

Safeguards Implementation at KAERI

Juang Jung^{a*}, Sung Ho Lee^a, Byung-Doo Lee^a, Hyun-Sook Kim^a

^aNuclear material and technology control team, Korea Atomic Energy Research Institute

*Corresponding author: jajung@kaeri.re.kr

1. Introduction

The safeguards implementation of nuclear materials was carried out at a facility level in an effort to support peaceful nuclear activities at the Korea Atomic Energy Research Institute (KAERI). The safeguards implementation will fulfill the obligations associated with international agreements such as the IAEA comprehensive safeguards agreement and additional protocol and bilateral nuclear cooperation agreements. The main objective of the safeguards implementation activities is to assure that there are no diversions of declared nuclear material and/or no undeclared activity. In the course of achieving these objectives, the role of the nuclear material and technology control team is the KAERI safeguards implementation for 11 nuclear facilities (Table 2). Also, the purpose of safeguards implementation activities is the assistance facility operators to meet the safeguards criteria set forth by the Atomic Energy Safety Acts and Regulations. In addition, the nuclear material and technology control team has acted as a contact point for domestic and international safeguards inspection activities and for the relevant safeguards cooperation. [1]

2. KASIS (KAeri Safeguards Information treatment System)

KAERI developed a web-based nuclear material accounting system, called KASIS, for periodically managing and processing the nuclear material accounting data at each facility, and to cope with random interim inspections under the IS. A random interim inspection means that KAERI should prepare the inspection documents within 2 hours after notification of the RII by the IAEA or domestic inspectors. In fact, it was difficult for the facility operator to prepare the accounting report of RII within 2 hours without KASIS. Figure 1 shows a schematic diagram of KASIS. [2]

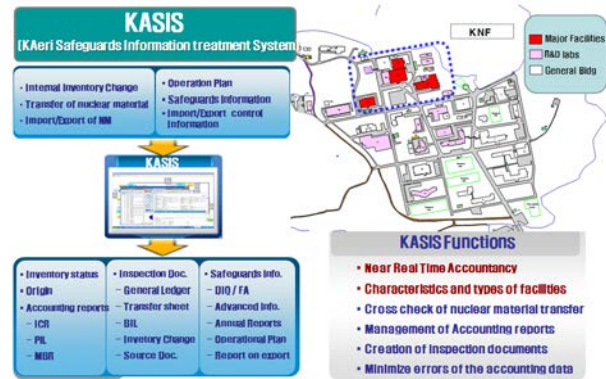


Fig. 1. Schematic diagram of KASIS

3. The status of Safeguards Implementation

3.1 The status of KAERI nuclear material accountancy

The obligation of safeguards is making the accounting records of all KAERI nuclear materials and submitted to Agency. Reports to be provided to the Agency consist of three types: [3]

- (1) Inventory Change Reports (ICR) showing all changes in the inventory of the nuclear materials.
- (2) Physical Inventory Listing (PIL) showing the material identification and other batch information for each batch of nuclear materials physically present in the facility at a given time. [4]
- (3) Material Balance Reports (MBR) showing the material balance based on a physical inventory of the nuclear materials actually present in the material balance area.

KAERI has submitted these to the Agency on a timely basis. Table 1 shows the submission status of KAERI over the last decade.

Table 1: Submission status of KAERI nuclear material accounting reports in 2006~2014.

	2006	2007	2008	2009	2010
ICR	84	78	78	97	86
PIL	23	18	17	19	21
MBR	21	12	10	11	12
	2011	2012	2013	2014	2015
ICR	83	74	79	84	-
PIL	21	19	19	22	-
MBR	11	11	10	11	-

3.2 The Status of IAEA and domestic inspections at KAERI

The main purpose of IAEA inspections is the detection of nuclear material diversion, which is the most important and basic for the safeguards implementation. To do that Agency shall verify the consistency and correctness of information provided for on-site inspection. The facilities shall properly prepare accounting reports for inspection, and should take the measures for on-site inspection. Figure 2 shows a comparison graph for the domestic inspections, IAEA inspection, and IAEA technical visits.

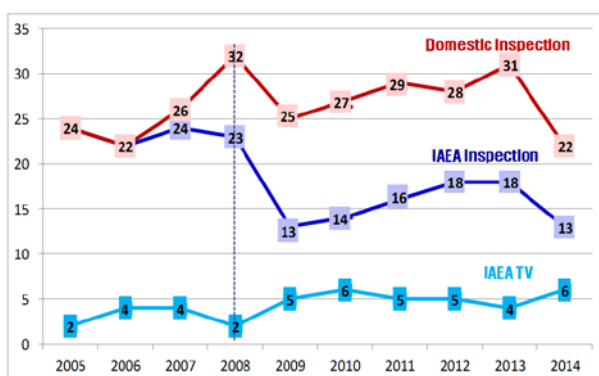


Fig. 2. Trend of Inspection Frequency

3.3 The advanced declaration by Integrated Safeguards at KAERI

One of the major safeguards measures proposed by IAEA under integrated safeguards is the advanced information of category III facilities. It was agreed to submit the advanced information of Monthly, Quarterly and Annual for category III facilities. Table 2 shows the classification of category for KAERI nuclear facilities. [5]

Table 2: Classification of category

Category	Functional capability	Facility
I	<ul style="list-style-type: none"> Self-contained capability facilities Over 1 SQ Undeclared Pu production without other support 	HANARO PIEF
II	Other facilities except category I, III	HFPP, IMEF, LOF, R&DF, NMS, NRS
III	Pyro-processing related facilities	PRIDE, ACPF, DUPIC

4. Upcoming issues of KAERI Safeguards

4.1 The safeguards approach for Pyro-related facilities

For the purpose of carrying out of field verification activities at pyro-related facilities on the KAERI site, the IAEA will verify the consistency and correctness with advanced information using unannounced inspection.

For development of Safeguards approach for pyro-related facilities, advanced declarations and an annual operational schedule are required from the facility operator for the Category III facilities (ACPF, PRIDE, DUPIC). This is in accordance with Articles 2.a.(ii) and 3.f. of the AP, and monthly information will include any update for the declared information of the proceeding period, and the annual information will be updated quarterly. Updated advanced information on NM receipt/shipment will be reported through the ICR.

Additionally, the safeguards of PRIDE facilities started from this year. Every nuclear material and salt will be moved from argon cell to the container before we take the IAEA inspection at PRIDE facilities. We do not yet know whether this nuclear material accounting method is effective or not. The nuclear material accounting method of pyro-related facilities is not specified yet therefore the Agency and KAERI need to have more discussions.

4.2 The improvement of domestic inspection regime

The KINAC (Korea Institute of Nuclear Nonproliferation and Control) is improving its domestic inspection. As shown in Table 3, KINAC is trying to conduct separate IAEA and domestic inspections.

Table 3: Before and after improvements of the domestic inspection system

	Now	Improvement	
System of Inspection	IAEA and Domestic Inspection perform simultaneously.	IAEA and Domestic Inspection perform separately.	
Type of Inspection	IAEA and Domestic Inspection	IAEA Inspection	Domestic Inspection
	<ul style="list-style-type: none"> DIV PIV SNRI Random Interim Inspection Ad-hoc Inspection Special Inspection 	<ul style="list-style-type: none"> DIV PIV SNRI Random Interim Inspection Ad-hoc Inspection Special Inspection 	<ul style="list-style-type: none"> Inspection before receipt(New) Domestic regular inspection(New) Ad-hoc Inspection Special Inspection
Duty of KINAC	IAEA inspection supervision and	IAEA inspection supervision and	Comprehensive inspection of

	technical support • Limited inspection of regulations for nuclear material accounting compliance	technical support	regulations for nuclear material accounting compliance • Check for situation of undergoing IAEA inspections
--	---	-------------------	--

5. Conclusions

KAERI nuclear facilities have undergone inspections well from the IAEA and demonstrated a good quality of safeguards implementation with no discrepancy or errors. In addition, domestic inspections were successfully carried out at the KAERI nuclear facilities pursuant to the domestic laws and regulations in parallel with the IAEA safeguards inspections.

It is expected that safeguards work will be increased due to the pyro-related facilities such as PRIDE, ACPF and DUPIC, for which the IAEA is making an effort to establish safeguards approach. KAERI will actively cope with the plan of the NSSC by changing its domestic inspection regulations on the accounting and control of nuclear materials.

REFERENCES

- [1] The 1st meeting minute “ROK-IAEA Coordination Group for Enhanced Cooperation in the Implementation of Integrated Safeguards” CGEC 2012
- [2] B.D. Lee, H.S. Ko, H.S. Kim, The transparency efforts of KAERI on the development of a web-based accounting system under the integrated safeguards, Institute of Nuclear Materials Management, 2012
- [3] Integrated Support Center for Nuclear Nonproliferation and Nuclear Security, International Training course on the state systems of accounting for and control of Nuclear Material, 2012
- [4] Nuclear Safeguards Technology, Proceedings of a symposium, 1978
- [5] B.D. Lee, H.S. Ko, H.J. Kim and H.S. Kim, Implementation Experience of the Integrated Safeguards Approach at the KAERI site, Institute of Nuclear Materials Management, 2010
- [6] H.J. Kim, B.D. Lee, Integrated Safeguards at KAERI-Daejeon Site, Nuclear Engineering and Technology, 2008
- [7] IAEA Safeguards Glossary 2001 Edition. International nuclear verification on series No.3