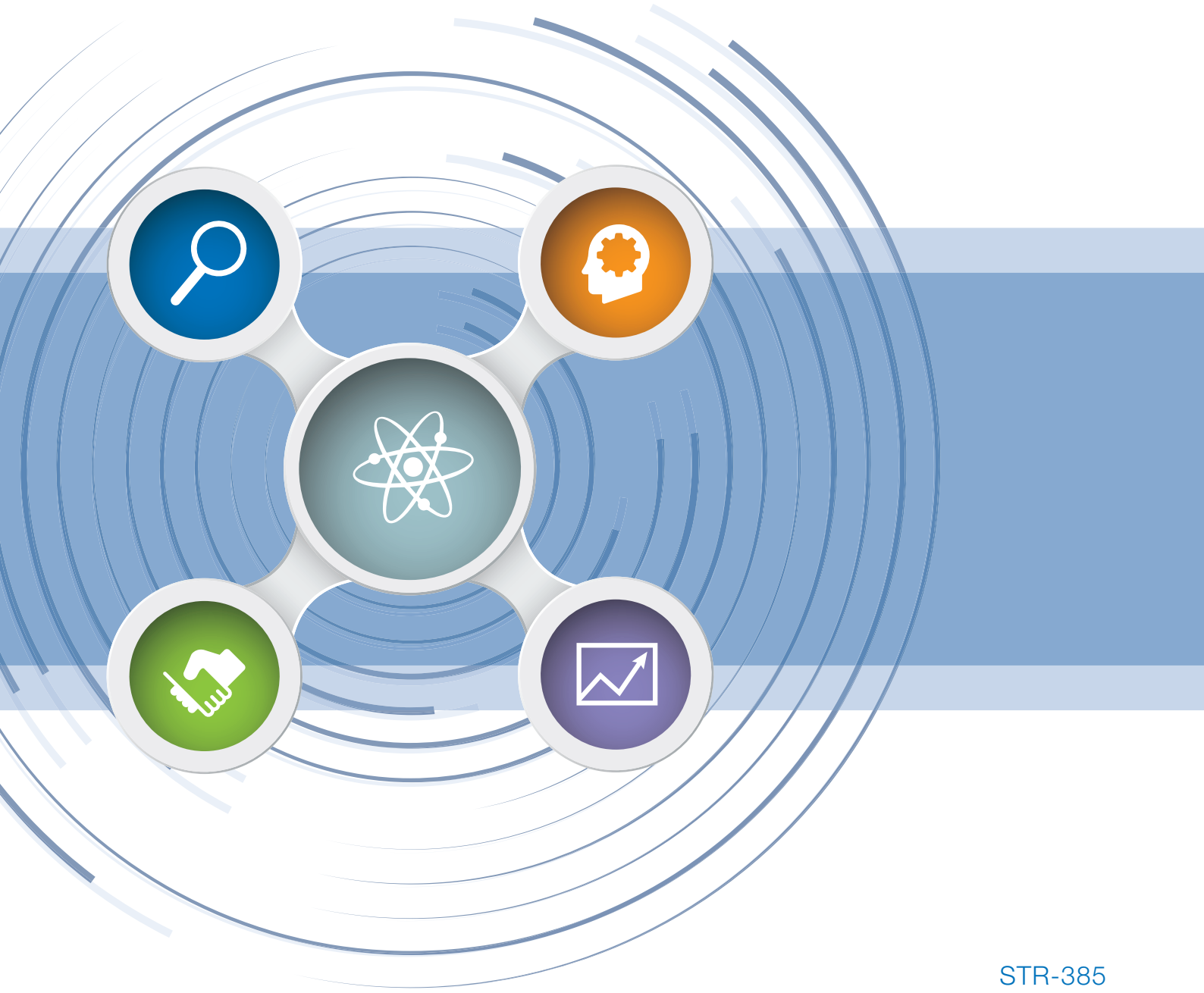
IAEA

Safeguards

Research and Development Plan

Enhancing Capabilities for Nuclear Verification



STR-385
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Foreword

IAEA safeguards make a vital contribution to international peace and security. The effectiveness of safeguards is achieved partly thanks to the continuous effort of the Department of Safeguards to ensure that it keeps pace with emerging challenges and opportunities in the field of nuclear verification.

Staying ahead of the game is not an easy task. The IAEA has no dedicated budget for research and development. Nor does it have all of the nuclear facilities and materials it would need to, inter alia, provide specialised training for inspectors, test equipment, and maintain the highest level of quality and accuracy for analysis of samples taken in the field.

In order to deploy the 'state of the art' tools, techniques, methodologies and expertise required for effective and efficient safeguards, the IAEA relies heavily on Member State Support Programmes, which provide invaluable resources and expertise.

This R&D Plan provides a roadmap for results-oriented activities with external stakeholders. It is an important tool for contextualising the Department's R&D needs and for identifying common ground for joint efforts.

For us, failure is not an option; safeguards must succeed. Our Member States are counting on us to deliver credible safeguards conclusions each and every year. I very much look forward to our joint accomplishments.

Tero Varjoranta
Deputy Director General
Head of the Department of Safeguards

Introduction

This document presents the Research and Development (R&D) Plan of the Department of Safeguards. The R&D Plan is developed under the departmental strategic planning framework, which also includes the biennial Development & Implementation Support (D&IS) Programme for Nuclear Verification[1].

Purpose

The Department of Safeguards requires relevant R&D to remain effective and efficient; it relies on external support to meet its R&D needs. 'R&D' is defined here as activities designed to advance and sustain the capabilities of the Department in pursuit of its mission.

The R&D Plan supports strategic planning by identifying and communicating the set of R&D needs that are reliant on external support. It is intended to help stakeholders understand the context for specialized needs and how they relate to the bigger picture of strengthening the effectiveness and improving the efficiency of safeguards.

Scope

The R&D Plan focuses on departmental needs that require or would benefit from significant external support. This could include, for example, financial recources or expertise to facilitate internal development and implementation support activities. The plan is not exhaustive; it highlights departmental priorities.

Audience

The main audience for the R&D Plan is the Department's management and staff, Member State Support Programme (MSSP) coordinators, sponsor organizations, permanent missions, and R&D organizations and project teams in Member States. The plan is also intended for use in reaching out to non-traditional partners such as research organizations, academia and the NGO community.

[1] Development and Implementation Support Programme for Nuclear Verification 2018–2019, (STR-386), IAEA, 2018.

Evolving in a changing context

Strategic Objectives

The Department of Safeguards' three over-arching strategic objectives are:

To deter the proliferation of nuclear weapons, by detecting early the misuse of nuclear material or technology, and by providing credible assurances that States are honouring their safeguards obligations;

To remain ready to assist with verification tasks, in accordance with the Agency's Statute, in connection with nuclear disarmament or arms control agreements, as requested by States and approved by the Board of Governors; and

To continually improve the Department's performance and productivity to effectively carry out the Agency's verification mission.

The Department executes its mission within the legal mandates provided by (1) Agency Statute; (2) safeguards agreements that States have concluded with the Agency and protocols thereto; (3) other mandates provided by the Board of Governors. In carrying out its work, the Department also observes the decisions and guidance provided by its policy-making organs (e.g. resolutions by the General Conference (GC) and the Board of Governors).

Strategic Issues

A number of significant (current or future) issues are expected to affect the Department's mission, mandates, capabilities and/or activities. They will not only pose challenges but also offer opportunities for the Department of Safeguards. These strategic issues underpin the Department's planning and were delivered through various analyses, including the Emerging Technologies Workshop held in February 2017. The following summarizes the key strategic issues for the Department[4]:


Maintaining the trust and support of stakeholders


Bridging the gap between workload and resources


Remaining effective in a globalized environment


Adapting to information challenges


Operating in a changing security context


Anticipating and responding to new demands


Keeping up with technology and innovating


Sustaining our workforce and institutional knowledge

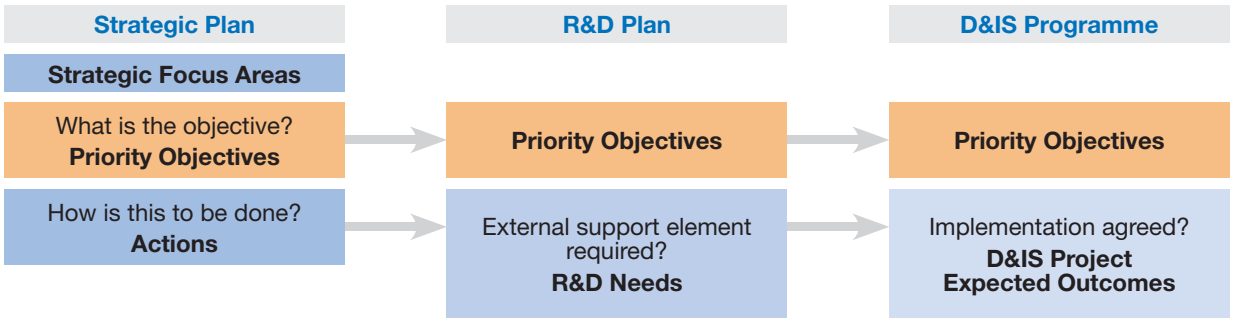
[2] Comprehensive safeguards agreements with non-nuclear weapon States based on INFCIRC/153 (Corrected); voluntary offer safeguards agreements with the five nuclear weapon States party to the NPT; item-specific safeguards agreements based on INFCIRC/66/Rev.2; as well as protocols additional to any of the above safeguards agreements, including those based on INFCIRC/540 (Corrected).

[3] Such as the Board's decision in 2015 to authorize the Director General to implement and report on the verification and monitoring of Iran's nuclear-related commitments as set out in the JCPOA.

[4] The order in which these are presented does not imply any order in their importance.

Safeguards strategic planning framework

Along with the Medium Term Strategy 2018–2023, there are three main documents in the Department's strategic planning framework: (1) the Strategic Plan, (2) the R&D Plan, and (3) the biennial Development and Implementation Support (D&IS) Programme. Together, these documents connect high-level strategies and expected outcomes to R&D needs that require external support, which in turn are linked to individual tasks and new task proposals described in the D&IS Programme.



Strategic Planning

The Department develops strategies in four strategic focus areas: (1) delivering on the mission, (2) managing intellectual capital, (3) enhancing organizational performance, and (4) partnering for success.

Within each strategic focus area, the Department has defined priority objectives as well as actions to advance those objectives. Together with the Agency's Medium Term Strategy, the Strategic Plan supports internal decision-making on programmatic priorities and allocation of resources, enabling the Department to focus its efforts and resources where they are most needed.

R&D Plan

The R&D Plan supports the implementation of the Department's priority objectives in the Strategic Plan by highlighting specific needs that are reliant on external support.

Development and Implementation Support (D&IS) Programme for Nuclear Verification

The D&IS Programme serves as the bridge between priority objectives, R&D needs, and planned tasks to address those needs. The D&IS Programme is currently composed of 24 projects. Each project plan details expected outcomes, key outputs and activities that are defined for the forthcoming two-year period. Both internal tasks carried out by IAEA staff and consultants, and external tasks carried out under MSSPs, are captured in the projects, some of which are aimed at meeting shorter-term needs while others are part of longer-term R&D efforts.

	Strategic Planning	R&D Plan	D&IS Programme
Structure	Focus areas – priority objectives - actions	Priority objectives - R&D needs	Projects – expected outcomes – key outputs – tasks
Audience	Internal (SG)	SG staff, MSSPs and partners	SG staff, MSSPs and partners
Focus	Strategic, big-picture	External support needs	Tasks and implementation
Update interval	Periodic	Periodic	Every two years

Why an updated R&D Plan?

The Department's first R&D Plan was issued in 2012. Its introduction noted that the R&D Plan was to be formally reviewed after six years. The update to the plan is timely given changes to the Department's operating environment and priorities since 2012. These include, inter alia, Departmental activities under the Joint Comprehensive Plan of Action (JCPOA), progress with the Modernization of Safeguards Information Technology (MOSAIC) project, and the implementation of safeguards at the State-level, including the development of updated State-level safeguards approaches (SLAs).

Identification of planned R&D needs

Lessons learned

To undertake the R&D Plan update, the Department conducted a series of review activities designed to understand (1) how the previous R&D Plan was received and utilized by stakeholders (2) what readers found most useful in terms of content and format, and (3) whether any lessons could be learned to improve the Plan.

Member State representatives stressed the value of the R&D Plan as a means of contextualizing, and focusing the support States and related sponsor entities intend to provide to the Department. The brevity of the plan was also appreciated.

Suggestions for improvement included:

- A clearer explanation of the link between this document, the departmental priorities, and the D&IS Programme;
- Specification of the type of support (e.g. expertise, equipment, or financial support) that is likely to be requested for a given need;
- Periodic feedback and updates that show progress and relevant activities in Member States for each need; and
- Clearer explanation of terms (e.g. the use of 'milestone' and 'urgency' in the original plan).

[5] IAEA Department of Safeguards Long-Term R&D Plan, 2012-2023 (STR-375)

Input consolidation

Inputs to the current R&D Plan were drawn from the sources listed below and they were consolidated into the list of needs based on the criteria of urgency and reliance on external support.

Actions from strategic planning

Each priority objective referenced in the plan-on-a-page is advanced through a set of prioritized actions. Actions with an external support component have been included in the R&D Plan, sometimes with adjustments to indicate how external partners can contribute.

Unmet milestones from the previous Long-Term R&D Plan

Many needs (i.e. milestones) from the initial plan have been addressed, overtaken by events, or altered by experience and circumstances. The unmet portions of these that remain relevant have been carried forward to this R&D Plan.

Insights from the 2017 Emerging Technologies workshop

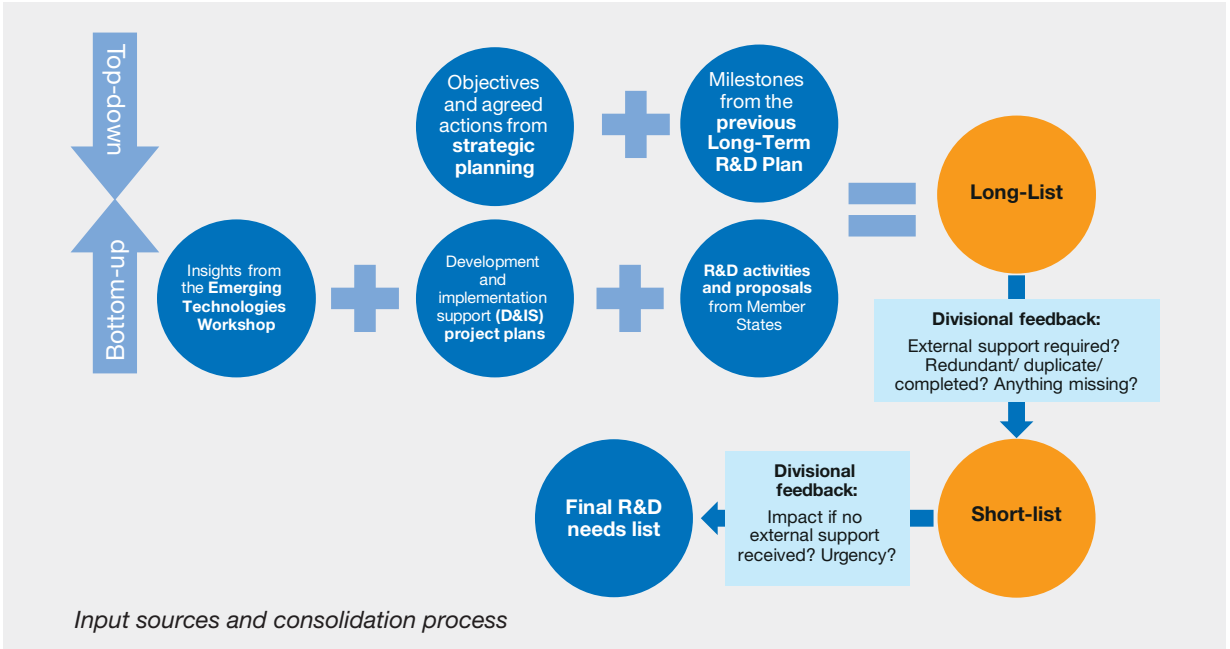
In preparing the update to the R&D Plan, the Department organized an Emerging Technologies Workshop in February 2017. At the workshop, around 100 participants from the Department, private sector, NGOs, academia, and Member State Support Programmes helped increase the Department's awareness about and preparedness for addressing the challenges and opportunities of emerging technologies, both nuclear and non-nuclear. A number of insights raised during this workshop have been included in the R&D Plan, such as potential roles for machine learning.

Current and planned tasks from the D&IS project plans

A comparison of the original R&D Plan and previous D&IS Programme documents highlighted a number of important task areas worth capturing as current and continuing needs in the updated Plan.

Safeguards-relevant R&D activities and proposals from Member States

The Department interacts frequently with R&D stakeholders in Member States regarding specific activities and safeguards-relevant R&D initiatives. These interactions regularly contribute to the Department's awareness of R&D opportunities and challenges.



Input sources and consolidation process

Terminology of the updated R&D Plan

Capabilities from the previous Long-Term R&D Plan have been replaced with **priority objectives** from the plan-on-a-page; milestones have been replaced by **R&D needs**, which describe a specific target supporting the improvement of a departmental capability.

The needs vary in specificity as well as anticipated scope, time frames, and resource requirements. This reflects differences in the maturity and certainty levels of possible solutions across the technical areas of relevance to safeguards. For example, the Department has defined needs for anticipated, incremental improvements to technologies used for Non-Destructive Assay. On the other hand, specific use cases for machine learning/artificial intelligence are less certain; possible improvements to Departmental capabilities are yet to be explored and demonstrated.

The R&D Plan highlights a few **top priority** needs, which are defined as needs that are both urgent and particularly reliant on external support for success. The D&IS Programme will further reflect urgency through the selection of specific R&D needs to pursue in a given biennium.

In response to feedback from Member States, the R&D Plan specifies the **types of support** that are most likely to be requested for each need, but these are expected to be refined and narrowed as needs are addressed with specific tasks.

Additional strategic planning terms are defined in the Appendix.

Next steps and monitoring

The updated R&D Plan takes a long-term vision; it will be updated periodically as required by changes to the operating environment. The lack of a fixed life span is a reflection of the inherent uncertainty associated with long-term R&D planning, and the need for clarity on direction while allowing (and ensuring) regular course-corrections as circumstances evolve.

The R&D Plan will be used to solicit and organize information on **activities being undertaken by external partners**. Beginning in 2018, to inform the Department's efforts to address R&D needs, the Department will reach out to Member States through established channels to compile information they volunteer regarding relevant R&D activities.

Finally, **progress monitoring** for the R&D Plan will be strengthened for the 2018–2019 biennium through the identification of internal points of contact for each specified R&D need. These points of contact will be responsible for progress monitoring and reporting on individual needs.

Plan-on-a-page

Objectives in the strategic plan

MISSION

STRATEGIC OBJECTIVES

VISION

Delivering on the mission

Our core activities

- **V.1** Strengthen information collection and analysis
- **V.2** Reinforce State evaluation
- **V.3** Align procedures to support SG at the State level
- **V.4** Enhance SG effectiveness monitoring and evaluation
- **V.5** Employ fit-for-purpose and state-of-the-art methodologies

Our technical capabilities

- **T.1** Strengthen instrumentation capabilities for verification
- **T.2** Enhance sensitivity, reliability and timeliness in sample analysis
- **T.3** Support all SG processes through IT
- **T.4** Manage SG technology assets strategically
- **T.5** Identify and exploit innovations

Managing intellectual capital

Our people and knowledge

- **W.1** Reform human resource management
- **W.2** Promote a high performance work culture
- **W.3** Treat knowledge as an organizational asset
- **W.4** Advance workforce diversity, including gender

Partnering for success

Our stakeholders

- **S.1** Communicate proactively and transparently
- **S.2** Resolve priority areas of difficulty in SG implementation
- **S.3** Advance safeguards-by-design
- **S.4** Leverage and establish partnerships

Enhancing organizational performance

Our org. capacity

- **C.1** Develop organizational agility
- **C.2** Strengthen management processes
- **C.3** Strengthen departmental communication and coordination
- **C.4** Secure and optimally manage financial resources

Our preparedness

- **P.1** Ensure information security
- **P.2** Increase resilience and prepare for disaster recovery
- **P.3** Monitor and prepare for evolving proliferation challenges
- **P.4** Maintain readiness for other verification tasks
- **P.5** Prepare for new types of facilities and decommissioning

VALUES

Integrity | Professionalism | Respect for diversity

Top priority R&D needs*

While all of the R&D needs reflected in this R&D Plan are important to the Department of Safeguards, the following table highlights needs that are both urgent and particularly reliant on external support for success.

Priority Objective		R&D need	
V.1	**Strengthen information collection and analysis**	**V.1.R3**	Further integrate safeguards information to strengthen all-source information analysis and make it more user-friendly (e.g. via the Collaborative Analysis Platform).
T.1	**Strengthen instrumentation capabilities for verification**	**T.1.R1**	Develop and introduce an integrated system of instrumentation data processing and review, with high level of automation and with unified user interface.
		T.1.R2	Develop the Next Generation Surveillance Review software (NGSR).
		T.1.R6	Develop safeguards equipment to establish and maintain knowledge of spent fuel in shielding/storage/transport containers at all points in their life cycle.
T.2	**Enhance sensitivity, reliability and timeliness in sample analysis**	**T.2.R5**	Continue to reduce and manage nuclear material holdings stored at the Nuclear Material Laboratory (NML) in line with safeguards needs, and identify long-term sustainable solutions for disposal of nuclear materials, particularly plutonium and highly-enriched uranium.
		T.2.R6	Develop and implement methods to detect signatures of nuclear activities in environmental samples including: • Age determination of U and Pu relevant to the origin of nuclear materials • Analysis of impurities relevant to the origin of source materials • Particles morphology for identifying operational processes • Reliably finding smaller particles of interest in an excess of background material • Isotopic characterization of Pu containing particles using FT-LAICPMS and LG-SIMS
T.4	**Manage SG technology assets strategically**	**T.4.R1**	Execute a long-term maintenance and replacement plan for the safeguards information technology system as a follow-up to MOSAIC.
		T.4.R2	Develop and execute a long-term replacement plan for analytical equipment at SG Analytical Laboratories, with appropriate mix of regular and extra-budgetary funds.
W.1	**Reform human resource management**	**W.1.R1**	Develop and maintain, through training, new expertise required by the Department, where needed, with the help of Member States.
P.1	**Ensure information security**	**P.1.R1**	Improve the capability to quickly identify and react to security events within the Department's information systems.
P.4	**Maintain readiness for other verification tasks**	**P.4.R1**	Maintain readiness to resume safeguards/verification/monitoring activities in the DPRK, when so requested.
P.5	**Prepare for new types of facilities and decommissioning**	**P.5.R2**	Based on the prospects and timing for emerging nuclear fuel cycle facilities (e.g. pyroprocessing plants, geological repositories) develop and deploy as appropriate: • safeguards concepts • tools • techniques • training

* The order in which these are presented does not imply any order in their importance.

Table of R&D needs

Type of Support	Definition
Financial Support	Contribution through direct fund provision
Expertise	Provision of a cost-free expert, junior professional officer, or temporary consultant
R&D	Research and development activities, undertaken within Member States or partner organizations, that are designed to improve safeguards capabilities
Collaboration	Consultations or correspondence with experts through, for example, meetings workshops, training, etc.
Equipment/ Materials/Access	Provision or transfer of equipment, reference materials, working standards, provision of access to facilities for testing, training, etc.

ID	R&D Need	Type of Support Requested				
		Financial Support	Expertise	R&D	Collabo-ration	Equipment, Materials & Access
Delivering on the Mission						
V.1 Strengthen information collection and analysis						
V.1.R1	Enhance the set of expert tools necessary to process the variety of SG-relevant information and implement them, with emphasis on timely responses and cost-effectiveness.	•	•	•	•	
V.1.R2	Make use of new sources of openly available information, including from multimedia, and address the associated information management needs.	•	•		•	•
V.1.R3	Further integrate safeguards information to strengthen all-source information analysis and make it more user-friendly (e.g. via the Collaborative Analysis Platform).	•	•	•	•	•
V.2 Reinforce State evaluation						
V.2.R1	Develop a set of reference materials to assist SEGs in the assessment of a State's capability to accomplish acquisition path steps which take into account the level of maturity of the State's nuclear fuel cycle and associated technical capabilities.			•	•	
V.4 Enhance SG effectiveness monitoring and evaluation						
V.4.R1	Identify and deploy analytical tools, including data visualization, to better measure and analyse performance and take advantage of capabilities provided by MOSAIC.	•	•	•	•	•

ID	R&D Need	Type of Support Requested				
		Financial Support	Expertise	R&D	Collaboration	Equipment, Materials & Access
V.4.R2	Evaluate process for introduction of Hypothesis testing approaches for nuclear material measurements, as an alternate to quantification methodology.			•	•	

V.5 Employ fit-for-purpose and state-of-the-art methodologies						
V.5.R1	Upgrade existing and develop new statistical methodologies applied to the: • Evaluation of quantitative and qualitative verification data including at the State level (e.g., for nuclear material balance evaluation, random inspections) • Measurement of verification performance (in terms of detection probability) and the associated level of confidence at the facility and state level • Design of random verification schemes (minimizing resources for the same level of effectiveness).	•	•	•	•	
V.5.R2	Strengthen knowledge of the elemental and isotopic signatures of the nuclear fuel cycle and processes that are specifically detectable through material characterization and environmental sample analyses, and develop expert systems and methodologies that advance data evaluation and enhance continuity of knowledge.		•	•	•	
V.5.R3	Explore data analysis methods and tools to strengthen the synthesis and evaluation of information (e.g., optimal random verification schemes, nuclear material flow analysis, material balance evaluation, near real-time accountancy and process monitoring tools).		•	•	•	

T.1 Strengthen instrumentation capabilities for verification						
T.1.R1	Develop and introduce an integrated system of instrumentation data processing and review, with high level of automation and with unified user interface.	•	•		•	
T.1.R2	Develop the Next Generation Surveillance Review software (NGSR).	•	•		•	
T.1.R3	Assess existing techniques to detect misuse of reprocessing plants (real time detection of Pu separation).		•	•	•	
T.1.R4	Improve tools and techniques to enable timely, potentially real time, detection of HEU production in LEU enrichment plants.		•	•		
T.1.R5	Develop improved tools and techniques to enable real time flow measurements of nuclear material, including UF_6 at enrichment plants and conversion plants, and Pu at reprocessing plants.		•	•	•	
T.1.R6	Develop safeguards equipment to establish and maintain knowledge of spent fuel in shielding/storage/transport containers at all points in their life cycle.		•	•	•	
T.1.R7	Evaluate implementation potential for calorimetry of plutonium samples when the commonly available passive neutron multiplicity measurements are not feasible.		•			

ID	R&D Need	Type of Support Requested				
		Financial Support	Expertise	R&D	Collabo-ration	Equipment, Materials & Access
T.1.R8	Develop in-field alpha spectrometers (including sample preparation) for nuclear material identification and isotopic composition analysis.			•		
T.1.R9	Strengthen intrusiveness and vulnerability analyses on current and future use of unattended systems, particularly to address any new threats resulting from technology advancements.		•		•	

T.2 Enhance sensitivity, reliability and timeliness in sample analysis						
T.2.R1	Improve analytical timeliness of dealing with special and high priority demands for analysis by means of the reduction of sample size, the application of in-situ analysis and by strengthening the response regime (e.g. COMPUCEA, Cristallini method).	•			•	
T.2.R2	Further improve the quality assurance and control (QA/QC) for the Agency's NWAL for safeguards, including SAL, in the area of particle analysis in particular.	•			•	•
T.2.R3	Support the improvement of Member States' analytical quality for nuclear material accountancy (i.e. for better Operators' analytical systems).				•	
T.2.R4	Develop/expand a set of reference materials with NWAL assistance, and produce/distribute working reference materials to support Member States' analytical quality.			•		•
T.2.R5	Continue to reduce and manage nuclear material holdings stored at the Nuclear Material Laboratory (NML) in line with safeguards needs, and identify long-term sustainable solutions for disposal of nuclear materials, particularly plutonium and highly-enriched uranium.				•	
T.2.R6	Develop and implement methods to detect signatures of nuclear activities in environmental samples including: • Age determination of U and Pu relevant to the origin of nuclear materials • Analysis of impurities relevant to the origin of source materials • Particles morphology for identifying operational processes • Reliably finding smaller particles of interest in an excess of background material • Isotopic characterization of Pu containing particles using FT-LAICPMS and LG-SIMS		•	•	•	•

T.3 Support all SG processes through IT						
T.3.R1	Further develop the State Declarations Portal as a tool that optimizes the quality and usability of State-declared information and enhances the State-Secretariat communication on State declarations.	•	•		•	

ID	R&D Need	Type of Support Requested				
		Financial Support	Expertise	R&D	Collaboration	Equipment, Materials & Access
T.3.R2	As part of STEPS (Statistical Testing, Evaluation and Planning for SG) project, re-engineer and integrate all the legacy systems used for the statistical evaluation of State declared and verification data and the probabilistic calculations that inform verification approaches (e.g. sampling plans and random inspection schemes).	•	•			
T.3.R3	Build on the development of geographic information system (GIS) technology to enhance geo-based information sharing and related analysis.	•	•	•	•	•
T.3.R4	Maintain and continue to upgrade the environmental sampling database and the process modelling tools as well as the database and tools that support trace elements analysis (material characterization).	•				
T.3.R5	Develop updated software tools for use by SRAs in creating and submitting accountancy reports and additional protocol declarations.	•	•		•	
T.4 Manage SG technology assets strategically						
T.4.R1	Execute a long-term maintenance and replacement plan for the safeguards information technology system as a follow-up to MOSAIC.	•	•	•	•	•
T.4.R2	Develop and execute a long-term replacement plan for analytical equipment at SG Analytical Laboratories, with appropriate mix of regular and extra-budgetary funds.	•			•	•
T.5 Identify and exploit innovations						
T.5.R1	Identify, evaluate and test promising applications of robotics and machine learning/artificial intelligence to improve the effectiveness and efficiency of safeguards.	•	•	•	•	•
T.5.R2	Identify areas in which technology challenges (e.g. expert crowdsourcing) could be an asset for developing the Department's technologies and methodologies.		•		•	
T.5.R3	Monitor the potential utility of block chain technology for safeguards applications (e.g. nuclear material accounting).		•	•	•	
T.5.R4	Define requirements for SG surveillance technology required beyond the next generation surveillance system (NGSS).		•	•	•	
T.5.R5	Develop training tools using technologies such as virtual reality, immersive learning systems and web-based training.	•	•	•	•	•
T.5.R6	Investigate and test fieldable neutron counting systems reducing the use of ^{3}He or offering equivalent functional and technical alternatives.	•		•	•	•
T.5.R7	Develop and evaluate alternatives to photo-multiplier tubes for large neutron or gamma scintillation detectors.			•		
T.5.R8	Develop alternative fast neutron detectors that improve effectiveness and fieldability.			•	•	•
T.5.R9	Develop large room-temperature semiconductor medium-resolution gamma spectrometers to replace scintillation detector systems.			•		

ID	R&D Need	Type of Support Requested				
		Financial Support	Expertise	R&D	Collaboration	Equipment, Materials & Access
T.5.R10	Develop new Sealing System Technologies with improved security and economy.	•	•	•	•	•

Managing intellectual capital

W.1 Reform human resource management						
W.1.R1	Develop and maintain, through training, new expertise required by the Department, where needed, with the help of Member States.	•	•	•	•	•

Partnering for success

S.2 Resolve priority areas of difficulty in SG implementation						
S.2.R1	Develop training material and remote delivery methods (e.g., E-Learning) to support SRA training with reduced costs and increased accessibility.	•	•		•	

S.3 Advance safeguards-by-design						
S.3.R1	Identify and pursue opportunities for the Agency and Member States to promote the early consideration of safeguards among the nuclear industry.	•	•		•	

Enhancing organizational performance

C.2 Strengthen management processes						
C.2.R1	Develop effective and sustainable strategic management processes to enable effective horizontal and vertical strategy execution.	•	•		•	

P.1 Ensure information security						
P.1.R1	Improve the capability to quickly identify and react to security events within the Department's information systems.	•	•		•	
P.1.R2	Improve Information Security capabilities in areas of risk: management, auditing and reporting; vulnerability management; threat intelligence; and improve processes, procedures and standards.	•	•		•	

ID	R&D Need	Type of Support Requested				
		Financial Support	Expertise	R&D	Collaboration	Equipment, Materials & Access
P.2 Increase resilience and prepare for disaster recovery						
P.2.R1	Address requirements (processes and technology) for carrying out mission-critical functions (needed for continued delivery of SG conclusions) in case of disasters (e.g. disruptive, massive cyber-attack or physical loss of critical infrastructure).	•	•			
P.3 Monitor, assess and prepare for evolving nuclear proliferation challenges						
P.3.R1	Maintain awareness of changes in the nuclear landscape and associated proliferation risks, including the impact of non-State actors on the safeguards system.	•	•		•	
P.4 Maintain readiness for other verification tasks						
P.4.R1	Enhance readiness to resume safeguards/verification/ monitoring activities in the DPRK, when so requested.	•	•	•	•	•
P.4.R2	Assist with Chernobyl and Fukushima related activities as requested.	•	•	•	•	•
P.5 Prepare for new types of facilities and decommissioning						
P.5.R1	Address identified gaps in facility-specific guidance, training and tools for conducting verification activities during decommissioning.	•	•	•	•	
P.5.R2	Based on the prospects and timing for emerging nuclear fuel cycle facilities (e.g. pyroprocessing plants, geological repositories) develop and deploy as appropriate: • safeguards concepts • tools • techniques • training	•	•	•	•	•

Annex

Definitions

Term	Definition
R&D	Activities designed to advance and sustain the capabilities of the Department of Safeguards in pursuit of its mission
Strategic Objectives	The Department of Safeguards has three overarching strategic objectives (see Section 2); the first two are approved as part of the Agency's Programme and Budget by the Board of Governors while the third is of a departmental nature
Priority Objectives	Objectives to be pursued by the Department to advance its vision and strategic objectives
R&D Need	Description of a specific target, supporting the improvement of a departmental capability
Actions	Practical steps (e.g. initiatives, tasks) to advance the objectives which make the strategic plan actionable
Project	In the D&IS Programme, a project is a technical area of the Department's work within which development or implementation tasks are performed (e.g. Information Analysis, Training, NDA Techniques)
Task	A task is a specific activity designed to deliver an output that will contribute to the achievement of an expected outcome; for the implementation of tasks, resources, including external support, are required
Top Priorities	The set of R&D needs considered by the Department to be most urgent and reliant on external support. (*R&D Plan*); The set of key outputs within a D&IS Project considered by the Department to be most urgent and impactful within that project area for the forthcoming biennium (*D&IS Programme*)
Expected Outcome	Benefits or changes that are expected, if the objectives and associated actions/ tasks are implemented
Key Output	A measurable product or service delivered or acquired as a direct result of the implementation of a task
Project Plans	The biennial descriptions of planned tasks for each D&IS Programme Project. Together, these plans comprise the biennial D&IS Programme document

Acronyms

Acronym	Definition
CAP	Collaborative Analysis Platform
CFE	Cost Free Expert
COMPUCEA	Combined Procedure for Uranium Concentration and Enrichment Assay
D&IS	Development and Implementation Support
DDG	Deputy Director General
DPRK	Democratic People's Republic of Korea
FT-LAICPMS	Fission-track laser ablation-inductively coupled plasma mass spectrometry
GIS	Geographical Information Systems
^{3}He	Helium-3
HEU	Highly Enriched Uranium
HR	Human Resources
IAEA	International Atomic Energy Agency
INFCIRC	Information Circular
IT	Information Technology
JCPOA	Joint Comprehensive Plan of Action
JPO	Junior Professional Officer
LEU	Low Enriched Uranium
LG-SIMS	Large geometry secondary ion mass spectrometry
MOSAIC	Modernization of SG IT project

Acronym	Definition
MSSP	Member State Support Programme to IAEA Safeguards
MTS	Medium-Term Strategy
NGO	Non-governmental organization
NGSR	Next Generation Surveillance Review software
NGSS	Next Generation Surveillance System
NML	Nuclear Material Laboratory
NWAL	Network of Analytical Laboratories
Pu	Plutonium
QA/QC	Quality Assurance/Quality Control
R&D	Research & Development
SDP	State Declarations Portal
SEG	State Evaluation Group
SG	Safeguards
SIR	Safeguards Implementation Report
SRA	State or Regional Authority responsible for SG implementation
STEPS	Statistical Testing, Evaluation and Planning for SG
STR	Safeguards Technical Report
U	Uranium
UF_6	Uranium Hexafluoride

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