Identification of Requirements for Safeguards Inspection Supporting Program based on Domestic Regulation and CIOSP

Haneol Lee[a*], Hyun Ju Kim [a], Hyun Young Kim [a], Jung Youn Choi [a]
[a]Korea Institute of Nuclear non-proliferation and Control
*Corresponding author: haneol@kinac.re.kr

1. Introduction

The ROK has adopted the state level approach (SLA) of IAEA safeguards since 2015. As a result, the ROK has been conducting national inspection on domestic nuclear facilities.

The nuclear safety and security commission (NSSC) of the ROK is responsible for domestic nuclear safeguards in the ROK. The NSSC delegates national inspection to the Korea Institute of Nuclear non-proliferation and Control (KINAC). National inspectors in the ROK are currently using the common inspection on-site software package (CIOSP), which is an in-field inspection supporting program developed by the IAEA for book examination and item verification.

However, due to the different reporting system between the ROK and the IAEA, the application of the CIOSP software is limited in national inspection. Also, inspection supporting system for national inspection has to provide the input parameters for domestic material balance evaluation (MBE).

The purpose of the research is to identify requirements for national inspection based on domestic regulations and IAEA's inspection supporting program (CIOSP). The identified requirements will be used as a target to design an independent national inspection supporting program for nuclear safeguards.

We analyzed related domestic regulations and capabilities of the CIOSP to identify functional requirements for the inspection supporting program.

Results indicated the inspection supporting program should be able to perform book examination, item verification, report comparison, sampling plan and facility database establishment.

2. Regulation Requirements

The legislation hierarchy of the ROK's nuclear regulation consists of "Acts", "Presidential Decrees", "Ordinance of the Prime Minister" and "Administrative Rules (Notification)" (Figure 1) [1]. Table 1 describes the list of regulations which are relevant to national nuclear safeguards inspection [2-6].
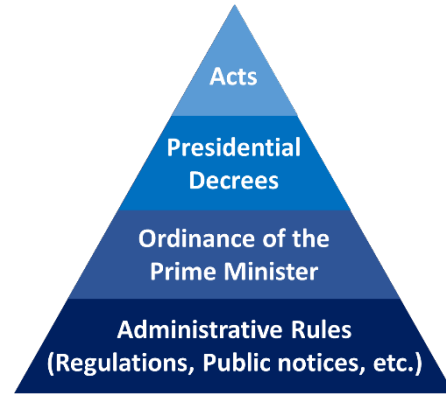

Fig 1. Legislation Hierarchy of the ROK

Table 1. The ROK's regulations related to SNM accounting

Type	Regulation
Acts	Nuclear Safety Act
Presidential Decrees	Enforcement Decree of the Nuclear Safety Act
Ordinance of the Prime Minister	Regulations for the Nuclear Safety Act
Administrative Rules (Regulations)	Regulations on the Inspection of Special Nuclear Material Accounting and Control (NSSC No. 2017-83)
	Regulations on the Writing of Special Nuclear Material Accounting and Control Rule (NSSC No. 2017-82)

The detailed requirements are described in the NSSC regulations. The regulation No. 2017-83 specifies the type, range and frequency of national inspection.

The national inspection in general represents "regular inspection" and "interim inspection". Inspectors evaluate the accounting rules of a facility and examine the compliance of the accounting rules. The range of national inspection, which is addressed in article 4, includes the following processes:

1. Verification of operator's nuclear material accounting report
2. Verification of the location, consistency, amount and composition of special nuclear material (SNM) based on measurement
3. Verification of the maintenance of operator's measurement system
4. Use of containment and surveillance devices
5. Examination of the material accounting records
6. Examination of the operator's design information questionnaire

7. Examination of the operator's material balance areas (MBAs) and key measurement points (KMPs)
8. Verification of the material unaccounted for (MUF), shipper receiver difference (SRD)
9. Examination of the operator's process for material accountancy
10. Performing additional process required for national inspection (i.e. sampling)

The NSSC regulation No. 2017-82 specifies the requirements for operators in nuclear facilities. The requirements, which are described in article 4, for the operator include:

1. Organization and duty related to the accountancy of SNM
2. Report for the accountancy of SNM
3. Information of KMP and measurement methods for SNM accounting
4. Process of receiving/shipping of SNM
5. Education and training related to SNM accounting
6. Additional process related to SNM accounting

The national inspection supporting program has to satisfy the requirements in the subparagraphs of the NSSC regulations above. We summarized the list of four regulatory requirements for national inspection supporting program.

1. Book examination
2. Inventory verification
3. Evaluation of the measurement system
4. Preparation for material balance evaluation (MBE)

3. CIOSP

CIOSP (Common Inspection On-site Software Package) is an IAEA program, which is used for IAEA safeguards inspections. The CIOSP is able to perform book examination, item verification, comparison of reports, inspection data editing, production of IAEA log-sheets [7].

The book examination process generates an operator's general ledger. Once the target period has set, the CIOSP generates revised general ledger using the previous general ledger and mailbox declaration, which is a daily item change report from a facility to the IAEA. It also evaluates the quality of the declared reports. However, the daily reporting system is not used for national safeguards inspection.

The item verification process performs stratification of nuclear material, sampling plan and generation of list of inventory item (LII) log-sheet. The CIOSP converts the format of operator's LII into a format for item verification. CIOSP then stratifies the converted LII based on the stratification rules inside the program. The sampling plan is then applied to the stratified LII.

The comparison of reports of CIOSP is performed by comparing item change report (ICR) and the operator's general ledger to examine the consistency. The inconsistencies are then corrected by inspection data editing process.

The IAEA log-sheet is a summary of the CIOSP processes or modules. The list and function of five modules of the CIOSP are described in Table 2.

Table2. The list and function of CIOSP modules.

Module type	Function
Module 1	Inspection information
Module 2	Results of book examination
Module 5	Results of comparison of results
Module 6	Loaded operator's declaration
Module 8	Verified LIIs and detailed information

The national inspection supporting program has to satisfy the functional requirements of the CIOSP software. We also summarized the list of functional requirements, which are not included in regulation requirements, below:

1. Inspection setup (information of the inspection)
2. Management of facilities' daily declaration
3. Qualification of operator's declarations
4. Stratification of LIIs
5. Sampling planning
6. Generation and management of log-sheet (inspection results)
7. Application of inspection results to national safeguards system

4. Conclusions

As discussed in Section 2 and 3, we identified requirements for national inspection supporting program based on the domestic regulation and the CIOSP. The program has to be able to setup inspection, perform book examination and inventory verification, evaluate the facilities' measurement system, convert the format of operator declaration, qualify and stratify operator's item lists, prepare the MBE including sampling plan, manage inspection results, apply the results to national safeguards system.

The identified requirements will be the functional requirements of national inspection supporting program, which has to be developed to satisfy requirements of national inspection.

ACKNOWLEDGEMENT

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