Development of on-line reporting system for nuclear material

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1. Introduction

Korea participation in the international non - proliferation regime began with the signing of the ROK-US Nuclear Cooperation Agreement on February 3, 1956. In 1975, the Korea-IAEA nuclear nonproliferation treaty was enacted and began to participate in the international nuclear nonproliferation regime in earnest. Based on the nuclear non-proliferation status, Korea reports on the inventory status and inventory changes of regulated materials based on the bilateral nuclear cooperation agreement with overseas countries and the safeguards agreement with the IAEA.

Currently, Korea is developing system to improve the reporting system of nuclear materials. In this paper, we present an on - line nuclear material reporting system under the supervision of KINAC as part of the development of the nuclear material reporting system. And by comparing the developed system with the function of the overseas reporting system, derive the systems characteristics and improvement needs.

2. Development of on-line reporting system

2.1 Background of Development

In Korea, KINAC is conducting international regulated material reporting in accordance with the Nuclear Safety Act. Three systems are in operation in KINAC for reporting purposes. The purpose of this system is to enhance the linkage between systems by integrating the nuclear material reporting system, and to enhance the efficiency of the reporting work and the convenience of users.

2.2 System Overview

In the existing reporting system, each nuclear facility in Korea submits a nuclear material report to KINAC via e-mail. The KINAC staff who receives the report from the facilities collects and reviews reports for each facility and uploads them to the Korea Safeguards Information System (KSIS) which is KINAC internal information system. The report uploaded to KSIS will generate a national report after one more automatic verification process such as grammatical / logical errors verification in the system.

However, the newly developed system simplified the existing reporting procedure. In the new system, each facility staff directly accesses the online site, uploads

the report, and completes the automatic verification in the site. Verified reports are automatically submitted to the KSIS system. Fig. 1 is showing the online reporting system work flow.
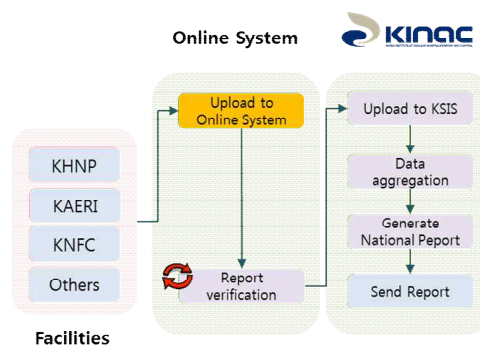

Fig. 1. Annual report & Accounting report reporting process

2.3 System function – Accounting Report

One of the main functions of the system is the preparation of the accounting report for Nuclear Materials. The person in charge of the domestic facilities accesses to the system and performs the report.

Each staff of the domestic facilities uploads data files written in accordance with the Code 10, checks reports on the system for any grammatical or logical errors, and then submits the report.

The grammatical / logical errors occur when the contents are not written in a proper location.

The submitted report is automatically transferred to the KINAC internal server so that the KINAC staff for accounting report can confirm whether each staff of domestic facilities submits the report. The KINAC staff for accounting report carries out comprehensive verification of the reports submitted for each staff of the domestic facilities and submits them to the IAEA.

2.4 System function – Annual Report

Annual reports under the Nuclear Cooperation Agreement between countries are also a major function of the system. Korea has nuclear cooperation agreements with 29 countries, of which the main countries are Canada, Australia and Japan. Also from this year, the United States will be included in the annual report submission by amending Korea - US Cooperation Agreement. Therefore, system maintenance is required accordingly.

The basic function of the annual reporting system is to calculate the final inventory amount reflecting the year's decrease and increase values for the previous year's nuclear material inventory.

The basic process of the annual reporting system is similar to the Accounting reporting system. However, since the reporting items and reporting forms required by each country are different, an annual reporting system has been developed for each country. When each facility staff submits a report using the standardized form of Excel file for each country, KINAC internal server will collect and organize reports submitted and automatically generate a national report.

2.5 Foreign reporting systems

Representative examples, there are Nuclear Materials Management and Safeguards System (NMMSS), Nuclear Accounting and Compliance (NAC) Reporter, and Technology for Accounting and Reporting (STAR) systems. NMMSS specific specifications and functions are not disclosed.

The NAC Reporter is similar to NMMSS, but is a bit more simplified and used in some US facilities that handle small quantities of nuclear material. STAR system is first nuclear material accounting system developed by a private company. The following table compares each system function.

Table 1. Reporting system function

Function	KINAC on-line system	NAC Reporter	STAR
Accounts based on MBAs	Yes	Yes	Yes
Accounts maintained for sub-MBAs	No	No (system can be enhanced to add this function)	Yes
Material transfer tracking	No(under development)	No (system can be enhanced to add this function)	Yes
Facility level function	No	Yes	Yes

Basically, all three systems manage nuclear materials based on the Material Balance Area (MBA) concept. However, the STAR system uses the concept of sub-MBA by dividing the existing MBA in more detail and uses this concept in the Location Outside Facilities (LOF). But, the online system developed by KINAC does not have the function for LOF facility, and the system for LOF facility is separately constructed.

NAC Reporter and STAR systems provide state level function, but also provide facility level function. The functions corresponding to each level are shown in the following table [1].

In Korea, however, systems with facility level functions are developed by each facility itself. KAERI's KASIS and KNF's MES system are representative examples.

Table 2 State level, Facility level system functions

State Level	Facility Level
- System Operation and Information Flow - Nuclear Material Accounting and Reporting - Nuclear Material Tracking - Source Material Reporting and Tracking - Voluntary Reporting Obligations - QA and Information Security - System Relationships and Reports - Domestic, Bilateral, and Other Requirements	- Source Data - Supporting Documents - Accounting Records - IAEA Accounting Reports - Nuclear Material Accounting - Nuclear Material Tracking - Source Material Reporting and Tracking - Voluntary Reporting Obligations - QA and Information Processing - System Relationships and Reports - Domestic, Bilateral, and Other Requirements

3. Conclusions

KINAC developed an on-line nuclear material reporting system, and compared the functional aspects with the foreign reporting systems.

The reporting system has different functions depending on the country according to the IAEA or bilateral cooperation agreements. Therefore, it is difficult to directly compare foreign reporting systems.

But there are characteristic that appears in Korea's reporting system. First, the foreign reporting system manages the LOF facility with other facilities using the sub-MBAs concept, but in Korea, a separate system for managing the LOF facility is being constructed and operated. Second, the foreign reporting system provides the functions of the State level and the Facility level at the same time, but in Korea, Facility level function is developed by the facility itself.

The developed system has excellent performance such as data collection, error verification and report generation, and simplified the existing reporting procedure. However, reporting functions and data such as LOF management systems and facility-level systems are distributed across multiple systems and facilities. Therefore additional system maintenance and development will be needed to systematize and integrate the reporting process.

REFERENCES

[1] John Oakberg, Kimberly Gilligan, NUCLEAR MATERIAL ACCOUNTING AND REPORTING INFORMATION SYSTEMS: CAPABILITIES REVIEW, ORNL, p.7-11, 2014.