A study on the benefits of support for updating the International Target Value through the Member State Support Program (MSSP)

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1. Introduction

The IAEA intends to establish and update the International Target Value (ITV), the uncertainty required to assess the feasibility of the process sample analysis method for verifying safeguards, every 10 years. Accordingly, in 2020, the IAEA held the ITV 2020 project to renew the existing ITV 2010 to ITV 2020, thereby requesting the ROK to cooperate with the project. The project will receive expert advice and material resources from member states through the IAEA Member State Support Program (MSSP).

In the ROK, the measurement management of specific nuclear materials in the ROK has been carried out since the introduction of the State Level Approach (SLAs) in 2015, but there has been no analysis system and no quantitative analysis standards. Therefore, in order to establish guidelines for the precision of nuclear material analysis aimed at establishing the domestic nuclear material analysis system, we plan to establish the precision standards for specific nuclear material analysis in the ROK by participating in the IAEA ITV 2020 project.

2. Necessity and Process

2.1 A Request to participate in ITV task through MSSP

The IAEA has sought various opinions and consultations from member states through the MSSP and has asked the ROK to attend to amend ITV-2010, which was written in 2010. Because the ITV value is a measurement uncertainty value in a "General State Systems of Accounting for and Control of Nuclear Material (SSAC) environment", the IAEA wanted to be reviewed by experts in implementing inspections and verification each member state to assess the reliability and feasibility of the revised value. In addition, the IAEA introduced ITV values ('93) as a concept of standard uncertainty by weight measurement, non-destructive analysis and destructive analysis methods in a typical analytical environment, and is being updated every 10 years.

2.2 Background, Necessity,Process and expected output

The Section for Nuclear Fuel Cycle Information Analysis (IFC) in the Division of Information Management (SGIM) contributes to the all-source information analysis necessary for the IAEA to produce credible conclusions concerning the compliance of States with their Safeguards obligations.

In particular, SGIM-IFC is responsible for the processing and analysis of verification data collected by IAEA inspectors in nuclear fuel cycle (NFC) facilities in the form of:
1) destructive analysis (DA) and environmental sampling (ES) samples analyzed by the IAEA safeguards analytical laboratory (SAL) and other laboratories of the IAEA network of analytical laboratories (NWAL);
2) non-destructive assay (NDA) measurements made by inspectors in NFC facilities; and
3) bulk measurements (weights, volumes) made by inspectors.

SGIM-IFC's role is to assess the consistency between the results of verification data and declared information in order to detect and deter diversion from declared nuclear material and identify indicators of possible undeclared nuclear material and activities.

Nuclear material accountancy (NMA) for safeguards involves quantitative verifications by independent measurements of nuclear material quantities declared by States under their safeguards agreements. The effectiveness of the IAEA verifications strongly depends upon the quality of both the NFC facility operator's declarations and the inspector's verification measurements. A reference system is therefore needed to assess the quality of measurement results and compare them with international standards. The ESARDA Working Group on Standards and Techniques for Destructive Analysis (WG DA) introduced the concept of target value to the IAEA and EURATOM in the late 1970s. The concept was extended and refined over the years, leading to the international target values (ITV), which is regularly updated in the form of an IAEA Safeguards Technical Report (STR) first issued in 1993. The preparation of the next report issue, ITV-2020, will take into account advances in the areas of uncertainty quantification (UQ) and verification measurement performance evaluation (VMPE), advances in measurement equipment and analytical techniques, and lessons learned from the preparation and application of ITV-2010(Fig. 1.).

Fig. 1. IAEA Document -ITV 2010(STR1368)

The strengthening of safeguards effectiveness heavily depends on the constant progress made in the verification of state declarations, particularly with regard to the nature and quantity of nuclear material under safeguards. By not updating the ITV for over a decade, such strengthening would be at risk.

The ITV project will be carried out in three phases. Phase 1 is to review the preparation phase and organization/planning of the execution phase. Phase 1 of the project as described in the overall Task Plan under Section 7.1 below was accomplished in 2019 according to the plan: the high-level schedule, objectives, roles and responsibilities were established; a Project Board was created; teams of experts in charge of ITV in different measurement areas (DA, NDA, weight, volumes) were created, each led by an IAEA specialist; outreach was initiated with a call for assistance raised in the context of international conferences side events (ESARDA meeting in May 2019, meetings with NMCC/JSGO in Japan, INMM annual meeting in July 2019). As execution phase, intense exchanges between the IAEA groups (DA, NDA, Bulk measurements) and external stakeholders in the form of correspondence, video conferences, workshops and the CGM as last stage will be conducted in 2 phase. In last phase, preparation and publication of the STR and electronic media will be implemented by IAEA ITV team. This will require financial support and in-kind support e.g. review, translations, IT expertise (possible development of an ITV application). In the process, the ROK will actively support the final compilation.

The expected output is a new version of STR-368 (ITV-2010) entitled "ITV-2020," which would include tables of measurement uncertainties that should be achievable under nominal conditions by typical NFC facility laboratories or during safeguards inspections for commonly-used DA, NDA, and bulk (weight, volume) measurement methods applied to the measurement of nuclear material types encountered in NFC facilities. In addition to the paper version, versions on modern media platforms (website application) will be considered.

The ITV STR is one of the Department of Safeguards most consulted reports, and a large number of stakeholders (State and regional authorities, NFC operators, IAEA inspectors) will benefit from the ITV-2020 update.

2.3 The Role of the ROK through Participation in ITV Project

The ROK is currently conducting safeguards activities, such as verification and analysis of nuclear materials at nuclear facilities, but it is difficult to achieve 100% verification of all nuclear materials through the absence of quantitative analysis standards. Under these circumstances, the participation of the IAEA ITV project is expected to be of great help in establishing guidelines for the precision of nuclear material analysis. Therefore, the project will be carried out to share the ROK's experiences, etc. and to conduct technical consultations related to the establishment of specific nuclear material analysis procedures and systems carried out in the ROK.

3. Conclusions

By participating in the proposed ITV revision project through the MSSP, the ROK will attend IAEA expert advisory group meetings and propose methodologies related to analysis methods, review IAEA methodologies to derive values for ITV 2020, and review ITV 2020 values proposed by the IAEA. It is believed that the precision criteria for analyzing specific nuclear materials in Korea will be established based on the uncertainty value of the analysis methodologies derived through this.

REFERENCES

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