Improvement of Nuclear Material Accounting and Control Reporting Process in the ROK

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1. Introduction

Countries joining the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) should conclude Safeguards agreement with the International Atomic Energy Agency (IAEA) [1]. Therefore, 131 countries including the ROK concluded the Comprehensive Safeguards Agreement (CSA) and Additional Protocol (AP) with the IAEA as of 2019 [2]. The ROK has continuously supported the IAEA to keep the obligations resulted from the CSA and AP. The IAEA basically applies Safeguards to nuclear material, and the Safeguards measures constitute of four elements such as nuclear material accounting and control (NMAC) reporting, containment, surveillance, and inspections. Among these elements, the NMAC reporting is performed by submitting the reports. These NMAC reports, which are inventory change report (ICR), physical inventory listing (PIL), and material balance report (MBR), are submitted from a state to the IAEA. For this submission, the authority of the ROK is responsible for consolidating and verifying the NMAC reports submitted from nuclear facilities. Previously, the NMAC reports were submitted from the nuclear facilities to the authority by official documents through the government's intranet. Then, the authority verified all types of error in the NMAC reports. However, this work was extremely time consuming. Therefore, this reporting process was improved for increasing the efficiency and effectiveness of the Safeguards implementation by launching the State Declaration Portal (SDP) in 2021. The operators of the nuclear facilities can submit the NMAC reports through the SDP and verify errors included in the reports themselves. In this study, the differences between the previous and present NMAC reporting process and the advantages of the SDP were introduced.

2. Methods and Results

The authority of the ROK for nuclear regulation is the Nuclear Safety and Security Commission (NSSC), and it has three technical support organizations (TSO). Among these TSOs, the Korea Institute of Nuclear Nonproliferation and Control (KINAC) is entrusted by the NSSC for the information management on internationally controlled materials provided for in Article 98 of the NUCLEAR SAFETY ACT [3]. The nuclear material is one of the internationally controlled materials, and the information management includes the NMAC reports submission to the IAEA. Therefore, the KINAC submits the NMAC reports submitted from the nuclear facilities in the ROK to the IAEA on behalf of the NSSC. And, this NMAC reporting process was improved by the development of the SDP which was the web-based system for the NMAC reports submission.

2.1 Description of NMAC Reports

The NMAC reports include the information on the status of the nuclear material subject to Safeguards at a defined area and on the changes in that status since the previous report [4]. And, these NMAC reports consist of the ICR, PIL, and MBR. The ICR contains changes in the nuclear material inventory and should be submitted to the IAEA within 30 days from the end of the month in which the inventory changes occur. If there are no inventory changes in a nuclear facility, the ICR does not need to be submitted. The MBR contains the material balance based on a physical inventory of the nuclear material which is actually present in the material balance area (MBA). The MBR should be submitted to the IAEA within 30 days after the physical inventory taking (PIT) in a nuclear facility. The PIL is listing all nuclear material batches separately and specifying material identification and batch data. The PIL should be submitted within 30 days after the PIT of a nuclear facility and attached to the MBR. Specifically, the PIL and MBR should be submitted to the IAEA even if there is no nuclear material in a MBA at the time of the PIT [4]. And, a concise note can be attached to each NMAC report if additional explanations need to be included. Each NMAC report's form and the explanations for their use are included in the Subsidiary Arrangement (SA) of the CSA between the ROK and the IAEA.

2.2 Previous NMAC Reporting Process

Before the SDP was developed and launched, the operators of the nuclear facilities in the ROK submitted their NMAC reports by the official documents through the government's intranet. Then, the KINAC entrusted by the NSSC consolidated the NMAC reports submitted from the nuclear facilities. Based on the NMAC reports consolidated, the KINAC verified them to find any type of logical and transfer error. If any

error was found in the NMAC reports, the KINAC asked the operators of the nuclear facilities to correct and submit the NMAC reports again. This step for correcting the NMAC reports was extremely time consuming. After all errors found in the NMAC reports were corrected validly, the KINAC submitted the NMAC reports encrypted to the IAEA through the its declaration web portal. The overall flow chart of the previous NMAC reporting process is shown in Fig. 1.

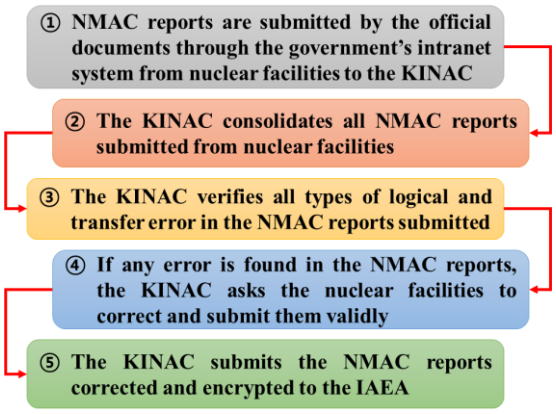

Fig. 1. Previous NMAC reporting process

2.3 Improved NMAC Reporting Process

The most important characteristic of the SDP is that the operators of the nuclear facilities can submit and verify their NMAC reports themselves. Therefore, the KINAC only needs to verify the type of transfer error in the NMAC reports between the nuclear facilities. This advantage can extremely reduce the time for the KINAC to verify the NMAC reports submitted. The overall chart of the improved NMAC reporting process is shown in Fig. 2.

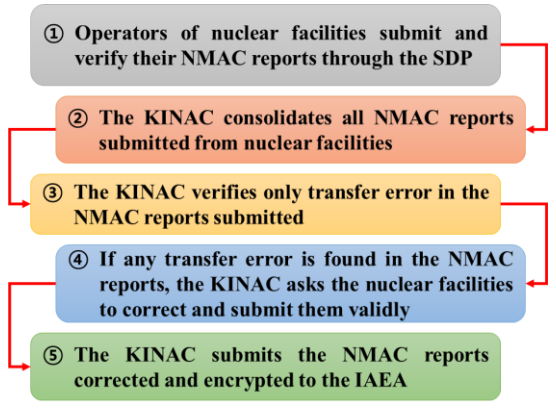

Fig. 2. Improved NMAC reporting process

2.4 Advantage of SDP

The development of the SDP was initiated in 2017 to enhance the efficiency and effectiveness of the Safeguards implementation in the ROK. And, the test trials for the SDP developed were performed by several operators of the nuclear facilities in 2020. Based on the feedbacks collected from the operators, the SDP was updated to strengthen security and officially launched in February 2021. The main advantages of the SDP are shown below, and the main page of the SDP is shown in Fig. 3.

- Operator's ability for producing the NMAC reports is enhanced
- The KINAC's task load for verifying the NMAC reports to find any type of logical error is reduced
- Efficiency and effectiveness of the NMAC reporting process is increased
- Quality of the NMAC reports submitted from the ROK to the IAEA is enhanced
- Several reports for annual, quarterly, and monthly advanced declaration of the KAERI and KHNP's CANDU can be submitted through the SDP

Fig. 3. Main page of the SDP

3. Conclusion

The previous NMAC reporting process was improved by the development of the SDP. Therefore, the differences between the previous and present NMAC reporting process and the main advantage of the SDP were introduced in this study. The most important change is that the operators of the nuclear facilities in the ROK can submit their NMAC reports and verify the reports themselves. Conclusively, the SDP will contribute to enhance the efficiency and effectiveness of the Safeguards implementation and the quality of the NMAC reports submitted from the ROK to the IAEA.

REFERENCES

[1] TREATY ON THE NON-PROLIFERATION OF NUCLEAR WEAPONS, 1970.
[2] IAEA, The Safeguards Implementation Report for 2019, GOV/2020/9, IAEA Board of Governors, 2020.
[3] Nuclear Safety and Security Commission, NUCLEAR SAFETY ACT, 2020.
[4] IAEA, IAEA Safeguards Glossary, International Nuclear Verification Series No.3, 2001.