



Safeguards

Enhancing Capabilities for Nuclear Verification

Resource Mobilization Priorities



Foreword

The Department of Safeguards is responsible for delivering the International Atomic Energy Agency's (IAEA's) nuclear verification mission, with implementation activities in 184 States around the world. The technical, multi-disciplinary work of IAEA safeguards makes an essential contribution to international peace and security.

In the past couple of years, unforeseen hurdles arising from the global Covid-19 pandemic compounded already existing challenges, including the persistent need to 'do more with less' in a constrained budget context. With the help of partners, the Department of Safeguards rose to the occasion and delivered on Director General Rafael Mariano Grossi's pledge to "not stop [safeguards] for a single minute." As we look ahead, we see that the need to ensure resilience in an ever changing and uncertain world must accompany our long-standing pursuit of improved effectiveness and efficiency.

To mobilize stakeholders' support, this document identifies a prioritized set of capabilities the Department needs and for which we are seeking external support, ranging from R&D to expertise and financial support. Sustaining and developing these capabilities is essential to overcome challenges and seize opportunities.

Since 2012, the Department has made use of an 'R&D Plan' to provide a roadmap for results-oriented activities with partners. In recognition that the Department increasingly needs more than R&D from external stakeholders to enhance its capabilities, we have retitled the document to 'Enhancing Capabilities for Nuclear Verification — Resource Mobilization Priorities' (RMP), to more accurately describe its content and purpose going forward.

While operational activities, such as in-field activities and related travel costs, are covered exclusively through the Department's regular budget, other activities of a developmental nature that support safeguards implementation — such as equipment procurement, development of IT tools, improvement of measurement techniques, and training — are increasingly reliant on extrabudgetary contributions and other support. This document is key to mobilizing support for such unfunded activities.

The reliance on extrabudgetary support is most acute in the area of IT. As with the majority of organizations, the Department



depends on modern and capable IT infrastructure. The Department performs its IT development work in-house for reasons that include access to end-users, efficiency, quality assurance, and information security. The practice has yielded impressive successes in recent years, but sustaining these advances into the future and maintaining the substantial investments thus far requires continual financial support on a higher scale than ever before.

To broaden our support base, we are working to expand and diversify partnerships — both traditional and non-traditional — and invite our new partners to consider these priorities, find areas of mutual interest, and get involved.

We are counting on your support and creativity in the years to come.

Massimo Aparo
Deputy Director General
Head of the Department of Safeguards

Introduction

This document presents the Resource Mobilization Priorities (RMP)¹ of the Department of Safeguards for enhancing its capabilities. These priorities are identified within the departmental strategic planning framework.

Purpose and scope

The Department of Safeguards requires R&D and other support to remain effective, efficient and resilient. The RMP identifies and communicates the set of needed capabilities that are of highest priority to the Department and especially reliant on external support. It is intended to help stakeholders understand the context for pursuing particular capabilities and how they relate to the bigger picture of strengthening the effectiveness, efficiency and resilience of IAEA safeguards. In so doing, the RMP serves as a framework for guiding the Department's collaborations with traditional and non-traditional partners and mobilizing resources for activities not funded through the IAEA's regular budget. External support goes beyond R&D, and includes, for example, financial resources and expertise to facilitate internal development and implementation support activities.

Audience

The main audience for the RMP is the Department's current and future traditional and non-traditional

partners. This includes Member State Support Programme (MSSP) Coordinators, R&D organizations, State and regional safeguards authorities, as well as permanent missions to the IAEA. Also, given the IAEA's strengthened focus on non-traditional partnerships, the audience includes academia, foundations, non-governmental organizations (NGOs) and private sector entities, which are also invited to collaborate with the IAEA in advancing its capabilities.

Impact of feedback from users

To update this document, the Department conducted a series of review activities, including a user survey, designed to identify (1) how the previous R&D Plan was received and utilized by stakeholders; (2) what users found most useful in terms of content and format; and (3) what improvements could be made.

As a result of the user feedback, the following improvements have been incorporated:

- More clearly articulated capabilities (i.e. results) for which support is being sought;
- Clearer links between the departmental Strategic Plan, D&IS Programme, and this document;
- Where possible, use of language that enables a broader non-specialist audience to understand the technical aspects of the IAEA's support needs.

Member State Support Programmes

| | | |
|---|--|--|
|  Argentina |  Finland |  Russian Federation |
|  Australia |  France |  Spain |
|  Belgium |  Germany |  Sweden |
|  Brazil |  Hungary |  Switzerland |
|  Canada |  Japan |  United Kingdom |
|  China |  Netherlands |  United States of America |
|  Czech Republic |  Republic of South Africa | |
|  European Commission |  Republic of South Korea | |

¹ Previously called the Research and Development (R&D) Plan.



Top priority capabilities*

While all the capabilities reflected in this document are important to the Department of Safeguards, the following table highlights 15 capabilities that are of the highest priority:²

| | Priority objective | ID | Capability |
|-----|--|--------|--|
| V.1 | Strengthen information collection, integration and analysis | V.1.C2 | Ability to process and integrate the variety and volume of safeguards-relevant information in a timely, user-friendly and cost-effective manner |
| V.3 | Advance State-level safeguards | V.3.C1 | Ability to derive verification intensities and frequencies from performance targets and to determine detection probabilities |
| V.4 | Enhance SG effectiveness monitoring and evaluation | V.4.C2 | Ability to comprehensively evaluate, record, and document safeguards effectiveness at the State level |
| T.1 | Strengthen instrumentation capabilities for verification | T.1.C1 | Ability to more efficiently verify and maintain knowledge of spent fuel in shielding/storage/transport containers at all points in their life cycle, including through remote means |
| | | T.1.C5 | Ability to develop, deploy and maintain new sealing system technologies with improved security and efficiency |
| T.2 | Enhance sensitivity, reliability and timeliness in sample analysis | T.2.C1 | Ability to reliably and quickly deliver sample analysis results for special and high priority demands |
| | | T.2.C2 | Ability to determine age of U and Pu in environmental samples through techniques and evaluation methods |
| T.3 | Ensure resilient, secure and up-to-date SG IT systems | T.3.C1 | Ability to secure information and quickly detect and respond to security events that arise within the Department's information systems |
| T.6 | Enhance remote sensing, monitoring and verification capabilities | T.6.C1 | Ability to develop and deploy improvements to the next generation surveillance review (NGSR) software (e.g. by leveraging machine learning to improve imagery review) |
| | | T.6.C3 | Ability to leverage new types of space-borne sensor data from open sources, including the processing of synthetic aperture radar data, analysis of multi/hyperspectral data, and thermal imagery |
| M.2 | Manage SG assets strategically | M.2.C1 | Ability to strategically plan, maintain and improve safeguards IT tools, information assets, and associated infrastructure |
| M.4 | Increase organizational resilience | M.4.C2 | Ability to carry out mission-critical functions — needed for continued delivery of safeguards conclusions — in case of disasters (e.g. disruptive, massive cyber-attack or physical loss of critical infrastructure) |
| S.1 | Communicate proactively and transparently | S.1.C1 | Ability to deploy data visualization and other methods and techniques to present safeguards findings and performance-related data in a clear and compelling manner |
| S.2 | Enhance States' safeguards capacity | S.2.C1 | Ability to strengthen the capacity of SSACs/SRAs and monitor and measure progress |
| W.4 | Advance workforce diversity, including gender parity | W.4.C1 | Ability to attract and retain a geographically diverse and gender-balanced workforce |

* These top priorities are marked with an asterisk in the comprehensive list of capabilities on pages 9-13.

² The order in which these are presented does not imply any order in their importance.



Safeguards' strategy framework

Mission

To deter the proliferation of nuclear weapons.

Strategic objectives

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

1. To detect early the misuse of nuclear material or technology;
2. To provide credible assurances that States are honouring their safeguards obligations;
3. To assist with other verifications tasks³;
4. To continually improve the Department's capabilities and performance.

Key documents

Along with the IAEA's [Medium Term Strategy](#), the Department's strategic planning framework consists of (1) the Department's Strategic Plan, (2) the Resource Mobilization Priorities (RMP), and (3) the Development and Implementation Support Programme for Nuclear Verification (D&IS). Together, these documents connect high-level strategy with required capabilities and associated support needs and implementation activities. In so doing, they help ensure that the Department focuses its development efforts and resources where they are most needed, contributing to effective stewardship of limited resources and maximizing the impact of stakeholders' support.

Strategic Plan

The Department's Strategic Plan is an internal management and communication tool that describes departmental priorities across five focus areas: (1) core activities, (2) technical capabilities, (3) management, (4) stakeholders and partnerships, and (5) people and knowledge. Within each focus area, the Department has defined priority objectives (see the Strategic Plan-on-a-Page on page 4). The Department implements its Strategic Plan through priority projects and actions.

RMP

The Department's RMP communicates to external audiences a prioritized set of needed capabilities for which the Department is seeking external support and describes the type of support needed. In so doing, it supports the Department in achieving its priority objectives.

D&IS Programme

The Development and Implementation Support Programme for Nuclear Verification (D&IS) supports the implementation of the RMP by operationalizing efforts to develop and sustain the needed capabilities. It comprises over twenty plans for development and implementation efforts coordinated by the Department, that involve resources provided by Member State Support Programmes in response to the Department's support task proposals. The D&IS Programme is updated every two years. D&IS managers link the plans to departmental priority objectives and capabilities enumerated in the RMP and describe their expected outcomes and outputs.

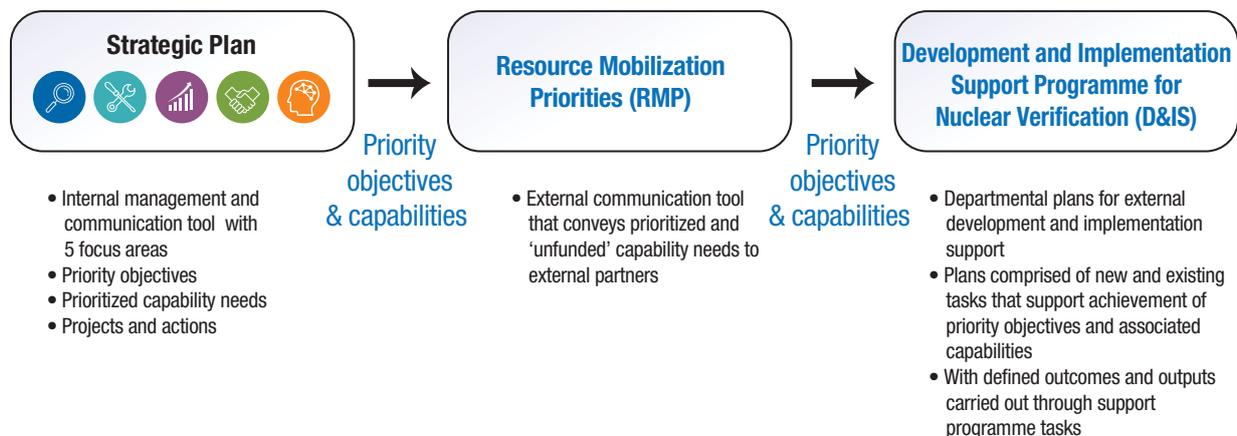


Figure 1: Departmental priorities flow through Safeguards plans

³ For exact wording of the first three strategic objectives, please see the Agency's Programme and Budget.



The Department's Strategic Plan-on-a-Page



Safeguards

MISSION

To deter the proliferation of nuclear weapons

STRATEGIC OBJECTIVES

- To detect early the misuse of nuclear material or technology*
- To provide credible assurances that States are honouring their safeguards obligations*
- To assist with other verification tasks*
- To continually improve the Department's capabilities and performance

VISION

IAEA nuclear verification contributes to a secure and peaceful world. The Agency's competence and independence enable it to operate with the trust and support of its Member States and the international community

VALUES

Integrity, professionalism and respect for diversity

Delivering on the Mission – Departmental Priority Objectives



| | | | | |
|---|--|--|---|--|
| <p>V.1 Strengthen information collection, integration and analysis</p> <p>V.2 Reinforce State evaluation and consistency in drawing SG conclusions</p> <p>V.3 Advance State-level safeguards</p> <p>V.4 Enhance SG effectiveness monitoring and evaluation</p> <p>V.6 Prepare for new types of facilities and activities</p> | <p>T.1 Strengthen instrumentation capabilities for verification</p> <p>T.2 Enhance sensitivity, reliability and timeliness in sample analysis</p> <p>T.3 Ensure resilient, secure and up-to-date SG IT systems</p> <p>T.6 Enhance remote sensing, monitoring and verification capabilities</p> | <p>M.1 Secure and optimally manage financial resources</p> <p>M.2 Manage SG assets strategically</p> <p>M.3 Mature process management and operational discipline</p> <p>M.4 Increase organizational resilience</p> | <p>S.1 Communicate proactively and transparently</p> <p>S.2 Enhance States' safeguards capacity</p> <p>S.3 Promote safeguards-by-design</p> <p>S.4 Expand and leverage partnerships</p> | <p>W.3 Build and retain organizational knowledge</p> <p>W.4 Advance workforce diversity, including gender parity</p> |
|---|--|--|---|--|

* For exact wording of the three strategic objectives, please see the Agency's Programme and Budget

Figure 2: Department of Safeguards' Strategic Plan-on-a-Page

Identification of needed capabilities

To identify and prioritize capabilities that need to be either developed or further enhanced, the Department consulted all of its Divisions, from working level staff to senior management. The Department used a thorough process for identifying the capabilities for which it is seeking support, involving:

- Consideration of current and emerging safeguards implementation challenges and opportunities;
- Assessment of current capabilities, progress made in developing them, and of further development needs;
- Prioritization of desired capabilities, using five criteria; and
- Analysis of emerging technologies and the changing nuclear landscape at large.

Inputs to the process

Priority projects/actions from the Strategic Plan

The priority objectives in the Department's Strategic Plan are advanced through departmental projects and actions, such as the State-level safeguards approach (SLA) Improvement Project and the Comprehensive Capacity-Building Initiative for SSACs⁴ and SRAs⁵ (COMPASS). The capabilities associated with these projects and actions that need external support were considered as inputs.

Consultations with all Safeguards Divisions

To identify the needed capabilities, the Department consulted staff throughout the Department using both a bottom-up and top-down approach. Divisions were requested to identify capabilities needed to advance each of the Department's priority objectives, under the five strategic focus areas. These were reviewed and validated by Section Heads and Directors.

Continuing development needs

Many capabilities (formerly referred to as 'needs') from the 2018 R&D Plan have been advanced or overtaken by events. Priority capabilities needing further development and support have been carried forward into this document. In addition, a comparison of the 2018 R&D Plan and previous D&S Programme highlighted some task areas worth capturing as continuing capabilities to be developed.

Safeguards-relevant R&D activities and ideas 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 opportunities with promising potential for safeguards application.

Emerging Technologies Workshops

The capability priorities described in this document have been informed by the Department's [Emerging Technologies Workshops](#) (ETW), held in 2017 and 2020. Both workshops yielded several insights into the scientific and technological landscape with potential to both challenge and aid safeguards implementation. Challenges included safeguarding new types of nuclear reactors; technologies such as accelerator driven systems, lasers and additive manufacturing that may enable proliferation and require altering safeguards assumptions; the explosion in the amount, speed and variety of information ('big data'); and threats posed by 'deep fakes'. Opportunities identified included incorporating artificial intelligence (AI) and machine learning (ML) into safeguards surveillance and automation of information processing; deploying robotics and distributed ledger technologies to spent fuel verification; leveraging rapidly expanding sensors data for detection of undeclared nuclear activities; and leveraging visualization for safeguards data analysis and communication. Many of these insights are now incorporated into the Department's capability development efforts.

⁴ State system of accounting for and control of nuclear material.

⁵ State or regional authority responsible for safeguards implementation.



Insights from the 2018 Symposium

The capability priorities are also informed by the [2018 Symposium on International Safeguards: Building Future Capabilities](#), and its seven 'ideas for action':

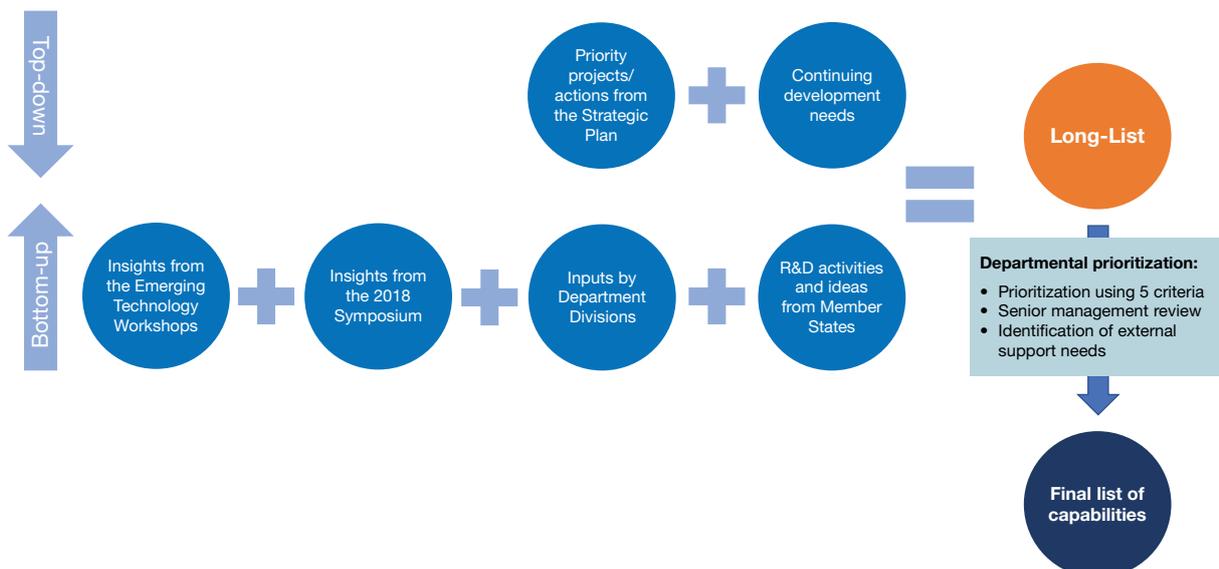
1. Rethink spent fuel verification for optimized safeguards.
2. Reinforce implementation of multisource data visualization for better integration, analysis and use of safeguards information.
3. Build national safeguards capacity by supporting the improvement of SSAC performance.
4. Bolster safeguards education to build the next generation of safeguards experts.
5. Proactively engage industry to ensure the early incorporation of safeguards requirements into nuclear projects.
6. Develop tailored communication on the role and importance of safeguards.
7. Expand and leverage non-traditional partnerships to broaden political, financial and technical support to the safeguards mission.

1. *Effectiveness* – i.e. the extent to which the capability enables the Department to meet safeguards technical objectives; to detect indicators of safeguards/proliferation concern; and to strengthen confidence in safeguards findings.
2. *Efficiency* – i.e. the extent to which the capability helps the Department to optimize safeguards activities in the field and at HQ; to optimize processes and eliminate redundancies; to reduce costs; and to save time and effort.
3. *Effort vs. Impact* – i.e. the extent to which the anticipated effort/cost of creating or enhancing the capability is in line with its expected benefits (return-on-investment); and how often and how broadly the Department would benefit from the capability.
4. *Challenge/Risk* – i.e. how significant of a safeguards challenge the capability helps solve; and how significant is the risk if the Department does not achieve this capability.
5. *Urgency* – i.e. how soon the Department needs this capability.

The resulting prioritized set of capabilities was reviewed and validated by the Department's senior management. Only those expected to need external support have been included here.

Prioritization of needed capabilities

The initial list of some 140 capabilities was prioritized first by consulting Section Heads and Directors and then in a series of workshops with subject matter experts from throughout the Department, using five criteria:



Capabilities and associated support needs

This update reflects changes in the way the Department communicates its capability development priorities and associated support needs. While the 2018 R&D Plan was built around the term ‘needs’, this update seeks to more clearly identify the ‘capabilities’ the Department is seeking to develop or further enhance.

The identified capabilities do not necessarily anticipate a particular solution or approach, but describe the outcome (i.e. the end state/result) that is being sought, and for which external support is required – giving partners more contextual information (the ‘why’) and leaving room to consider various ways in which to reach that outcome (the ‘how’). In so doing, the document seeks to pave the way for more results-oriented monitoring and reporting, as the level to which a capability is achieved is more meaningful to track and report than the sole fulfilment of needs.

The document also identifies which type of support is expected, so partners can channel their support accordingly (see ‘type of support’ on page 8).

Capability key words

Recognizing that partners may wish to support specific capabilities and areas of interest, the table below tags the capabilities with key words for ease of reference⁶:



Information Technology (IT)

Capability relates to development/enhancement of IT infrastructure, tools or expertise as enablers to safeguards implementation



Spent fuel verification

Capability relates to more efficiently measuring and verifying spent fuel transfers and inventories in both wet and dry storage



In-field instrumentation

Capability relates to verifying nuclear material and activities in the field through use of equipment (resident/portable), including radiation-based instruments, containment and surveillance systems, etc.



Information analysis

Capability relates to collection, processing and analysis of safeguards-relevant information and associated processes, methodologies and tools



Sample analysis

Capability relates to equipment, methodologies and techniques for analysing nuclear material and environmental samples and associated quality control



Safeguards approaches

Capability relates to development of concepts and approaches to meet current and future safeguards challenges, and to implement effective and efficient State-level safeguards



Training and capacity building

Capability relates to development of core and functional competencies of IAEA staff, and enhancement of effectiveness of SSACs and SRAs



Organizational performance

Capability relates to processes and systems to enhance the Department’s performance, preparedness and resilience, and to manage its critical assets



Communication and reporting

Capability relates to assessing and reporting safeguards findings, performance and trends to stakeholders, and communicating on IAEA safeguards broadly



Detection of undeclared

Capability relates to detection of undeclared nuclear material and activities

⁶ In a future electronic version of this document, users can search the capabilities by key words.



Type of support



Financial resources — Contribution through direct fund provision



Collaboration — Consultations and correspondence with experts through, for example, conferences, workshops, and trainings as well as provision of access to facilities for testing and training



Expertise — Provision of a cost-free expert (CFE), junior professional officer (JPO) or a consultant



R&D — Research and development activities of exploratory or developmental nature, including studies and testing of ideas, methodologies, techniques and tools and other innovations with potential for safeguards application



Equipment & Materials — Provision or transfer of equipment, reference materials, working standards and other tangible assets

| ID | Capability | Key words | Support Type |
|---|---|---|---|
| Focus Area: Core Activities (V) | | |  |
| V.1 | | | |
| Strengthen information collection, integration and analysis in all aspects (e.g. processes, methodologies, competences, tools) targeted at identifying early indications of proliferation concern. | | | |
| V.1.C1 | Ability to synthesize and evaluate disparate sets of verification data from the field through data analysis methods and tools | Information analysis IT Detection of undeclared | €   |
| V.1.C2 * | Ability to process and integrate the variety and volume of safeguards-relevant information in a timely, user-friendly and cost-effective manner | Information analysis IT Detection of undeclared | €   |
| V.1.C3 | Ability to efficiently process and interpret multi-lingual safeguards-relevant information, including within the Agency's secure air-gapped network | Information analysis IT Detection of undeclared | €   |
| V.1.C4 | Ability to apply machine learning for automatic selection or change detection in open source text and other media, commercial satellite imagery and cloud data streams, including a library of training data | Information analysis Detection of undeclared IT | €   |
| V.1.C5 | Ability to enhance the sharing, aggregation, visualization and analysis of geo-based information (e.g. verification data, satellite imagery) | Information analysis IT Detection of undeclared | €   |
| V.1.C6 | Ability to apply optical character recognition/text extraction as a robust service to enable information integration into digital systems | Information analysis IT | €  |
| V.1.C7 | Ability to effectively maintain situational awareness of safeguards-relevant nuclear trade activities and developments | Information analysis Detection of undeclared | €   |
| V.3 | | | |
| Further develop and align technical policies, procedures and methodologies for safeguards implementation at the State level, and develop and update SLAs. | | | |
| V.3.C1 * | Ability to derive verification intensities and frequencies from performance targets and to determine detection probabilities | Safeguards approaches IT |    |
| V.3.C2 | Ability for safeguards information systems to assist analysts in identifying significant changes in a State's nuclear fuel cycle, which may trigger a need to update the APA, SLA, and AIP | Information analysis IT | €  |
| V.4 | | | |
| Enhance the monitoring and evaluation of safeguards implementation for continued effectiveness, efficiency and improved consistency, with emphasis on State level. | | | |
| V.4.C1 | Ability to leverage statistical methodologies to evaluate verification data, to assess verification performance (detection probability, timeliness and deterrence) and the associated level of confidence, at the facility and State levels | Safeguards approaches IT |    |
| V.4.C2 * | Ability to comprehensively evaluate, record, and document safeguards effectiveness at the State level | Safeguards approaches IT | €  |
| V.4.C3 | Ability to better measure and analyse safeguards performance (of the Department and the safeguards system more broadly) through use of analytical and IT tools, including data visualization | Organizational performance IT | €  |



| ID | Capability | Key words | Support Type |
|--|---|-----------------------------|---|
| V.6 | | | |
| Ensure that the Department is prepared to implement safeguards for all new types of nuclear facilities at all stages of their lifecycle, including decommissioning, and prepare for other activities of safeguards relevance. | | | |
| V.6.C1 | Ability to implement effective and efficient safeguards for geological repositories | Safeguards approaches | €   |
| V.6.C2 | Ability to implement effective and efficient safeguards for SMRs and microreactors | Safeguards approaches | €   |
| V.6.C3 | Ability to implement effective and efficient safeguards at J-MOX | Safeguards approaches | €   |
| V.6.C4 | Ability to perform process monitoring and associated data analysis for safeguarding facilities, particularly advanced reactors with liquid or pebble fuel | Safeguards approaches IT | €    |

Focus Area: Technical Capabilities (T)



T.1

Strengthen instrumentation capabilities for verification with emphasis on reliability, security, portability and user-friendliness.

| | | | |
|---------|---|--|---|
| T.1.C1* | Ability to more efficiently verify and maintain knowledge of spent fuel in shielding/storage/transport containers at all points in their life cycle, including through remote means | Safeguards approaches Spent fuel verification | €    |
| T.1.C2 | Ability to verify nuclear material in closed containers in spent fuel ponds during short notice or unannounced inspections | Safeguards approaches Spent fuel verification In-field instrumentation |    |
| T.1.C3 | Ability to more effectively and efficiently verify spent fuel from on-load reactors | Safeguards approaches Spent fuel verification |   € |
| T.1.C4 | Ability to perform partial defect verification of spent fuel with the digital Cerenkov viewing device (XCVD) | In-field instrumentation Spent fuel verification |   |
| T.1.C5* | Ability to develop, deploy and maintain new sealing system technologies with improved security and efficiency | In-field instrumentation Spent fuel verification IT | €    |
| T.1.C6 | Ability to verify nuclear material in containers with heterogenous matrices | In-field instrumentation |    |
| T.1.C7 | Ability to unintrusively monitor the flow rate of UF ₆ in cascades and at conversion plants | In-field instrumentation |    |
| T.1.C8 | Ability to detect HEU production in real time at declared LEU enrichment facilities | In-field instrumentation | €   |
| T.1.C9 | Ability to detect and quantify contamination in equipment returned from the field with heterogenous matrices and shapes | In-field instrumentation |   |
| T.1.C10 | Ability to rely upon an integrated system of instrumentation data (e.g. spectra) processing and review, with high level of automation and with unified user interface | In-field instrumentation Information analysis IT | €   |

| ID | Capability | Key words | Support Type |
|--|---|--|---|
| T.1.C11 | Ability to rapidly detect, characterize and address breaches to unattended systems, and evaluate their vulnerabilities more broadly, particularly from threats arising from technology advancements (e.g. conduit integrity verification) | In-field instrumentation IT |    |
| T.2 Improve capabilities for nuclear material and environmental sample analysis, pursuing higher levels of sensitivity, reliability and timeliness, and develop age dating capabilities. | | | |
| T.2.C1* | Ability to reliably and quickly deliver sample analysis results for special and high priority demands | Sample analysis Detection of undeclared |   |
| T.2.C2* | Ability to determine age of U and Pu in environmental samples through techniques and evaluation methods | Sample analysis Detection of undeclared |    |
| T.2.C3 | Ability to detect NFC materials and determine nuclear activities based on elemental and morphological analysis of particles in environmental samples, with emphasis on the recognition of anthropogenic particles using scanning electron microscopy techniques | Sample analysis Detection of undeclared |    |
| T.2.C4 | Ability to perform mixed U-Pu particle analysis, including screening, isotopic and elemental composition analysis | Sample analysis Detection of undeclared |    |
| T.2.C5 | Ability to assure the quality of the NWAL, including SAL, in environmental sample analysis (specifically particle analysis) using fit-for-purpose quality control and quality assurance methods | Sample analysis | €   |
| T.2.C6 | Ability to maintain and further enhance the environmental sampling database and the process models, databases, and tools that support trace elements analysis (material characterization) | Sample analysis IT | €   |
| T.2.C7 | Ability to reliably manage and deliver safeguards analytical results, e.g. through SGAS laboratory information management system (LIMS) | Sample analysis IT | €  |
| T.3 Sustain an IT system that serves safeguards implementation through up-to-date systems and tools, has robust security and is resilient in the face of disruptions. | | | |
| T.3.C1* | Ability to secure information and quickly detect and respond to security events that arise within the Department's information systems | IT Organizational performance | €  |
| T.3.C2 | Ability to assist SRAs with the creation and submission of accountancy reports and additional protocol declarations with an IT tool | IT Training & capacity building | €   |
| T.6 Expand infrastructure for unattended monitoring systems and explore advancements in space-based and other sensor technologies and data, in support of safeguards resilience and the detection of undeclared nuclear material and activities. | | | |
| T.6.C1* | Ability to develop and deploy improvements to the next generation surveillance review (NGSR) software (e.g. by leveraging machine learning to improve imagery review) | In-field instrumentation Information analysis IT | €   |
| T.6.C2 | Ability to deploy next generation capabilities to the cameras used in future surveillance systems (e.g. non-optical surveillance, climate insensitivity) | In-field instrumentation IT | €  |



| ID | Capability | Key words | Support Type |
|-------------|--|---|---|
| T.6.C3 * | Ability to leverage new types of space-borne sensor data from open sources, including the processing of synthetic aperture radar data, analysis of multi/hyperspectral data, and thermal imagery | Information analysis Detection of undeclared |   |

Focus Area: Management (M)



M.1

Secure adequate and predictable resources and optimize their allocation, taking into account workloads and seeking an appropriate balance between regular and extrabudgetary funds.

| | | | |
|--------|--|----------------------------------|---|
| M.1.C1 | Ability to fully implement data-driven programmatic planning, monitoring and evaluation, to support managerial decision-making | Organizational performance IT | €   |
|--------|--|----------------------------------|---|

M.2

Manage safeguards assets (information, infrastructure, technology etc.) strategically, with long-term vision and planning that ensures timely availability of resources to sustain the assets.

| | | | |
|-------------|---|----------------------------------|---|
| M.2.C1 * | Ability to strategically plan, maintain and improve safeguards IT tools, information assets, and associated infrastructure | Organizational performance IT | €  |
| M.2.C2 | Ability to enhance equipment reliability through improvements to the Safeguards Equipment Management System and monitoring of equipment performance | Organizational performance IT | €  |

M.3

Mature process management with well-defined processes, and ensure consistency and compliance in their implementation.

| | | | |
|--------|--|--|---|
| M.3.C1 | Ability to maintain an effective departmental communication framework and processes | Communication & reporting IT | €  |
| M.3.C2 | Ability to enhance managerial decision making processes, capabilities and competencies | Organizational performance Training & capacity building | €  |
| M.3.C3 | Ability to assess and improve the implementation efficiency of the Department's system of processes, procedures and supporting tools | Organizational performance IT | €   |
| M.3.C4 | Ability to deploy project management approaches to ensure effective execution of strategic priorities and projects | Organizational performance IT | €   |

M.4

Increase organizational resilience and preparedness to recover from major disruptions to the Agency's work and prepare for changes in the nuclear landscape.

| | | | |
|-------------|--|---|---|
| M.4.C1 | Ability to enhance working practices, leveraging Covid-19 lessons learned (e.g. information architecture, secure cloud services, secure virtual meeting environment) | Organizational performance IT | €   |
| M.4.C2 * | Ability to carry out mission-critical functions — needed for continued delivery of safeguards conclusions — in case of disasters (e.g. disruptive, massive cyber-attack or physical loss of critical infrastructure) | Organizational performance IT | €   |
| M.4.C3 | Ability to maintain awareness of changes in the nuclear landscape and associated impact on safeguards implementation, including the impact of emerging technologies and non-State actors | Organizational performance Detection of undeclared |   |

| ID | Capability | Key words | Support Type |
|---|--|------------------------------------|---|
| Focus Area: Stakeholders and Partnerships (S) | | |  |
| S.1 | | | |
| Communicate and engage with States on safeguards matters more proactively, consistently and transparently, taking into account Member States' areas of interest. | | | |
| S.1.C1 * | Ability to deploy data visualization and other methods and techniques to present safeguards findings and performance-related data in a clear and compelling manner | Communication & reporting IT | €  |
| S.1.C2 | Ability to more clearly and effectively communicate the value and importance of IAEA safeguards, and to reach a broader audience | Communication & reporting | €   |
| S.2 | | | |
| Build capacity of State safeguards authorities and their systems of accounting for and control of nuclear material (SSACs) and assess progress in their effectiveness. | | | |
| S.2.C1 * | Ability to strengthen the capacity of SSACs/SRAs and monitor and measure progress | Training & capacity building IT | €  |
| S.3 | | | |
| Promote, through close collaboration with regulators and proactive outreach to industry, safeguards-by-design to ensure that nuclear facilities are designed and constructed taking into account safeguards requirements. | | | |
| S.3.C1 | Ability to identify and address the needs of designers and operators of modified or new facilities in the early preparation for efficient implementation of safeguards | Safeguards approaches | €   |

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|--|---|--|---|
| Focus Area: People and Knowledge (W) | | |  |
| W.3 | | | |
| Build staff skills and expertise and improve corporate knowledge management (e.g. capture, sharing, retention, and utilization), using modern methods and tools. | | | |
| W.3.C1 | Ability to train inspectors on spent fuel measurement techniques inside facilities | Training & capacity building Spent fuel verification | €   |
| W.3.C2 | Ability to further develop the expertise of the Safeguards Department's workforce and train the next generation of safeguards experts | Training & capacity building | €   |
| W.3.C3 | Ability to improve safety culture by enhancing staff skills and expertise related to radiological and industrial safety | Training & capacity building | €  |
| W.3.C4 | Ability to effectively utilize knowledge and expertise already existing with the Department | Training & capacity building Organizational performance |  |
| W.3.C5 | Ability to preserve and disseminate critical organizational knowledge to overcome staff turn-over and other associated challenges | Training & capacity building Organizational performance |   |
| W.4 | | | |
| Meet the Agency's targets for gender parity and mainstreaming and for a geographically diverse workforce. | | | |
| W.4.C1 * | Ability to attract and retain a geographically diverse and gender-balanced workforce | Organizational performance | €   |

Annex

Definitions

| Term | Definition |
|-----------------------------|---|
| Actions | Practical steps (e.g. initiatives) by the Department to advance the priority objectives in its Strategic Plan. |
| D&IS Plans | The biennial descriptions of planned tasks for each D&IS Programme Plan. Together, these plans comprise the biennial D&IS Programme document. |
| Outcome | Benefits or changes that are expected, if the objectives and associated projects, actions and tasks are accomplished. |
| Output | A measurable product or service delivered or acquired as a direct result of the implementation of a task. |
| Priority Objectives | Objectives to be pursued by the Department to advance its vision and strategic objectives. |
| Projects | Departmental projects to advance the priority objectives in the Department's Strategic Plan. |
| R&D | Research and development activities of exploratory or developmental nature, including studies and testing of ideas, methodologies, techniques and tools and other innovations with potential for safeguards application. |
| Strategic Objectives | The Department of Safeguards has four overarching strategic objectives; the first three derive from the IAEA's Programme and Budget for Major Programme 4 (Nuclear Verification) while the fourth is of a departmental nature. |
| Task | A task is a specific activity under the D&IS Programme designed to deliver an output that will contribute to the achievement of an expected outcome. Resources, including external support, are required for the implementation of tasks. |



Acronyms and abbreviations

| Acronym | Definition |
|-----------------|---|
| AI | Artificial intelligence |
| AIP | Annual implementation plan |
| APA | Acquisition path analysis |
| CFE | Cost-free expert |
| COMPASS | Comprehensive Capacity-Building Initiative for SSACs and SRAs |
| D&IS | Development and Implementation Support Programme for Nuclear Verification |
| ETW | Emerging Technologies Workshop |
| HEU | Highly enriched uranium |
| HQ | Headquarters |
| IAEA | International Atomic Energy Agency |
| IT | Information technology |
| J-MOX | Japan Nuclear Fuel, Ltd., mixed oxide fuel fabrication plant |
| JPO | Junior professional officer |
| LEU | Low enriched uranium |
| LIMS | Laboratory information management system |
| ML | Machine learning |
| MOX | Mixed oxide |
| MSSP | Member State Support Programme |

| Acronym | Definition |
|-----------------------|---|
| NFC | Nuclear fuel cycle |
| NGO | Non-governmental organization |
| NWAL | Network of analytical laboratories |
| OCR | Optical character recognition |
| Pu | Plutonium |
| R&D | Research and development |
| RMP | Resource mobilization priorities |
| SAL | Safeguards analytical laboratories |
| SGAS | Office of Safeguards Analytical Services |
| SLA | State level safeguards approach |
| SMR | Small and modular reactors |
| SRA | State or regional authority responsible for safeguards implementation |
| SSAC | State system of accounting for and control of nuclear material |
| U | Uranium |
| UF₆ | Uranium hexafluoride |
| XCVD | Next generation of Cerenkov viewing device |

