

# Development of Life-cycle Process for Effective Construction Management in Korean Nuclear Power Plant

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## 1. Introduction

After receiving an order of the UAE NP project, the industry of nuclear power plant in Korea has been transformed into export-oriented industry from the local infrastructure industry. So, it is required to transform the local construction management techniques into the globalized and systematic ones. As an initial research, the objective of this paper is to define the whole life-cycle process for nuclear power plant and to develop the framework of EPCS process. The result of this study will be applied to the advanced construction technology and development of information management system.

## 2. Development of the life cycle process for nuclear power plant project

In order to develop the systematic life-cycle process for nuclear power plant, a study was done in the following order.

### 2.1 Benchmarking on advanced overseas technology

Unlike other building construction projects, for nuclear projects, it is very important to develop a management system for managing whole life-cycle of nuclear power plant because of controlling various stakeholders. Therefore, the As-Is process is examined within the life-cycle of the existing areas in nuclear power plant construction such as Engineering, Procurement, Construction and Start-up thereby developing the To-Be process.

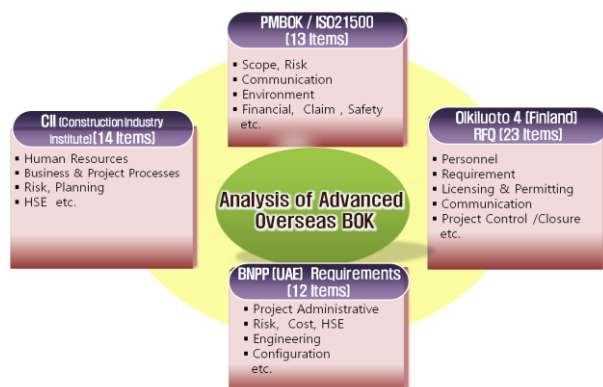


Fig. 1 Analysis of advanced construction management system of foreign countries for nuclear power plant

To this end, various construction management systems such as PMBOK of PMI, CII, FIATECH and requirements for construction project of foreign countries were analyzed.

### 2.2 Strategy for technology development

The overall strategies for technology development are as follows:

- Step 1 (2012): Establishment of strategy for technology development of life-cycle management for nuclear power plant
- Step 2 (2016): Integration and automation of the construction process for nuclear power plant
- Step 3 (2022): Integration and automation of operation and maintenance process for nuclear power plant
- Step 4 (2030): Integration and automation of entire life-cycle for nuclear power plant

The strategy of technology development is to grow to be one of the nuclear Big 3 of the world by 2030. Among the strategies, the scope of this study is limited to propose a whole life-cycle process frame and to provide a strategy to develop the To-Be model for the construction process of nuclear power plant.

### 2.3 Process Breakdown Structure

In this study, principal construction management functions from the current construction management systems were analyzed (As-Is) thereby providing the improvement direction of the corresponding processes.

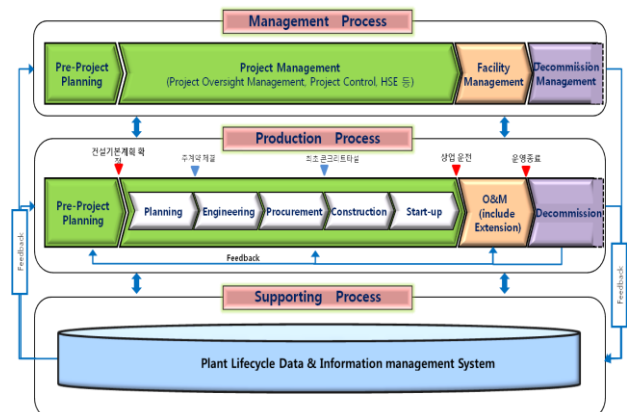


Fig. 2 Life-cycle management process framework of Korean standard nuclear power plant

Furthermore, in order to set up the implementation direction for systematization of the As-Is process and To-Be processes which are required to create, studies on practices from the advanced nations and global standards were performed.

Though, this process has the SNPM frameworks in shape, contents were composed of items such as PMBOK and ISO, and characteristics of Korean nuclear power plant in details. Based on the results of these surveys, the life-cycle processes of nuclear power plant were divided into Management Process, Production Process, and Supporting Process largely in this study. Each process was configured as an interactive form as shown in Figure 2. [1][2]

#### 2.4 Improvement direction for nuclear power plant construction process (To-Be)

In order to make the As-Is processes to comply with the global standard and improve productivity and economic efficiency for nuclear power plant construction, the To-Be process prototype frame was configured as shown in Figure 3.

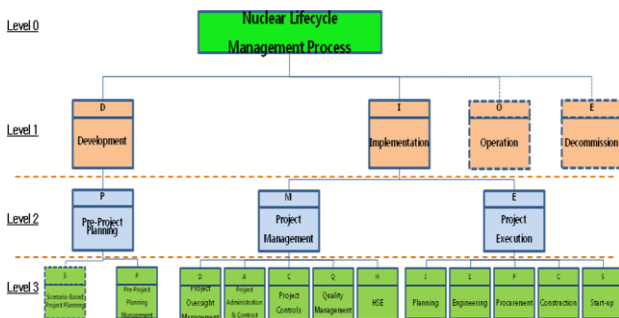


Fig. 3 Nuclear power plant life-cycle management process breakdown structure

##### 1) Configuration of Level 1

Level 1 is divided into Development, Implementation, Operation and Decommission. In this study, it is limited to Development and Implementation only.

##### 2) Configuration of Level 2

Level 2 is divided into Scenario-Based Project Planning and Pre-Project Planning of the development stage, Project Management and Project Execution of the implementation stage.

##### 3) Configuration of Level 3

Level 3 is divided into 12 processes in total.

#### 2.5 Conceptual System Architecture

Once the development of the process is completed, the system contents are created using the process, and system is developed.[3] The development procedure for the integrated life-cycle information management system for nuclear power plant is as follows: Gathering of requirements, existing system review, benchmarking, basic design, As-Is process review, and establishment of detailed plan and system development planning. Figure 4 shows conceptual framework of this system.

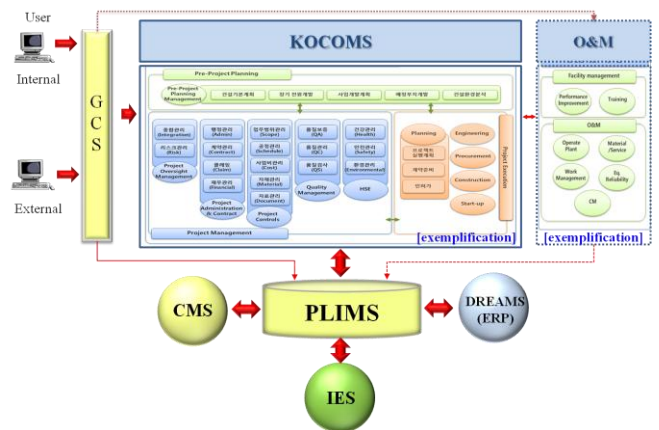


Fig. 4. Conceptual diagram of integrated life-cycle information management system for Korean nuclear power plant

[abbreviation]

- KOCOMS : Knowledge-oriented Construction Management System
- ERP : Enterprise Resource Planning
- PLIMS : Plant Life-cycle Information Management System
- DREAMS : Digital Real-time Enterprise Asset Management System
- CMS : Configuration Management System
- IES : Integrated Engineering System
- GCS : Global Cooperation System

### 3. Conclusions

The strategy development established in this study can be used as contents for the Data based Integration/Automation Technology for NP Project Management System development. The expected effects from the results of this study together with future research are as follows : First, globalized construction management technology and ability, which can compete with leading companies in nuclear power field, will be obtained. Therefore, competitiveness can be secured in the market of nuclear power plant. Second, construction cost will be reduced due to the productivity improvement in nuclear power plant construction. Finally, it is expected to create new jobs as a business model in the world market, and to distribute the management technology to other industries in Korea.

#### Acknowledgement

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- [3] S. K. Won, J. B. Lee, and C. H. Han, Analysis of Pre-construction Processes and Development of KMS Prototype of LNG Plant Projects, The Korea Institute of Building Construction, Vol. 9, No. 6, pp.151-159