The Establishment of a Web-Based Safeguards Information Treatment System at KAERI

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1. Introduction

The agreement between the government of the ROK and the IAEA for the application of nuclear safeguards was signed in Oct. 1975, and entered into force in Nov. of that year. The ROK signed on Model Protocol Additional to the Safeguards Agreements (AP) with IAEA in 1999, which entered into force in Feb. 2004.

The ROK submitted the initial expanded declarations in Aug. 2004 pursuant to the AP. Since then, the KAERI has submitted expanded declarations (ED) on (1) the nuclear fuel cycle-related R&D activities not involving nuclear materials (Article 2.a.(i) of the AP), (2) descriptions of each buildings including structure and temporary buildings of the site (Article 2.a.(iii) of the AP), and (3) general plans for the succeeding ten-year period relevant to the development of the nuclear fuel cycle (Article 2.a.(x) of the AP) to the NSSC by 31 March of each year, and the IAEA has performed the complementary access in KAERI site in order to assure the absence of undeclared nuclear materials and activities based on the ED.

KAERI developed the web-based information management system for expanded declarations to effectively collect, preparing and manage the expanded declarations, called CIMED (Computerized Information Management system for Expanded Declarations).

The Integrated Safeguards (IS) has been applied to 10 nuclear facilities and 1 location outside facility (LOF) at the KAERI since July 2008. Since then, IAEA has performed the Random Interim Inspection (RII) for confirming the absence of undeclared nuclear materials and activities.

To cope with the RII, KAERI developed a web-based nuclear materials accounting system with the function of a near real-time accounting (NRTA) system to effectively and efficiently collect and manage the nuclear material accounting data occurred at the nuclear facilities and laboratories, called KASIS (KAeri Safeguards Information treatment System).

This paper describes the outlines on the status of the web-based safeguards information treatment system for both nuclear material accounting and expanded declarations. In 2017, KAERI improved the functions of CIMED to effectively prepare, collect and modify the expanded declarations. It also describes the improved functions of the CIMED.

2. Safeguards implementation system at KAERI

The KAERI site consists of 11 nuclear facilities subject to IAEA safeguards as shown in figure 1 on the safeguards system of KAERI.

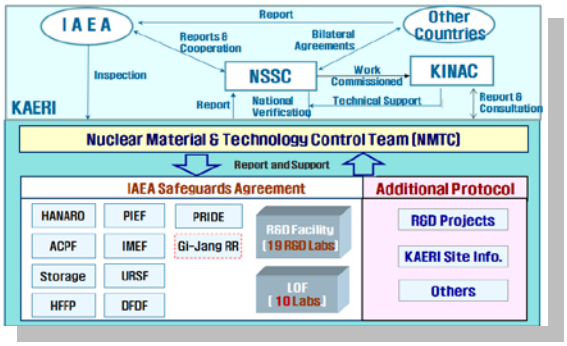

Fig 1. Safeguards System at KAERI site

Each nuclear facility must designate a safeguards manager for the implementation of safeguards work performed at the facility level under the internal regulation of KAERI. The designated safeguards manager should inform the nuclear material & technology control team (NMTC) of the safeguards information to be reported to the IAEA, and manage the nuclear material accounting documents maintained at the facility level. The R&D facility consists of 19 nuclear fuel cycle related R&D laboratories, while the LOF of KAERI consists of 10 basic R&D laboratories unrelated to the nuclear fuel cycle. The project manager in each R&D laboratory of an R&D facility or LOF should conduct the safeguards work like a facility manager. The NMTC, which is designated as a counterpart for international and domestic safeguards work at KAERI, has the responsibility for the overall implementation of the safeguards matters arising at each facility. Therefore, the NMTC has to timely collect and manage the nuclear material accounting data from the nuclear facilities although most nuclear facilities and R&D laboratories are located at different places in the KAERI site, and has to draw up the inspection documents and then provide them to the IAEA inspectors during the RII.

To cope with the RII performing by a short notice, it was needed for the development of a computerized accounting system to timely collect the nuclear material

accounting data from all nuclear facilities in KAERI as a near real-time basis.

3. Development of the KASIS (KAeri Safeguards Information treatment System)

KAERI has unique characteristics in its safeguards implementation system such as (1) the various types of nuclear facilities, (2) the different locations of the nuclear facilities and R&D laboratories, and (3) the independent organization (NMTC) for the safeguards implementation. Based on these characteristics, KAERI recognized some difficulties for the preparation of RII when the IS was applied in the ROK because there was no central computerized system for collecting the nuclear material accounting data from the different nuclear facilities in KAERI. For this reason, it is necessary for the KAERI site to develop a near real-time accounting system (NRTA) to collect and manage the nuclear material accounting data occurred from 11 nuclear facilities for the preparation of RII under the IS.

KAERI developed a web-based nuclear material accounting system, called KASIS, to periodically prepare, manage and process the nuclear material accounting data occurred from each facility, and to cope with short notice inspection under the IS, as shown Fig. 2. KASIS has main features such as (1) NRTA for maintaining the nuclear material inventory reflecting the inventory changes for the preparation of RII under IS, (2) cross-checking functions for the nuclear material transfer in KAERI, (3) information sharing with other computerized accounting systems, (4) the creation of nuclear material accounting reports to be submitted to IAEA, and (5) the management of all kinds of information to be maintained for the safeguards implementation at the facility level.

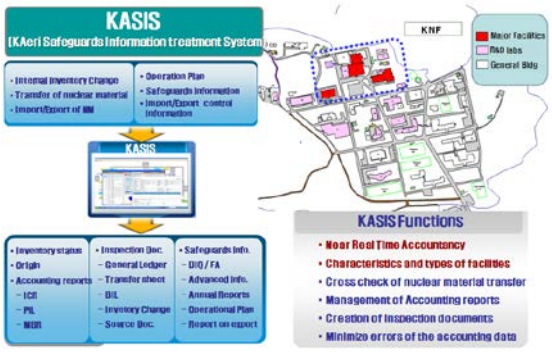

Fig 2. Schematic diagram of KASIS

4. Development of the CIMED (Computerized Information Management system for Expanded Declarations)

KAERI has used a protocol reporter provided from the IAEA to simply manage and produce expanded declarations since the Additional Protocol (AP) entered into force in 2004 in the ROK. It is not sufficient for KAERI site to manage the detail information of expanded declarations under the AP.

KAERI developed the Computerized Information Management system for Expanded Declarations (CIMED) in 2012 to effectively collect, manage and submit the expanded declarations related information from the R&D projects carried out at KAERI, as shown in fig. 3. The major functions of the expanded declarations are as follows:

1) Collection of expanded declaration from the project managers through the Intranet of KAERI, preparation, creation and management of expanded declaration provided to the IAEA
2) the automatic establishment of relationships on the R&D projects and site information

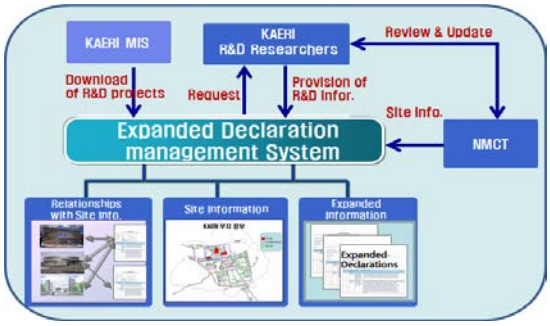

Fig 3. Schematic Diagram of CIMED

5. Improvement of CIMED Functions

The CIMED has the functions to effectively prepare and manage the expanded declarations on the information of nuclear fuel-cycled R&D activities not involving nuclear material which is subject to Article 2.a.(i) of the AP. The CIMED collects and manages the expanded declarations on the Article 2.a.(i) from a few thousands R&D projects performed in KAERI as well as the Article 2.a.(x) which is a general plans for the succeeding ten-years period relevant to the development of the nuclear fuel cycle. However, the CIMED had difficulties on the treatment of collection and modification of the expanded declarations on the Article 2.a.(i), and on the creation and management of the Article 2.a.(x) so that it was needed to improve its functions.

In 2017, KAERI improved the various functions of CIMED for effectively preparing, collecting and modifying the expanded declarations as follows

(1) Establishment of the function for the preparation, modification and current states of the Article 2.a.(x)
- Designation of the ID using the unique name and year of preparation
- Establishment of the linkage between the previous and current expanded declarations

- Improvement of effectiveness on the functions of the preparation, modification and current states of the Article 2.a.(x)
- Maintenance of the current states on the on-going declarations and the terminated declarations of the Article 2.a.(x)

Fig 4. Preparation and current states of Article 2.a (x)

(2) Establishment of the function for creating the expanded declarations on Article 2.a.(i), (iii) and (x) using existing information stored at the CIMED

- The function for creating the expanded declarations in the CIMED was upgraded, so that all declarations on Article 2.a.(i), (iii) and (x) are sequentially created after cross-checking the creation state of the previous Articles.
- Subsidiary information on project manager, project title, department, telephone no. etc are also attached to the created expanded declarations for the purpose of a cross-reference of the relevant information as shown in Fig 5..

Fig 5. Creation of Expanded Declarations (Article 2.a.(i))

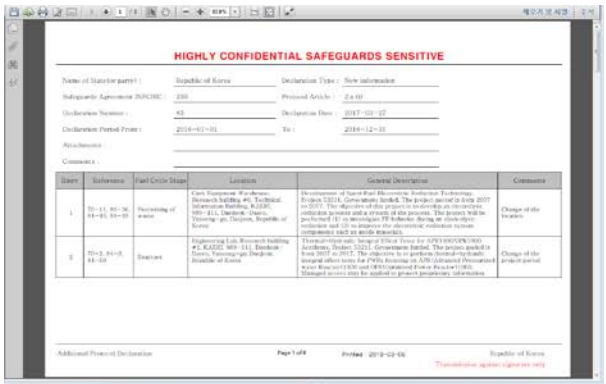

Fig 6. Output Form of Expanded Declarations

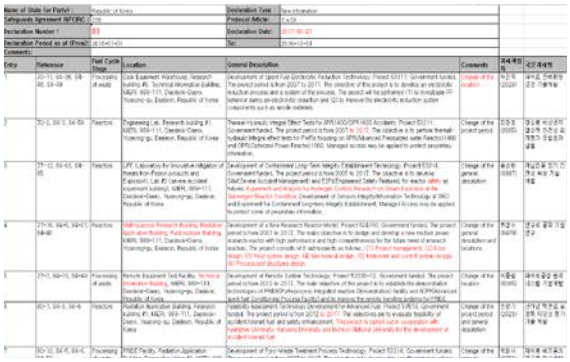

Fig 7. Information managed for Expanded Declarations

- Fig. 6 shows the print form of expanded declarations to be declared to IAEA not involving the relevant information, while excel file as shown Fig. 7 includes all relevant information for the management of the Article 2.a.(i).

(3) Enhancing the functions for displaying current status of expanded declarations submitted to IAEA

- Screen composition elements of expanded declarations consist of four sections as shown in Fig. 8; (i) outlines of R&D project on expanded declarations, (ii) detailed description of the R&D project, (iii) histories of the R&D project maintained in management information system of KAERI, (iv) histories of an expanded declaration

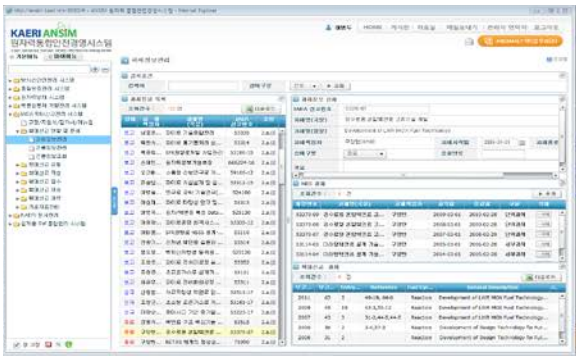

Fig 8. Screen Composition Elements for Expanded Declarations (Article 2.a.(i) & (iv))

- Detailed information can be searched by clicking a designated line on the screen as shown in Fig. 9, and it also continues tracking of the past expanded declaration submitted to IAEA using the reference number displayed on the screen.

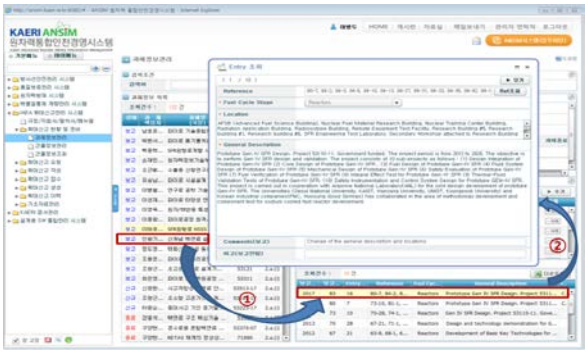

Fig 9. Method of information Retrieval on Article 2.a.(i)

- Information on the excluded declarations and the reviewed R&D projects during the preparation of the Article 2.a.(i), are managed in the CIMED as shown in Fig. 10

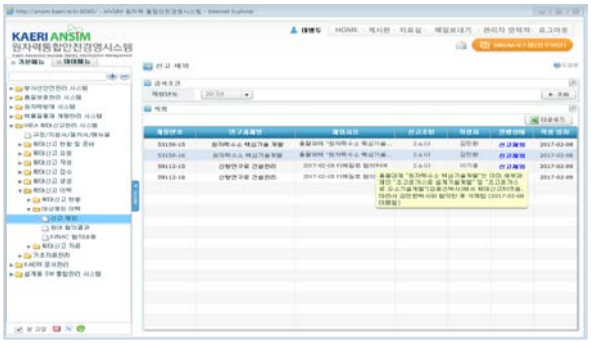

Fig 10. Excluded Declarations from Article 2.a.(i)

(4) Establishment of co-relation between Article 2.a.(i) and Article 2.a.(iii)
- Research rooms and laboratories used for the R&D projects of Article 2.a.(i) should be described in the Article 2.a.(iii). The CIMED automatically searches and establishes linkage in the Article 2.a.(iii) using the locations described in the Article 2.a.(i)
- The CIMED also establish the reference numbers to describe the co-relations between Article 2.a.(i) and Article 2.a.(iii)

6. Conclusions

The ROK has to implement the safeguards obligations under the traditional safeguards agreements signed in 1975 and the additional protocol which entered into force in 2004.

The nuclear facilities and laboratories subject to IAEA safeguards in KAERI have to provide the nuclear material accounting data to the inspector within 2 hours after notification of the RII under the IS and to submit the nuclear material accounting reports to IAEA under the traditional safeguards agreements. The nuclear fuel cycle-related R&D activities, site-information and general plan for nuclear fuel cycle should be submitted to IAEA under the AP. Therefore, it is very important for KAERI site to establish and maintain a safeguards information treatment system on the nuclear material accounting data and expanded declarations for the effective/efficient safeguards implementation.

KAERI developed the KASIS with the functions of a near real-time accounting data treatment to collect and control the nuclear material accounting data from different nuclear facilities and locations in a short time.

KAERI also developed the CIMED for the effective preparation, modification and management of the expanded declarations on Article 2.a.(i) from a few thousands R&D projects. It was especially improved on the functions of creation and management of Article 2.a.(x), and on the functions of modification and information management of Article 2.a.(i) in 2017.

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