Implementation of Main Process Function on Nuclear Facilities Decommissioning Project Information

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1. Introduction

Decommissioning information in the various fields (decommissioning legal regulatory requirements, facility characteristics information, radiation / performance information, radioactive waste management, radiation protection, etc.) related to decommissioning is generated during decommissioning for nuclear facilities, from permanent shutdown to site restoration. Since a vast amount of information is generated and this information is used for important factors such as waste management and cost estimation, it is necessary to manage information systematically and accurately. Various management systems have been developed so far, but they are used and managed independently as various systems, which limits the complexity and information management. In order to overcome this problem, we intend to develop an integrated management system by securing the connection between existing program unit information in the current research.

In this study, main process functions are implemented to efficiently manage the necessary information in the decommissioning process of nuclear facilities based on existing conceptual design and framework design.

2. Main Process Function Design

Prior to the decommissioning of the nuclear facilities, evaluating of an appropriate cost and determining the approximate scope of the project will determine the success of the decommissioning of the nuclear facilities in the planning stage. As cost evaluation method applied to existing facilities is not considered the radiological characteristics of decommissioning wastes, it is difficult to apply them to the decommissioning of nuclear facilities requiring stability and accuracy.

At this step, based on the design of framework, we developed the estimation of the amount of decommissioning wastes with radioactive characteristics and cost evaluation methodology. And using the flexible database we can adjust this method to other nuclear facilities.

At this stage, the method of calculating the decommissioning waste amount and the cost of decommissioning cost, which considers the radiological characteristics based on the results of the framework design stage, has been developed. Based on the database which is easy to utilize and expand information,

function to be applied to various types of nuclear facilities.

2.1. Framework Design

- Based on the integrated database, the framework was built into the Client / Server environment. In addition, the data can be integrated using a common data model.
- The framework of decommissioning information integrated system is to perform the most basic and key function which evaluates decommissioning cost through calculation of decommissioning waste quantity. Therefore, in this paper, the functions necessary for calculation of decommissioning waste quantity and basic decommissioning cost are implemented.

- Development of facilities information management system for nuclear facilities
- Implementation of decommissioning waste quantity calculation program
- Implementation of decommissioning cost calculation program

- Since the decommissioning of nuclear facilities conforms to the management direction and policy of the IAEA, it is necessary to set the information management and standard of nuclear facilities by reflecting the IAEA nuclear waste management system (RWMR) the amount of decommissioning waste can be calculated.

- Decommissioning cost evaluation methodology has developed based on decommissioning waste quantity calculation and decommissioning process model.

- Development of decommissioning process modeling program
- Costing for decommissioning waste quantity
- Costing through PBS and ABS mapping

3. Results

The main process of information decommissioning of nuclear facilities is to register and manage WBS related to decommissioning facilities and decommissioning activities as a main function of decommissioning work management and to calculate the decommissioning cost.

The main function of the decommissioning facility is to classify the waste by level based on the structure of the facilities to be decommissioning and the radiation / performance measurement data, and to support the basic data structure for evaluation of the decommissioning cost.

3.1. Contents of Program Menu

For the support the cost evaluation function, we redeveloped the UI based on former prototype. The top of the system consist with key modules and illustrated in Fig 1. In order to support the core process functions on decommissioning cost evaluation, we reconstruct some functions of the UI based on the existing implemented framework prototype as follows. At the top of the system, the core functions were placed on a module-by-module basis through a ribbon-type UI.

Fig 1. The Screen of top menu on decommissioning information integrated management system

Main process function details are followings.

- Decommissioning facility characteristics information; decommissioning facility information, facility history information, physical/radiological characteristic information
- Decommissioning waste information; Radioactive waste characterization information, radioactive waste determination and classification standard information
- Decommissioning cost evaluation; decommissioning facility and decommissioning process mapping, decommissioning cost analysis and reporting

3.2. Decommissioning Project Information Main Process Function

3.2.1 Decommissioning facility characteristics information

The decommissioning facility characteristic function classifies the waste by level based on the structure of the

facilities to be decommissioning and the radiation/activity measurement data, and supports basic data composition for evaluation of decommissioning cost. In this paper, the waste amount calculation formula is applied to the existing prototype UI, and some UIs are reconstructed considering user convenience.

- Decommissioning facility information: The first screen of this function provides a screen that summarizes the amount of waste and workforce calculated based on decommissioning facility information as shown in Fig 2. The structure of the screen is provided in the form of Tree Greed on the left side and the calculated result is provided on the right side. If you click on a specific facility out of the summarized information, you will be able to calculate the disposal waste amount. If you choose a particular facility in the drawing, you will have the ability to calculate the amount of waste disposal. In Inventory 1 of the Inventory Information, the user inputs the measured radiation activity information (Inner cont, out cont, etc.), technical properties, and nuclide information for the target facility and presses the calculation button, and the amount of waste is automatically calculated according to the radiation level. Inventory 2 allocates according to waste classification based on the waste rate information being managed.

Fig 2. Decommissioning facility characteristics information assessment

- Decommissioning facility history information: The decommissioning facility history information is a function of managing the history information of the decommissioning facility. As shown in Fig 3, the history is provided in the form of a list, and includes history information necessary for deriving decommissioning facility information.

Fig 3. Implementation screen of decommissioning facility history information

- Physical/radiological characteristic information: It manages the radioactivity information of each nuclide calculated through analysis in the form of table.
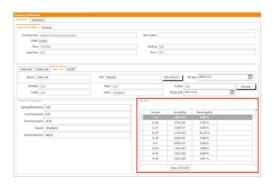

Fig 4. Radioactivity information by each nuclide

3.2.2 Decommissioning waste information

- Radioactive waste characteristics information: It consists of Acceptance Requirement, Waste Record, Approved Specification, Container, Supplier and Waster Generator.
- Information on radioactive waste determination and classification criteria: It is calculated the amount of waste according to the four-level classification criteria of radioactive waste by using the calculated each nuclide radioactivity information and radioactive waste limits.
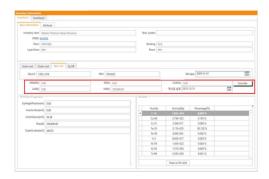

Fig 5. Calculation of radioactive waste quantity

4. Conclusions

In order to systematically and accurately manage related information generated during decommissioning of nuclear facilities, we have developed a methodology for estimating decommissioning costs based on the results of existing framework design phases.

In addition, it can be applied to various types of nuclear facilities by connecting facility characteristics information and decommissioning cost evaluation function based on database which can easily utilize and expand information with the aim of implementing the functions necessary to calculate decommissioning waste quantity and basic decommissioning cost calculation.

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