissioning the nuclear power plant, first of all, after the permanent stop of the power plant, cooling of the spent fuel, dismantling of the secondary system, installation of facilities for the treatment of radioactive waste management, and exporting of the cooled spent fuel must be preceded. Thereafter, dismantling of the primary system and site restoration is carried out. The minimum cooling period of the spent fuel is assumed to be seven years, and the dismantling process and the sequence between each process are considered. Based on this, the expected decommissioning plans for Kori Unit 1

through 4, including Kori 1, which has been permanently suspended for dismantling in 2017, are summarized in Fig. 1.

Unit	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30	'31	'32
Kori1	Cooling								Exporting	Primary Dismantling					Site Restoration	
							Secondary	RWMS Installation								

Fig. 1. Expected Decommissioning Plan for Kori Unit 1.

According to Fig. 1, termination of site restoration time is expected to be 2032 in Kori Unit 1. Considering the effectiveness of transportation of spent fuel, management of professional manpower, and operation of equipment, we propose modified the Decommissioning Schedule for the effective termination of licensing.

3. Suggestions

A reasonable decommissioning schedule for Kori site was suggested in consideration of management of human resources and business efficiency. Based on several assumptions, a decommissioning plan for the Kori site and the resulting spent fuel transfer scenario have been proposed.

3.1 Assumptions

Above all, there will be no life extension for Kori unit 2, 3 and 4. And the decommissioning process and sequence will be similar to Kori 1. Also the immediate dismantling strategy will be selected. Dry storage facility for Kori site will begin its operation in 2025 and concrete cask (Model : VSC-24) will be used for storage. The capacity of a cask is 24 assemblies. Central interim Storage facility operation starts from 2035. Future projection of spent fuel production was estimated by averaging spent fuel

production from 2010 to 2017.

3.2 Decommissioning schedule for Kori site

For efficient manpower management, each phase of the decommissioning process is designed to be performed gradually for the whole units. In other words, after the completion of the spent fuel exporting of Unit 1, spent fuel exporting for Unit 2 starts. Also it is beneficial in terms of manpower management that the primary and secondary system dismantling are performed after the process of it for previous unit is progressed to some extent. The site restoration is a very important step for successful decommissioning as the last stage of the decommissioning process. So it is suggested to focus on the site restoration of the unit after site restoration of the previous unit is completed fully. Suggested decommissioning plan for Kori site is shown in Fig. 2.

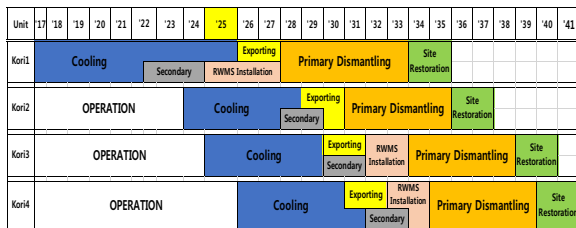


Fig. 2. Proposed Decommissioning Plan.

One of the objectives of this paper is to suggest a desirable spent fuel management scenario for the Kori site. Annual spent fuel production per year and unit is considered as 40 assemblies as estimated by averaging from 2010 to 2017. And the capacity of cask is assumed as 24 bundles. As a result of calculation, some of the spent fuel in Kori unit 2, 3, and 4 should be transferred to Shin Kori unit 1 and 2 before dry storage facility operation. After operation of it, all the spent fuel in Kori 1 should be transferred to dry storage facility just before primary system dismantling. After that, if the spent fuel in Kori 2, 3 and 4 is transferred to the dry storage facility sequentially, suggested scenario would be possible as shown in Fig. 3.

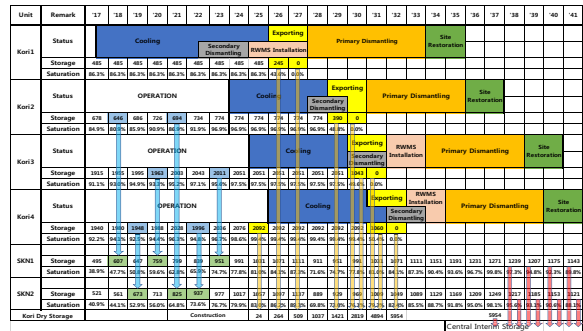


Fig. 3. Proposed Decommissioning Plan with Spent Fuel Transfer.

4. Conclusion

The suggested plan has been scheduled for an effective and successful decommissioning business aimed at 4 nuclear power plants that one (Kori unit 1) is already shut down and the others (Kori unit 2,3 and 4) will be shut down consecutively starting from 2023. Although the calculation of the damaged fuel or appropriate number of transportation cask should be considered more, our proposed decommissioning plan is expected to have significant benefits in terms of cost, management of professional manpower, and business efficiency.

ACKNOWLEDGEMENT

This research was supported by the Nuclear Safety Research Program through the Korea Foundation of Nuclear Safety (KOFONS), granted financial resource from the Nuclear Safety and Security Commission (NSSC), Republic of Korea (No.1605008)

REFERENCES

[1] KINGS, "Project Report SU 2.1 - Decommissioning Planning," 2017.
 [2] KHNP, "Preparation Program at the Pre-Decommissioning Phase for the D&D of the Kori-1 Nuclear Power Plant_IAEA Conference," 2016.