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

Byung-Doo Lee, In-Chul Kim, Seung-Ho Lee

Nuclear Material & Technology Control Team, Korea Atomic Energy Research Institute (KAERI) Corresponding author: bdlee@kaeri.re.kr

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 tenyear 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.

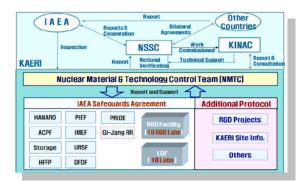


Fig 1. Safeguards System at KAERI site

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 realtime 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.

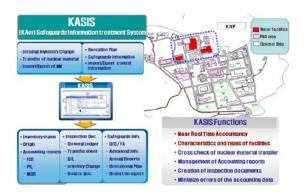


Fig 2. Schematic diagram of KASIS

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
- 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

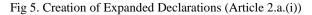
- Improvement of effectiveness on the functions of the preparation, modification and current states of the Article 2.a.(x)
- Maintenance of the current states on the on-going declarations and the terminated declarations of the Article 2.a.(x)



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..

CAERIANSTM						A 085	HOME THAT	NAME OF BRIDE	10月秋月秋日、東山村共				
EX대학동한안전경양시스템								A 📢	S AND A CONTRACTOR				
and Account Norther Middle (Panaliki) pickages and								1000					
4000 ± 0000	- 12	4.851 M	成白彩										
*	100	a etta											
建立法 口诊疗疗疗法		a marks grant governmenter med (mediater)											
東京市市市市 4-2市													
CONTRACT NAME	u												
	I HAUN T Destaret												
日かないの意力の目的もの場所を		ACREATE A			Room al Sinfeliat work?		Republic of Korea	Bachtaben Type	down transfer				
0 #000 0#9 5 mil	100	PANA RE LAURY			-Dafester	inte Aprentiat Mr C Str.	236 4	Platecol Article	0.8.00				
 ・ ・ ・		AVER TANK				Com Nambre	- P	Subsection Date:	2012-00-02				
49/12 24		+ California -			Sinkan	field Participation	2214048	14	2148-17-81				
C 10804 11 18 0		20043		Connerts		ala C							
· 四本(1)公司(2)年													
-045625#	1.2	nder Litt	ίΰ.										
	100	1	-	5 INT			mand Methodales						
Device Device	4	1111	tanta to t'	Call Couprier Research Isabi Terriniza Bala Building, KASS Daminok Galery Ju. Daminok Galery Ju. Daminok Galery	ng P6, Maton L 909-111, L Yuncotar	-35713. Government Runded	I the project period a from the tax development of electricity the periperion will be perfor- ing an electrolistic reduction.	a 2007 to 2017 Bi rinfue Tatin pricewale (70 ange manif (11) ha micutiwe and (22 to emprove	~~ 111 73 525				
		/1-2 64.5 81.59	-	Engranding Lan, Arreston building #2, cA216, 909- 111, Carrienti, Carris, Indong ya, Carris, Result of Kone		Thermodulation and a lifety fractional wave strategies and the strategies of the st							
		27.45	LEFE Cuberstres for provides integration of traceles from Dates predicts and features, bit #1 Dates account		Development of California Vector plops, Antibett 33214, Anna 2005 to 2017. The of Planage and J and EM-DTe Makes Extramed prior 4.	Chang, Term Johnson, Mich. Sourcement Europed, The publics & Ry Develop TerMCS processed Safetty Fusibured In	prosett period is Severe Accelent or reactor softery as Changes	··· 1/25 * 1/2					



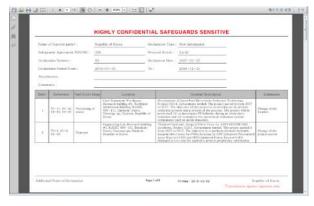


Fig 6. Output Form of Expanded Declarations



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

Land, ment (met els million : metter #	THE BEECEVENING PAILOR	19.1										
KAERIANSIM	T MAR HOW AND UP ARANA SAAAAAA TA	118										
B자락통합안전광양시스템	C C MENT CALLS	101										
APHIN COMMIS	a water	-										
attention and												
	a 2423											
CARAMORE ALL	Coas (544, [111.1-) + 18											
CA BUYHTAN YER	B ANTIN SM B BARY DA											
 ・ 広都市営会等株 不能的市 4万勝 ・ 広報価格 有能の不可能的 40.0 単 ・ 広報価格 有能の不可能的 4.0 単 ・ (1) 学習, 不会的 空外心 19 小会 ・ (1) 学習, 不会的 空外心 19 小会 ・ ・ ・	AND-1 TO ALL AND ALL A											
	THE REPORT OF THE PARTY AND AN											
10000000000000	TO MER., DOINT DAMAGEST STORE 2 AND 2 AND 20 MARKED TO CONTINUE OF CART SECTION OF											
Constraint of the second	8-2 455, 2010 82/855 8 5124 2.41 2010 2010 2010 2010 2010 2010 2010 20	18.9										
	NO NOR DESIGNER AGENT SIZES AND TAKE AND THE AND THE ADDRESS AND ADDRESS ADDRE											
	WI ANT. STREWNERS MODINI LASS											
	12 220											
	NT Day, Des Augung . States and											
		+ n										
	#2 898 500500005 No. 140											
		1										
		41										
		80)										
	TO THE RECEIPTER SHIT TAIL THEFE CONTRACT BY THE SHIELD SHIELDS AWAR	1										
	A TAN ATTACK ON AN											
	all and the benefit the tart (#120) + 0	61										
	15 per ADIGUESED, MALE LAS VIL 1994 Bettern Delly- Metersburger	100										
	THE LWY A SAME RESIDENCE TO A SAME AND A SAM											
	9.2 Direct Board 200 8/300 and 10 80 AMART Reading Strength of 200 Hill Station Development of 200 Hill Stationary											
	SE THA. WTG 72 41278 . SHUT LAT 1017 45 3 32 3442,442 hadre beeigned at 108 Min for Technique											
	BE DUP. BOTH STREET, SITUAT TAIL BID IN 2 SALES Samere disapprent of Base Tachology Te fun											
2.0.17 D × 0	Bill Party, Butter Mith Barga, Technol Zaug 1 2008 26 2 Beautine Development of Beager Technology T	-										

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.

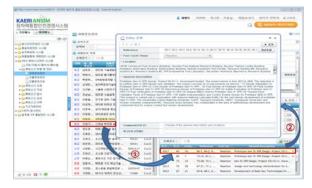


Fig 9. Method of information Retrieval on Article 2.a.(i)

- 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

			A DWG HOME CRASH	statut at	the late in the		-		
KAERIANSIM			a date interest interest	-1.00 00 140					
원자력통합안천경영시스템					193	and the second second	CO VINCTO		
3285 0085	an et al 4630						101		
100 000									
WARDER AND	B 2548.825								
Comparison August	PE00104 No.	(100)4 (+)					+ 21		
Ca 8/2/PM/28 -42.538	B 45								
日本市営業市 市営会社 ハム社						19	a own		
DMARG2286A3単 二字型/万変化/第四人/第四人		10 P A A 10	A11411	11288	MANA	1101010	-		
+ Ca REACE THE TO BE	33139-13	BRROW MUTH NE	美装加持 "我们的手上 相談打論…	2.4.0	30.0	0.241	2017-02		
+ (a NO(1)) 1 1 1	59159-10	ADVID-A MUTHING		2.6.07	200	#28m	2017-02		
+ C3 BORUT 1918	39112-15	090942450	3017-02-08 #1963245 \$2107404	2.6.03	1018	0.2410	2017-02		
C	29112-10	04636 5866	8 Q	12337404 87 671874912340 1271274141818	ANALASING AN AREA	あび第7時点 との市内市場。	3817-63		
* C1 CF-1278 31 CH-91			0.00	I).					
「行政権官」									
0.00.029									
- Carter Burne									
+ CA 718714157									
CALL IN THE REAL PLAN AND A LONG AND AND A LONG AND AND A LONG AND AND A LONG AND AND AND AND A LONG AND AND A LONG AND A LONG AND A LONG AND AND AND A LONG AND AND A LONG AND									
MAR DO BUDD HAM									
X # 22 B X 0									

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.

REFERENCES

[1] INFCIRC/540, "Protocol Additional to the Agreement between the Government of Korea and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons" entered into force on 19 February 2004.

[2] Services Series 11, "Guidelines and Format for preparation and submission of declarations pursuant to Articles 2 and 3 of the Model Protocol Additional to Safeguards Agreements", May 2004

[3] "Implementation Procedures for Inspection Activities under Integrated Safeguards on KAERI-Daejeon Site in ROK", Oct. 2008

[4] INFCIRC/236, "Agreement between the Government of the Republic of Korea and International Atomic Energy Agency for the Application of Safeguards in connection with the Treaty of the Non-Proliferation of Nuclear Weapons", 1975

[5] Institute of Nuclear Material Management, "The Transparency Efforts of KAERI on the Development of a Web-Based Accounting System under the Integrated Safeguards", July 2012

[6] Institute of Nuclear Material Management, "Implementation Status of the Additional Protocol at KAERI", July 2017