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The status of the safeguards implementation under the State-Level Approach at the HANARO

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1. Introduction

An agreement between the government of the ROK and the IAEA for the application of safeguards was signed in Oct. 1975. The ROK signed the Additional Protocol (AP) with the IAEA in 1999 and it entered into force in Feb. 2004. The broader conclusion that all nuclear material has remained in peaceful activities in the ROK was drawn by the IAEA in June 2008 and IS(Integrated Safeguards) was applied in 2009. The IAEA developed the SLA(State-Level Approach) for the States in order to maximize effectiveness of safeguards in an environment of constrained resources. The SLA has been implemented at KAERI-Daejeon site in the ROK since 2015.

The ten nuclear facilities and one LOF(Location Outsides Facility) of the KAERI-Daejeon site are grouped into three categories under the SLA. The HANARO(High flux Advanced Neutron Application ReactOr) and PIEF(Post Irradiation Examination Facility) are involved in the category I "self-contained capability" facilities that have at least one significant quantity of suitable nuclear material and which could support undeclared plutonium production/separation activities without other supporting infrastructures[1].

This paper described the status of the safeguards implementation at the HANARO involved in the category I under the SLA. The status of a model inventory management system for a research reactor developed in 2013 was also investigated.

2. The features of the HANARO

HANARO, a multi-purpose research reactor having a 30 MWth open-tank-in-pool type, light water cooled, light water and heavy water moderated, heavy water reflected consists of the fresh fuel storage, reactor core, spent fuel storage for storing the nuclear material, non-nuclear materials.

3. The status of the safeguards implementation under SLA at the HANARO

The APA(Acquisition Path Analysis) which is central to the development of the SLA enables the IAEA to structure its activities in a manner that focuses on the States as a whole and integrates in-field inspection and state evaluation efforts. Under the SLA, States will be differentiated based upon objective State-Specific Factors of the States that influence the design, planning, conduct and evaluation of safeguards activities[2]. ROK estimates that the frequency and intensity of IAEA inspection at ROK under the SLA has the similar level with those under the IS.

Under the IS, PIV(Physical Inventory Verification) was annually performed at the HANARO. RIIs (Random Interim Inspections) were performed at facilities randomly selected with a selection probability of 50%, but at least 1 to be selected per year, for all the Category I facilities[3]. Also, one additional RII for HANARO Research Reactor was carried out, because its thermal power exceeds 25MWth[3]. Though a selection probability for the inspection under the SLA was not applied, it is expected that the frequency and intensity of the IAEA inspection at HANARO under the SLA has the similar level with those under the IS. The IAEA inspection at HANARO has been successfully performed under the SLA.

In order to support RIIs on the short notice, the annual advanced information, advanced site operational declaration(quarterly) and monthly advanced information for the HANARO were submitted to the IAEA under the IS. Also, the above information for the HANARO need to be provided to the IAEA under the SLA. These information has been submitted to the IAEA in a timely manner.

In addition, there are several cameras and other equipment installed by the IAEA at HANARO. Under the IS, the data occurred from them was usually downloaded by the inspector during the inspection. Under the SLA, it enables to transmit remotely to the IAEA.

As the ROK government requests the HANARO to be earthquake-proof, the HANARO is under construction for the reinforcement work of the walls. So, the KAERI requested the IAEA to move the two surveillance cameras installed at the HANARO. The IAEA detached them and a single temporary XCAM was installed in Dec. 2015. Though the HANARO construction is scheduled to be finished in Oct. 2016, it is not fixed. Before the re-operation of HANARO, the IAEA will re-install the surveillance cameras. Also, the IAEA is targeting 2017~2018 to upgrade the SDIS(Server Digital Image Surveillance) to NGSS(New Generation Surveillance System).

4. A model inventory management system for a research reactor

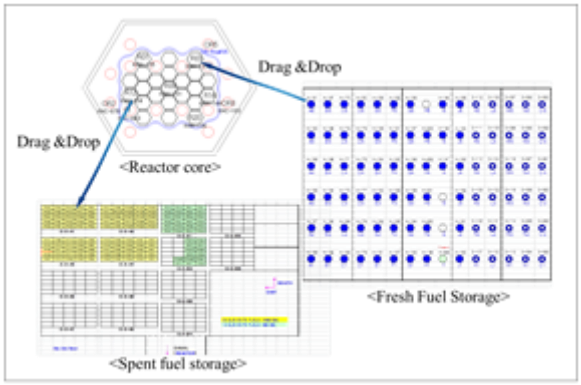

Fig. 1 The schematic diagram of a model inventory management system for a research reactor

KASIS (KAeri Safeguards Information treatment System) has been operated by the KAERI safeguards team to manage the nuclear material accounting data produced at the all KAERI nuclear facilities in near-real time and to cope with a short notice inspection.

In case of HANARO, the non-nuclear materials such as radio isotopes, casks, and rigs as well as the nuclear material inventory to be used for the reactor should be managed for the purpose of facility operation. A model inventory management system for a research reactor was developed to effectively manage them at HANARO.

Fig. 1 shows the schematic diagram of a model inventory management system for a research reactor. It aims at controlling the material inventory for the nuclear material accounting work and the convenient facility operation. The major functions of it are as follows:

Firstly, the history on the transfer of the nuclear materials as well as the non-nuclear materials such as radio isotopes, cask and rigs is traced.

Second, the nuclear material using Drag and Drop function is transferred between the different locations. Its design is based on graphic user interface environment to improve user's convenience.

Third, each diagram for the storages and reactor core is conveniently created.

Also, it was designed to integrate with the KASIS. It has additional functions for the creating nuclear materials accounting reports(Nuclear Materials Control Records, Inventory Change Report, Physical Inventory List, Material Balance Report, etc.) and for managing safeguards information.

But it was not available due to the budget and human resources problem on the constant maintenance and upgrading for the stable operation of it, though it was developed in 2013. If it is practically used, it will help to effectively manage the nuclear material accounting data as well as to conveniently control the material inventory for the facility operation.

5. Summary

In this paper, the features and status of the safeguards implementation of the HANARO under the SLA were analyzed. Under the SLA, the monthly, quarterly and annual advanced facility operational information for the HANARO has been submitted to the IAEA in a timely manner. The IAEA inspection at HANARO has been successfully performed under the SLA. It is expected that the safeguards implementation work at HANARO under the SLA has the similar level with that under IS. Under the SLA, the data occurred from the surveillance cameras and other equipment installed at HANARO enables to transmit remotely to the IAEA. The IAEA is targeting 2017~2018 to upgrade them.

In addition, the development status of a model inventory management system for a research reactor was investigated. It aims at controlling the material inventory for the nuclear material accounting work and the convenient facility operation. The major functions of it are to trace the transfer history of the nuclear materials and non-nuclear materials, to transfer the nuclear material using Drag and Drop function between the different locations and to conveniently create each diagram for the storages and reactor core. Though it was developed in 2013, it was not available due to the budget and human resources problem on the constant maintenance and upgrading for the stable operation of it. If it is practically used and integrated with the KASIS, it will help to effectively manage the nuclear material accounting data as well as to conveniently control the material inventory for the facility operation.

REFERENCES

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