

# Trend and Current State of Decommissioning Waste Quantity and Cost in Korea

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## 1. Introduction

Korea Hydro and Nuclear Power (KHNP) made a decision for permanent shutdown (PS) of Kori-1 on June 18th, 2015, which, finally, has been shut down since June 19th, 2017. Thus, decommissioning has emerged a matter of main concerns in Korean nuclear power industry.

Separately, KHNP has periodically evaluated decommissioning cost to comply with the Radioactive Waste Management Act and the corresponding government notices in Korea. Thus, it is necessary to calculate precise cost with the application of the regulation, guideline and site-specific characterization results or assumptions, since the feasibility study plays an important role in the decommissioning process. For this sake, estimation of decommissioning waste quantity and cost for Korean NPP are mainly described in this paper.

## 2. Methodologies & Results

Decommissioning cost can be regarded as all the cost for the decommissioning with regard to technical and administrative activities to allow the removal of the regulatory requirements from the decommissioning preparation to the site restoration [1]. In order to achieve the accuracy and details of decommissioning cost, Bottom-up approach is

utilized based on Unit Cost Factors (UCF). UCF is defined as the simplified units for cost estimation of decommissioning activities for a number of Structure, System and Components (SSCs) including manpower, expenses [2].

### 2.1 Decommissioning Period and Assumptions

**2.1.1 Decommissioning Period.** The initial first two years are for planning of decommissioning preparation before PS of the NPP. With PS of the NPP, a transition period should be needed around 5 years. At the end of the transition period, approximately 8.5-year Decontamination and Dismantling (D&D) phase follows. The final phase of decommissioning is the site restoration which would be conducted at least two years. Fig.1 depicts the outline of decommissioning project phases and schedule.

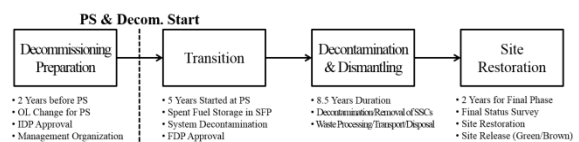


Fig. 1. Outline of decommissioning schedule.

**2.1.2 Main Assumptions.** According to the strategies generally suggested, NPP decommissioning will be carried out by the immediate dismantling known as DECON. Some of the scenarios of

decommissioning are listed in Table 1.

Table 1. Assumptions for decommissioning scenarios

Scenarios	Assumptions
Alternatives	Immediate Dismantling (DECON)
Decom. Operator	Utility (KHNP)
Decontamination	In Decommissioning Site
Final Site Status	Brown Field

## 2.2 Plant Inventory and Waste Quantity

SSCs should be surveyed by a sort of data to generate Plant Inventory (PI) DB. After the construction of PI DB, PI DB is going to be converted to waste quantity. By using this method, Ministry of Trade, Industry and Energy (MOTIE), in Korea expected the waste quantity in a range of 14,500~18,850 drums.

## 2.3 Decommissioning Cost Estimation

In pursuance of decommissioning cost estimation, a series of UCF are altered from PI DB as input data to a cost computation program. Decommissioning cost estimation are carried out as shown in Fig. 2.

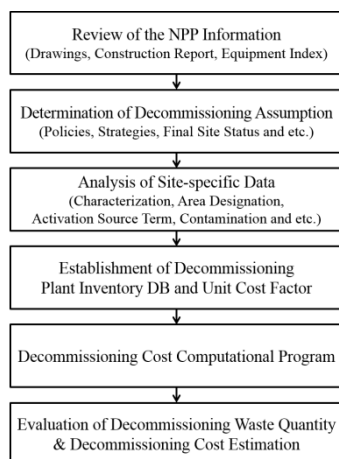


Fig. 2. Flow diagram of decommissioning cost estimation.

## 2.4 Updates of Decommissioning Cost in Korea

Decommissioning cost is periodically updated as demonstrated in Table 2 to observe the relevant regulations in Korea. The cost consists of project management and removal, waste disposal and contingency [3].

Table 2. Trend of Decommissioning Cost in Korea

Cost(M\$)	Year			
	2003	2012	2014	2016
Project Mngmt.	69.4	291.3	359.8	383.9
Waste Mngmt.	241.4	232.3	231.3	239.8
Contingency		43.7		
Total	310.8	567.3	591.1	623.7

## 3. Conclusions

Since there is no real radiological characterization and site-specific data for Korean NPP, to date, decommissioning cost is limited to the preliminary analysis. It is noted that discrepancies might be presented between future actual cost and current estimated cost. In this regards, to make up for the deficiency of data should be key factor to calculate decommissioning cost in an accurate manner.

## REFERENCES

- [1] Nuclear Energy Agency, Improving Nuclear Regulation, NEA No. 6275, OECD (2009).
- [2] Thomas S. L., etc., Guidelines for Producing Commercial Nuclear Power Plant Decommissioning Cost Estimates, AIF/NESP-036, Volume 1 (1986).
- [3] Notice of Ministry of Trade, Industry and Energy, 2017-195 (2017).