

## **Development of Earned Value Management System in NPP Construction Project**

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### **1. Introduction**

The construction of Nuclear Power Plant (NPP) is a complex construction project going after economic efficiency and safety. It is also a large-scale and technology-oriented national project requiring enormous financial investments over more than ten years and the engagement of numerous stakeholders, and massive human and material resources [1]. The NPP construction project has been determined in the form of a rather lump-sum contract with little details in resource requirements and estimations. Therefore, Earned Value Management System (EVMS) needs to be applied to the NPP projects in order to incorporate scope, schedule and cost targeting efficient and to control effective resource.

The NPP projects in Korea have not applied EVMS. However, EVMS has come into request for overall schedule and cost risk management and performance measurement in overseas project of the NPP as a contractor [2]. EVMS has phased in NPP construction project by Korea Hydro & Nuclear Power Co., Ltd (KHNP), playing the role of project master manager in NPP construction in Korea. This study presented the EVMS unlike other system. Accordingly, EVMS is expected to reduce risks and increase efficiency in the NPP project.

### **2. EVMS Development**

As per the PMBOK Guide, Earned Value Management (EVM) is a methodology that combines scope, schedule, and resource measurements to assess project performance and progress. It integrates the scope baseline with the cost baseline, along with the schedule baseline, to form the performance baseline, which helps the project management team assess and measure project performance and progress. It is a project management technique that requires the formation of an integrated base line against which performance can be measured for the duration of the project. The principles of EVM can be applied to all projects in any industry. EVM develops and monitors three key dimensions for each work package and control account [3].

By amending the Construction Technology Management Act Enforcement Ordinance, public construction project of 50 billion won or more apply the EVM technique that is compare plan and performance for the construction costs of the process and schedule to improve transparency in management. In the leading

construction companies, it developed and has operated EVMS. For the successful NPP construction project involving in long construction period, significant cost, numerous requirement, stakeholder and contractor, it is necessary to apply EVMS to be possible to secure transparency, scientific and systematic.

#### *2.1 Application of EVMS in KHNP*

The NPP construction project as a complex combination of innumerable parties, each with its own particular technology and various resources, required a lot of preparation and review for application of EVMS [4&5]. According to the study of B.S.Moon et al, there was suggested the execution scheme phased for the application of EVMS. The phase of 'Build-up base' analyzes structure, procedure and definition of the EVMS in detail, and then 'Development of pilot system' establishes a standard database by applying the Progress & Performance Measurement System for overseas project in the internal industry. The third phase 'Trial application' advances these data and procedures from the start to finish while operating the EVMS of selected project. The last phase 'Applied expansion' proposes to expend the enterprise-level system to complement the trial pilot system.

#### *2.2 Development of EVM components*

Components to perform EVM are divided into three types: Plan elements for setting baseline, measurement element for performance measurement and analysis element including various factor, variations, estimates and performance indicator. The study established a standard data of the system for the setting of the EVM components by utilizing the project data of KHNP. The Work Breakdown Structure (WBS) is a top priority for project management, classifying and defining all works hierarchically within the scope of project. It developed WBS and Cost Breakdown Structure (CBS) for EVMS. It also defined a WBS level that is manageable in common to form WBS consolidated schedule and cost, and Control Account (CA) in conjunction with the Organization Breakdown Structure (OBS). Activity as Integrated Project Schedule (IPS) managed in the current NPP construction project is defined in the Work Package (WP).

#### *2.3 Development of Pilot EVMS*

The EVMS in NPP construction project developed by utilizing base component, CA, WP and numerous data in KHNP system. The system was composed of 4 main title: Establishing Control Account, Earn value management plan, Earn value measurement & analysis and Change & maintenance management.

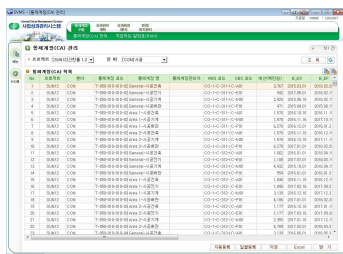


Fig. 1. Management of control account screen

Figure 2 shows the EVMS in NPP construction project, after the data input and performance analysis, the result was possible to expert various Contract Performance Report (CPR) of spread sheet (a) and to organize screen to be viewed by selecting up to four result chart (b).

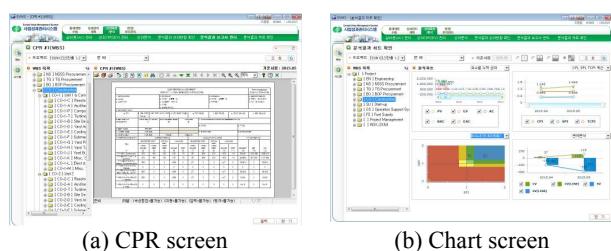


Fig. 2. The result screen

In dashboard screen, the EVMS expressed each CA unlike other system. It showed CA situation of tendency, scale and comparison of others to enhance the visibility and know intuitively. It presented distribution status based on the schedule and cost of the CA. It also was predictable the cost scale and tendency through the size and the arrow CA. The background color was distributable for progress state of CA.

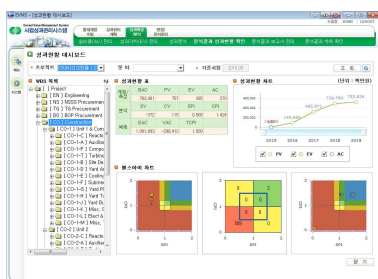


Fig. 3. The dashboard screen

### 3. Conclusions

The NPP construction project is a technology-intensive multi-construction project that should be based on economics and stability and that takes over ten

years to complete, requiring investment of billions of dollars, a great number of persons concerned, and a vast store of human and material resources.

KHNP is phasing EVMS in NPP construction project for overseas contracts and the efficient management, the paper presented the pilot EVMS in KHNP. It expected to control and identify of NPP construction projects by using EVMS as a computerized management tool which is quantitative and objective management criteria. It is necessary to improve of the contract system related EVM for enterprise system, and the effort will be required, such as on-site support and training so that this can be done in collaboration with the relevant stakeholders. The EVMS presented this paper will be continuously improve contract and function for assistance smoothly in project management.

### ACKNOWLEDGMENT

This work was supported by the Development of procedure & Manual for NPP project management of the Korea Institute of Energy Technology Evaluation and Planning (KETEP) grant funded by the Korea government Ministry of Knowledge Economy. (No. 2011T100200143)

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