

A Study on Decommissioning Strategy for Wolsong-1

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1. Introduction

Wolsong-1, which was licensed to extend its operation until 2022, has been permanently shutdown in June 2018. Since the shutdown of Wolsong-1 has been suddenly decided and CANDU has never been fully decommissioned, this study suggests the optimized Decontamination and Decommissioning (D&D) strategy of Wolsong-1.

2. D&D Strategy

2.1 Decommissioning Schedule

Factors considered in Fig. 1 decommissioning schedules are:

- Decommissioning Experience,
- Technical development specialized in CANDU,
- Common & adjacent facilities,
- Site remediation for soil and groundwater,
- Spent fuel management,
- Human resource management,
- Project finance.

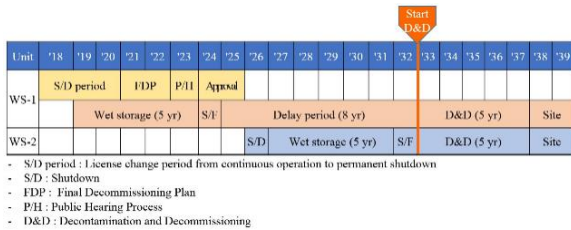


Fig. 1. D&D Schedule for Wolsong-1.

The proposed plan of Wolsong-1 (WS-1) D&D project for primary system is to start in 2032 along with Wolsong-2 (WS-2) after completion of Kori-1 D&D project. [1]

It would be necessary to develop specific technologies for CANDU reactor even though Wolsong-1 will reflect Kori-1 D&D project. Wolsong-1 has many common facilities with Unit 2 that D&D project should be carried out together to increase work efficiency and cost benefit. Due to the characteristics of CANDU reactor, Wolsong site soil and groundwater may have been more contaminated than Kori site, specifically for tritium. Thus, it is

recommended to utilize decay effect and perform site remediation for soil and groundwater for Wolsong-1, 2 together. In this study, spent fuel dry storage facilities are expected to reach its maximum capacity by 2020, which means it is required to construct additional facility in advance for the continuous operation of Unit 2,3, and 4 and removal of spent fuel from Wolsong-1 wet storage. Operational personnel of Wolsong-1 will remain during the transition period (14 yrs.) for the preparation of D&D project. Extending transition period of project will give more time for licensee to finance the D&D project fund.

3. Detailed D&D Preparation Plan

3.1 Detailed Schedule of D&D Preparation

The transition period of Wolsong D&D project will begin in 2019 after permanent shutdown of its operation. (see Fig. 2)

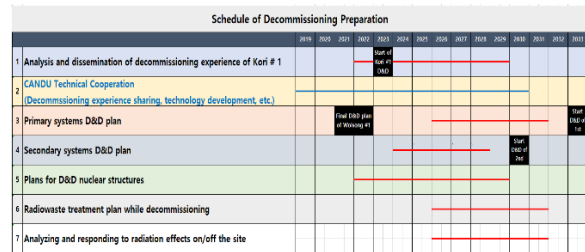


Fig. 2. D&D Prep. Schedule of Wolsong-1.

Delay period starting in 2027(see Fig. 1) is given time due to delay of Wolsong-1 D&D project based on previous consideration.

This detailed schedule consists of decontamination and dismantling of structures and equipment in details, evaluation of environmental radiation effects, and human resource management. Furthermore, lesson learned from Kori-1 D&D project is also implemented to detailed schedule of Wolsong-1 D&D project preparation.

However, CANDU has never been decommissioned, KHNP personnel have no experience in D&D project, and the uncertainties of national policy on Wolsong-1 were considered to establish a detailed schedule.

4. Spent Fuel Management

As shown in Table 1, total storage saturation level of Wolsong site already reached 87.8%. The dry storage reached saturation level of 94.9% and the remaining capacity of unit 1~4 wet storage will reach full saturation by 2020.

Table 1. Amount of Spent Fuel at Wolsong NPP Site [2]

Wolsong Site		Storage	Capacity (Bundles)	Saturation
Wet Storage Facility	Unit 1	28,168	42,408	66.4%
	Unit 2	29,768	42,408	70.2%
	Unit 3	33,048	42,408	77.9%
	Unit 4	34,496	42,408	81.3%
Dry Storage Facility		313,200	330,000	94.9%
Total Storage Capacity		438,680	499,632	87.8%

Thus, KHNP has planned to construct additional dry storage facility (MACSTOR) by 2020. [3] In this study, the spent fuel management simulation (see Fig. 3) was performed based on the plan of licensee considering follow assumptions:

- Annual production of Spent fuel per unit = 5,076 bundles (= 20,303 bundles/4 units)
- Additional Capacity = 168,000 bundles (7 modules of MACSTOR)
- Additional storage will be in operation = June 2020
- Maximum Capacity of transfer per quarter = 6,240 bundles

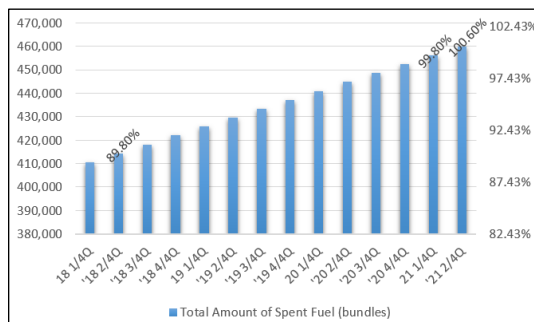


Fig. 3. Prediction of Spent Fuel Saturation without Additional Dry Storage Facility.

According to the simulation, It shows that the expected saturation of total capacity of storage is in 2021 second quarter, which is later than date stated above. It is due to the effect of early shutdown of Wolsong-1 and other maintenance work.

Until June 2020, the spent fuels in wet storage of Wolsong Unit 2, 3, and 4 will be transferred to existing dry storage to delay the saturation. Once the construction of new dry storage is finished, all the

cooled spent fuel will be transferred to newly constructed dry storage facility. The spent fuel in wet storage of Wolsong-1 will be fully removed on second quarter of 2023, which is prior to the actual D&D project. (see Fig. 4)

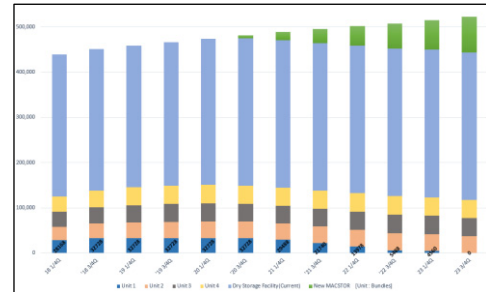


Fig. 4. Spent Fuel Management Using Additional Dry Storage Facility.

5. Conclusion

In this study, Wolsong-1 D&D project is proposed to begin after completion of Kori-1 D&D project, which plans to finish in 2032 as the first NPP D&D project of Korea. Thus, Wolsong-1 D&D project schedule is subject to change depends on Kori-1 D&D project schedule and given delay period. The construction of new dry facility (MACSTOR) is also required within the timetable to proceed Wolsong-1 D&D project. Even though many factors have been already considered, more detailed consideration on D&D strategy would be necessary to succeed in Wolsong-1 D&D project.

ACKNOWLEDGEMENT

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