

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

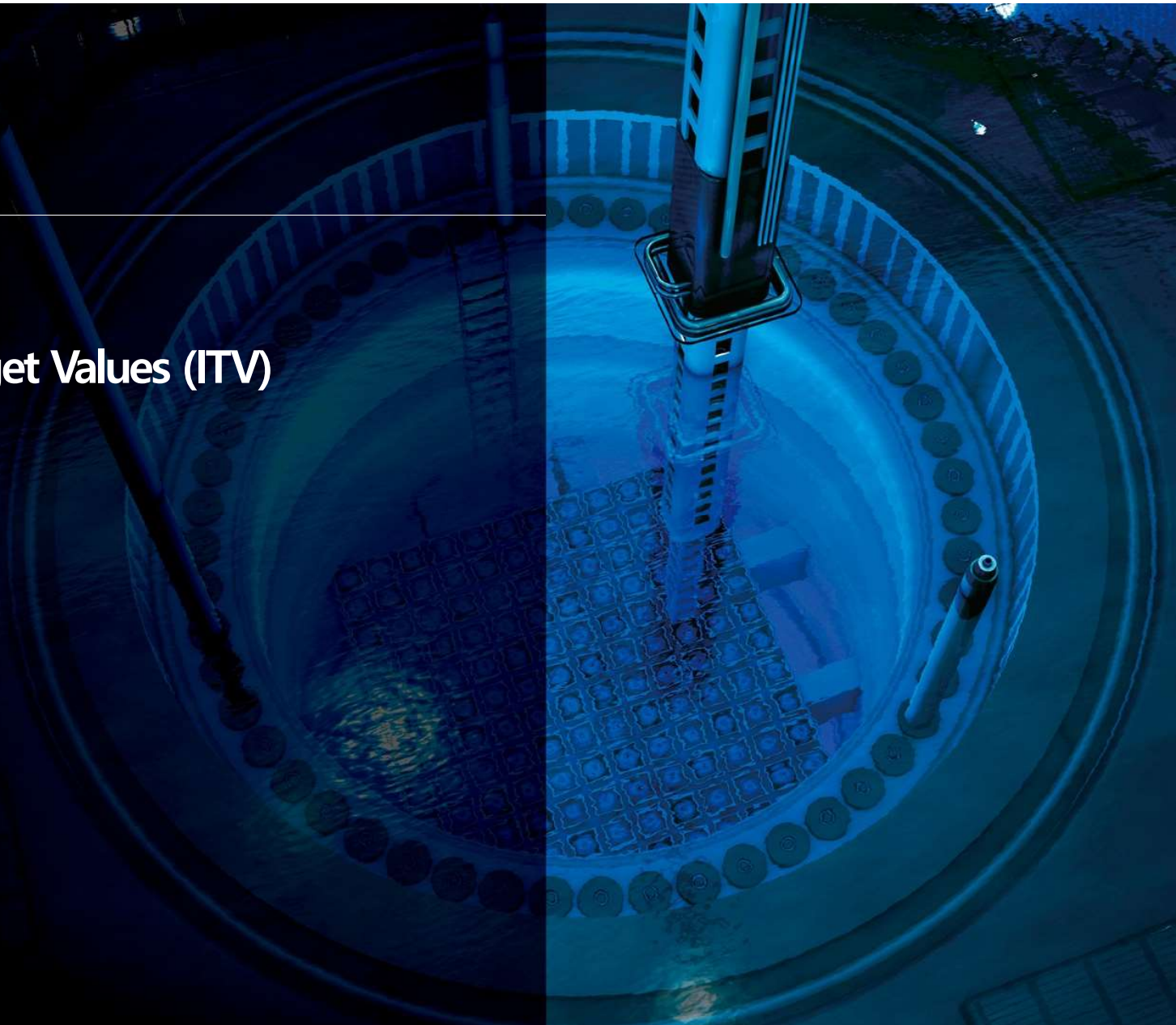
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# Why International Target Values (ITV)

## Why International Target Values (ITV)

- ❖ Special Safeguarding nuclear material involves a **quantitative verification** of the accountancy of fissile materials by **independent** measurements;
- ❖ The **effectiveness** of these verifications strongly depends upon the **quality** of both the facility operator's declarations and the inspector's measurements;
- ❖ A reference system is needed to **assess and compare** measurement qualities.

## Why International Target Values (ITV)

- ❖ For this reason, comprehensive safeguards agreements (CSA) based on INFCIRC/153 stipulate that:

*“The Agreement should provide that the system of measurements on which the records used for the preparation of reports are based shall either Conform to the latest international standards or be equivalent in quality to such standards.”*

*INFCIRC/153(Corr.) Part 2*

## Why International Target Values (ITV)

- ❖ **In the 1970s**, the IAEA defined a set of international standards of nuclear material accountancy defined as: values of the measurement uncertainty  $\delta E$  (relative standard deviation) expected for  $\delta E$  (%), for different types of facilities:

Facility Type	$\delta E$ (%)
Uranium enrichment	0.2
Uranium fabrication	0.3
Plutonium fabrication	0.5
Uranium reprocessing	0.8
Plutonium reprocessing	1
Separate scrap storage	4
Separate waste storage	25

## Why International Target Values (ITV)

- Special These values are used as **global limiting criteria** in the field of material balance but:
  - They are large values;
  - They were not revised;
  - They do not provide the reference framework needed for:
    - specific ***measurands*** (e.g. volume, weight, concentration, abundance);
    - specific destructive analysis or non-destructive assay (NDA) measurement ***methods***;
    - specific ***material types*** encountered in the nuclear fuel cycle.

## Why International Target Values (ITV)

- ❖ Are established **for specific measurands, measurement methods and material types**;
- ❖ Reflect measurement uncertainties that **can actually be achieved under regular conditions** by facility laboratories and safeguards verification methods;
- ❖ Are **updated to take new experience into account**;
- ❖ **New measurement and analytical techniques** are added to and others (**obsolete**) are **removed** from the ITV tables.





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## History of ITV

# 02

## History of ITV



1979	The Working Group on Techniques and Standards for Destructive Analysis (WGDA) of the European Safeguards Research & Development Association (ESARDA) opens the way by presenting a list of "Target Values" for uncertainty components in destructive analysis (DA) methods to the IAEA and EURATOM.
1983	Target Values are revised after extensive consultation with operator's laboratories and safeguards organizations.
1987	ESARDA/WGDA + the Institute of Nuclear Materials Management (INMM) publish random and systematic uncertainties to be aimed for in elemental and isotopic analysis of the most significant nuclear material types using common DA methods.
1988	Sampling uncertainties are included.
1991	Based on a 1988 recommendation of the Standing Advisory Group on Safeguards Implementation (SAGSI), a Consultants Group Meeting (CGM) convenes to provide expert advice on international standards of measurements applicable to safeguards data. The concept of ITV is proposed and its scope is extended to measurements by non-destructive assays (NDA).
1993	IAEA Safeguards Technical Report (STR) "1993 International Target Values for Uncertainty Components in Fissile Isotope and Element Accountancy for the Effective Safeguarding of Nuclear Materials".

# 02

## History of ITV



2000	International experts review the experience gained with the use of ITV 1993 and the progress made in accountancy and safeguards verification measurements.
2001	"International Target Values 2000 for Measurement Uncertainties in Safeguarding Nuclear Materials" published as IAEA STR in the ESARDA bulletin and by the INMM.
1987	"International Target Values 2010 for Measurement Uncertainties in Safeguarding Nuclear Materials" published as STR-368.



- IAEA conducted Verification Measurement Performance Evaluations (VMPE) in preparation of ITV-2010: *over 20 years of historical data* consisting of operator declared and independent inspector verification measurement results on the same material (paired data) were analyzed;
- Based on these VMPE and the experience from using ITV-2000, a set of draft tables were prepared for review and comments by the Consultants Group Meeting (CGM);
- In addition, the CGM was asked to report on measurement quality experience based on QC/QA inter-laboratory comparison exercises and instrument qualification;
- Methodology: discussions on the *links between the IAEA statistical model approach and the Guide to the Expression of Uncertainty in Measurement (GUM)* were initiated. ITV 2010 Tables report random and systematic as well as combined uncertainties in separate columns.



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2020-01-13

**Subject** Transmittal of Task Proposal  
**Task Proposal Title** International Target Values (ITV) 2020  
**Task Proposal ID** 19/IFC-003

Dear Mr Hwang,

The International Atomic Energy Agency (IAEA) would like to submit the attached Safeguards Member State Support Programme task proposal for your consideration.

Please inform me in writing at your earliest convenience of the Republic of Korea Support Programme's (ROK SP) decision. In your response, please include:

1. The decision to accept, reject, or propose amendments.
2. The name(s) and contact details of the point(s) of contact from your Support Programme.
3. If applicable, your Support Programme's task ID.

In the event that you would like to discuss the proposal or propose amendments, please contact Ms Claude Norman (C.Norman@iaea.org).

Upon acceptance of a proposal, the IAEA will send the task outline with the name and contact information of the IAEA task officer. Our understanding is that your Support Programme's contact person and the IAEA task officer will then establish a detailed work plan.

You can also find this proposal, and any other proposals pending your Support Programme's decision, on the Support Programme Information and Communication system (SPRICS) at <https://sprics.iaea.org/>. If you need assistance, please email [SPRICSHelp@iaea.org](mailto:SPRICSHelp@iaea.org).

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Dear Ms. Renis,

With reference to your letter M2.05-ROK(2020-01-13), I'm pleased to join and inform you the Government of the Republic of Korea accepts the following task proposal as one of the ROK State Support Programs;

19/IFC-003 International Target Values(ITV) 2020

You can find the information on task manager in connection with the task as follows;

- The IAEA circulated the SP-1(ITV 2020)
- The ROK decided to join and support this task in 2021

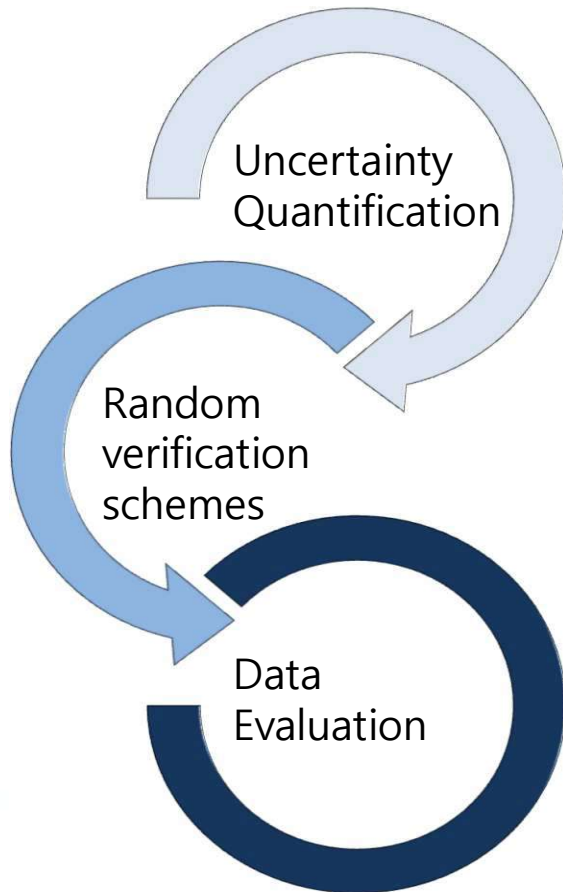


**3** The role of the ROK



- ❖ The first, second and third International Technical meetings (TM) on Statistical Methodologies for Safeguards were held in Vienna 16-18 October 2013, on 14-16 October 2015 and 10-12 October 2017.
- ❖ One of the main objectives of the TM is to create **partnerships** with SRA\*, NFC operators, research centres and universities in the field of safeguards statistics.
- ❖ The focus of the 2017 TM was on the **preparation of ITV -2020**;
- ❖ Extensive progress was made in **reconciling the IAEA statistical model and the GUM approach and highlighting their use in different safeguards communities and their complementarity.**

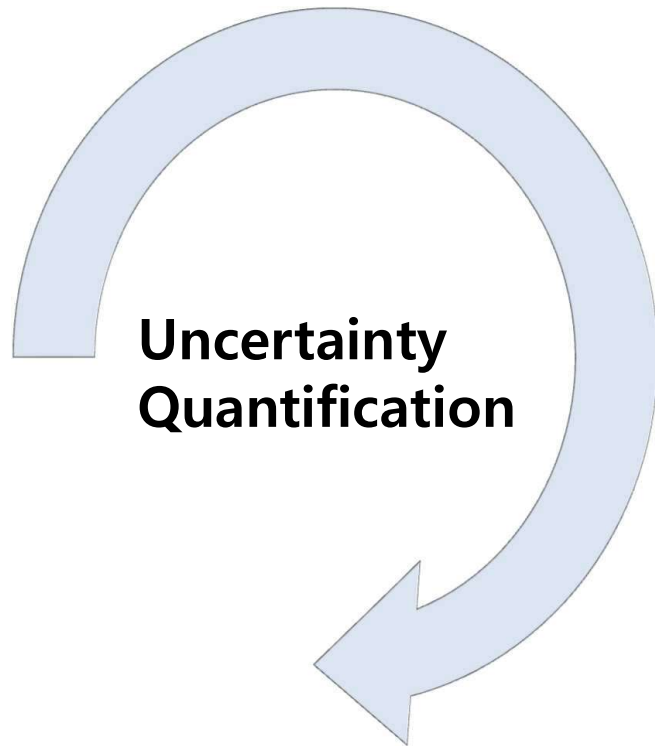




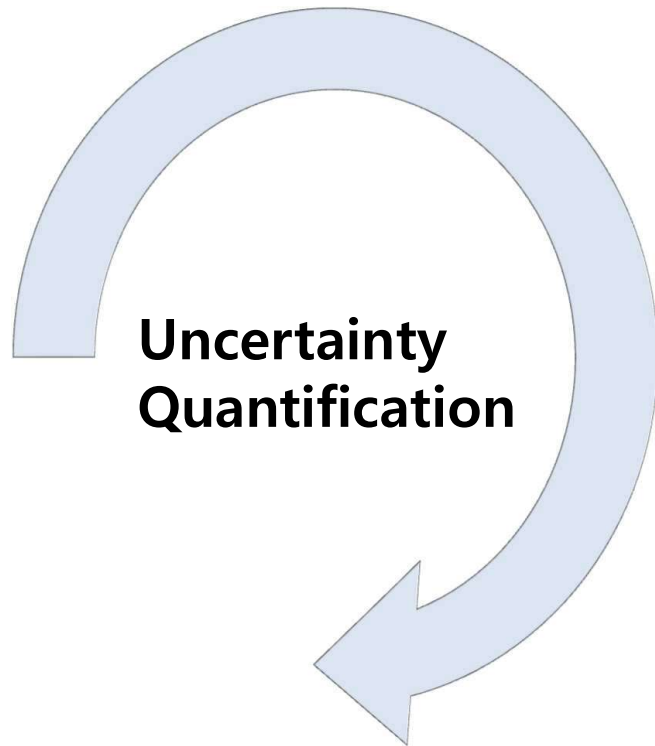
### ❖ Three main interconnected development areas:

- Measurement uncertainty quantification
- Random verification schemes
- Safeguards data evaluation





- ❖ **Improve, develop and document methodologies for UQ** of destructive analysis (DA), non-destructive assay (NDA) measurements and bulk measurements, i.e. weighing and volume measurement systems;
- ❖ Review, harmonize and update the algorithms for the **separation of inspector and operator RSD\*** and the identification of short-and long-term systematic errors;
- ❖ Review, harmonize and update the algorithms for **three Laboratory analyses** (IAEA , NFC facility operators , SRA).



- ❖ New IAEA STR on Uncertainty Quantification (UQ) – under review;
- ❖ New UQ software OPTANOVA (SGIM-IFC, SGAS-OSL). Selects the best estimator and estimates variances of RSD estimates;
- ❖ OPTANOVA testing by simulation;
- ❖ STEPS project (new databases, new evaluation software);
- ❖ GUM / IAEA statistical model reconciliation;
- ❖ Several publications (2014 SG symposium, JNMM, ESARDA).



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# Conclusions

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