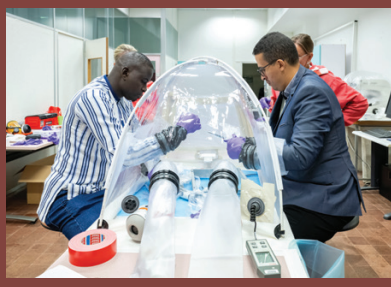
Nuclear Security Review 2025



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NUCLEAR SECURITY REVIEW 2025

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Nuclear Security Review 2025
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Foreword

The *Nuclear Security Review 2025* includes the global trends and the Agency's activities in 2024. It also presents priorities for 2025 and beyond, as identified by the Agency, for strengthening nuclear security globally. The majority of priorities remain unchanged from the previous year due to their long term nature but some have evolved to take into account changing global trends and in response to activities performed.

A draft version of the *Nuclear Security Review 2025* was submitted to the March 2025 session of the Board of Governors in document GOV/2025/6. The final version of the *Nuclear Security Review* 2025 was prepared in light of the discussions held during the Board of Governors and also of the comments received from the Member States.

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Nuclear Security Review 2025

Report by the Director General

Executive Overview

1. The *Nuclear Security Review 2025* reflects the Agency's perspective on global trends in nuclear security in 2024. It shows that the international community continued to demonstrate its commitment to further advancing nuclear security around the world. It also presents planned Agency activities for 2025 and priorities, as identified by the Agency and its Member States, including through the *Nuclear Security Plan 2022–2025*, for strengthening nuclear security globally. Agency activities completed in 2024 can be found in Appendix A.

Nuclear security priorities

- Supporting Member States, upon request, in developing, maintaining and implementing national nuclear security regimes, including legislative and regulatory frameworks; physical protection of nuclear and other radioactive material, insider threat mitigation and nuclear security culture; security of radioactive sources throughout their life cycle; and preparedness for, detection of and response to nuclear security events;
- Continuing efforts to promote further adherence to, and full implementation of, the Convention on the Physical Protection of Nuclear Material and its Amendment, including through enhanced outreach to legislators;
- Developing and strengthening nuclear security guidance and assisting with the application of such guidance through activities such as peer review and advisory services;
- Assisting Member States in strengthening capacity through the implementation of nuclear security education and training programmes, available to all States, and utilizing the International Nuclear Security Education Network, Nuclear Security Support Centres, national Collaborating Centres and Practical Arrangements;
- Operating the Nuclear Security Training and Demonstration Centre;
- Continuing to assist States, upon request, in strengthening the protection of sensitive information and computer-based systems, recognizing threats to nuclear security from cyber-attacks at nuclear-related facilities, as well as their associated activities including the use, storage and transport of nuclear and other radioactive material;
- Continuing to keep abreast of scientific, technological and engineering innovations with a view to confronting current and emerging threats to nuclear security, and also considering opportunities to enhance nuclear security from these innovations;
- Continuing to respond to requests from Member States to facilitate a coordination process to address safety and security interfaces and further develop guidance on how to effectively address them;
- Ensuring that contributions to the Nuclear Security Fund are used efficiently and according to the principles of results based management;
- Preparing the *Nuclear Security Plan 2026–2029,* taking into account the General Conference Resolution on Nuclear Security (GC(68)/RES/9), Member State priorities and trends and emerging challenges in nuclear security;
- Continuing to strengthen communication with the public and Member States about Agency nuclear security activities and how these activities can assist Member States in improving nuclear security globally;
- Preparing for the International Conference on Computer Security for the Nuclear World: Securing the Future and the International Conference on the Safe and Secure Transport of Nuclear and Radioactive Material, to be held in 2026; and
- Continuing to monitor, assess and report on the nuclear safety and security situation in Ukraine, and to provide assistance to Ukraine's nuclear facilities and activities involving radioactive sources, including support and assistance missions and delivery of equipment, as requested by Ukraine.

2. The present document, *Nuclear Security Review 2025,* intends to complement the forthcoming *Nuclear Security Report 2025*, which will focus on the activities undertaken by the Agency to implement the relevant General Conference resolutions and will cover the period from 1 July 2024 to 30 June 2025. In consultation with Member States, the complementarity and timing of the issuance of the assorted reports, within their defined scopes and with an objective of minimizing duplication, were considered in the development of the present report.

3. Global events in 2024, including the armed conflict in Ukraine, highlighted the importance of nuclear safety and security. The Agency and Member States continue to place the safety and security of nuclear and other radioactive material, associated facilities and associated activities as high priorities.

4. The responsibility for nuclear security within a State rests entirely with that State. Member States have consistently recognized the central role of the Agency in strengthening the nuclear security framework globally and in coordinating international cooperation in nuclear security activities, while avoiding duplication and overlap of such activities.

5. During 2024, the Agency continued implementing activities, with due regard to the protection of confidential information, under the *Nuclear Security Plan 2022–2025*, approved by the Board of Governors in September 2021 and taken note of by the General Conference at its 65th regular session in September 2021. The Agency undertook a number of steps to enhance its application of a results based approach during the planning, implementation and monitoring, and performance assessment phases of the Agency's nuclear security programme. The Agency remains committed to further mainstreaming and implementing a results based approach in its delivery of the relevant assistance to Member States.

6. In 2025, the Agency will prepare the *Nuclear Security Plan 2026–2029*, continuing to utilize a collaborative approach between the Secretariat and Member States. This Plan will be informed by the General Conference resolution on nuclear security (GC(68)/RES/9), trends in nuclear security and needs and priorities expressed by Member States in the preceding years.

7. As the only international organization having a central and coordinating role in nuclear security activities with competence in the various technical subjects that promote nuclear security, the Agency contributes to the work of the dedicated Committees of the United Nations, such as the 1540 Committee, and offices of the United Nations, such as the United Nations Office of Counter-Terrorism, United Nations Office on Drugs and Crime, and United Nations Office for Disarmament Affairs, and has established cooperation with a number of international organizations.

8. The Agency continued its systematic approach to external communication on nuclear security. The Agency issued 11 press releases and published 15 articles on nuclear security-related topics on its website. In addition, an edition of the *IAEA Bulletin* entitled "Nuclear Security: Shaping the Future" and several videos, including one entitled "IAEA Nuclear Security Training and Demonstration Centre", were developed and made available for public information purposes. The IAEA website pages on nuclear security were updated with a timeline of the "Milestones in the IAEA's Nuclear Security Programme", and new content about the Nuclear Security Fund (NSF). The Agency also completed a major update of the Nuclear Security Information Portal (NUSEC) and introduced in the catalogue of courses offered at the Nuclear Security Training and Demonstration Centre (NSTDC) a Training Course on Public Communication in Nuclear Security.

9. Further, to build and maintain the framework needed for States to effectively communicate and exchange information, the Agency held major conferences and organized virtual, hybrid and in-person Technical Meetings on nuclear security topics, and convened Information Exchange Meetings to encourage communication among organizations active in various aspects of nuclear security. A highlight

in 2024 was the ministerial International Conference on Nuclear Security: Shaping the Future, held in Vienna in May 2024. This large international gathering highlighted the continued commitment of States to ensuring nuclear security globally, while preparing for emerging challenges.

10. The Agency continues to receive a high volume of requests for support in education and training, across all technical areas of nuclear security, to support the ongoing sustainability of nuclear security in countries. To address these requests and to help Member States establish and sustain national nuclear security regimes more broadly, the Agency places considerable emphasis on its human resource development programme and on activities hosted by Nuclear Security Support Centres (NSSCs) and Collaborating Centres. Training activities based on a systematic approach support Member States in providing managers and personnel with the knowledge, skills and attitudes necessary to discharge their duties and perform their jobs and tasks in various areas of nuclear security.

11. The Agency's NSTDC, which became operational in October 2023, enhances nuclear security capacity building through the use of advanced technology and expertise, and complements the training opportunities offered in Member States, including by NSSCs, with special emphasis on hands-on and practical training. The Agency successfully implemented planned training courses at the NSTDC throughout the first year of its operation.

12. The Agency continued its efforts to strengthen international norms supporting nuclear security, including through activities that support Member States in joining relevant legally binding international instruments and implementing obligations thereunder, namely the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment (A/CPPNM).

13. Development or enhancement of regulatory infrastructures for nuclear security, nuclear material control and accounting systems at nuclear facilities for security purposes, and specific guidance on insider threats, nuclear security culture, threat-based and risk informed approaches, the safety–security interface, and contingency planning continue to be important nuclear security elements.

14. The Agency continues to facilitate a coordination process to address the interface between nuclear safety and security, for example by responding to requests from Member States as reflected in the main trends, including implementing Regulatory Infrastructure Development Projects (RIDPs), conducting the Advisory Mission on Regulatory Infrastructure for Radiation Safety and Nuclear Security (RISS), and addressing the safe and secure management of disused sources. Member States also continue to encourage the Secretariat to develop guidance on how to effectively address the interface, while acknowledging the distinctions between nuclear safety and security.

15. The Agency's assistance consists of many elements, including peer review missions, assistance missions and expert missions following countries' requests for assistance; national and regional workshops; international and regional training courses; technical visits; physical protection upgrades, and loaning and delivery of equipment.

16. Agency missions, including the International Physical Protection Advisory Service (IPPAS), the International Nuclear Security Advisory Service (INSServ) and RISS, provide Member States with invaluable information that is used in developing action plans within the Integrated Nuclear Security Sustainability Plan (INSSP) framework. These missions continue to be in high demand.

17. Information and computer security remains a topic of high importance for Member States, as the nuclear industry increasingly uses digital technologies to control, monitor and protect the various aspects of operations at nuclear power plants (NPPs), other fuel cycle and spent fuel storage facilities, non-power reactors, novel advanced reactors including small and medium sized or modular reactors (SMRs), and decommissioned nuclear facilities, as well as in other applications involving radioactive sources. Vulnerability to theft and/or manipulation of sensitive information or operational technology via cyber-

attack is a challenge across all aspects of the digitally connected world. In 2025, the Agency will begin preparations for two international conferences to be held in 2026: the International Conference on Computer Security in the Nuclear World: Securing the Future, and the International Conference on the Safe and Secure Transport of Nuclear and Radioactive Material. These conferences will look to consolidate the progress made in these rapidly evolving domains.

18. With increased interest in SMRs, new approaches to security and the development of guidance, tools and human resources to handle challenges related to the secure deployment of SMRs are under consideration. Nuclear security is being considered in the Agency's Nuclear Harmonization and Standardization Initiative (NHSI), and national nuclear security experts are engaged in all aspects of the initiative, including the development of an IAEA Technical Document related to a multinational pre-licensing regulatory review that could include safety and security aspects of a reactor design. During the NHSI plenary in October 2024, the establishment of a nuclear security working group within the NHSI was announced. This working group will address approaches for international collaboration to develop a common understanding of regulatory reviews for the security of SMRs.

19. The Agency continued to support Member States, upon request, in enhancing their capacities in nuclear security detection architecture, institutional response infrastructure, radiological crime scene management (RCSM) and nuclear forensics, by considering a more structured and holistic approach to these disciplines that builds on awareness, capacity building, sustainment and evaluation.

20. Throughout 20 years of the Agency's programme to support Member States, upon request, in hosting major public events (MPEs), technical assistance and expertise has been provided for 78 events in 48 host States.

21. Implementation of activities relevant to nuclear security depends on close interaction with States, with other international organizations and within the Agency. Effective mechanisms are required for coordination, including planning and monitoring, and for narrative and financial reporting to Member States and organizations that provide voluntary contributions to the NSF. Interactions with States are facilitated through the establishment of nuclear security support arrangements between the Agency and individual Member States. Some Member States implement nuclear security support programmes on a bilateral basis. The Agency continues to bring together States' experiences and to share information, as appropriate, as well as to implement joint activities, in order to improve both the effectiveness of the Agency-wide programme on nuclear security and the efficient use of resources.

22. In 2024, the Agency received contributions to the NSF from donors: Australia, Belgium, Canada, China, Estonia, the European Union, Finland, France, Germany, Hungary, Italy, Japan, the Kingdom of the Netherlands, New Zealand, Pakistan, the Republic of Korea, Spain, Sweden, Switzerland, the United Arab Emirates (UAE), the United Kingdom (UK), the United States of America (USA), and 16 non-governmental donors. The total budget allotment in 2024 was €28 million.[1] The Agency is committed to utilizing contributions to the NSF in an expedient and prudent manner, in accordance with the principles of the results based management (RBM). Rigorous planning and robust processes have allowed the Agency to achieve some of its highest rates of NSF expenditure from 2022 to 2024; in 2024, NSF expenditure was higher than NSF budget allotment.

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[1] For purposes of this report, "budget allotment" refers to funds set aside for the implementation of a project: the sum total of all awards that fund that project. Allotments provide a better overview of the funding made available to Agency for the nuclear security programme at the time the contribution was made, as opposed to revenue, recognition of which is based on the International Public Sector Accounting Standards requirements. In certain instances, this could result in the revenue being recognized only once the activities are completed and reported, which may not necessarily occur in the reported year. Budget allotment is also used for reporting by some other Divisions of the Agency.

23. The Agency remains committed to providing guidance and assistance to Member States in establishing comprehensive national nuclear security practices for protecting nuclear and other radioactive material, and for detecting and responding to nuclear security events. The Agency will continue to analyse new and emerging threats in order to assist Member States in preparing for, preventing, detecting and responding to potential nuclear security events.

Abbreviations

A/CPPNM	Amendment to the Convention on the Physical Protection of Nuclear Material
AI	artificial intelligence
COP	Conference of the Parties to the United Nations Framework Convention on Climate Change
CPPNM	Convention on the Physical Protection of Nuclear Material
CRP	coordinated research project
CSOC	computer security operations centre
DBT	design basis threat
DSRS	disused sealed radioactive source
EBRD	European Bank for Reconstruction and Development
FLO Network	International Network of Front Line Officers and Organizations for Nuclear Security Detection
FNPP	floating nuclear power plant
I&C	instrumentation and control
ICONS	International Conference on Nuclear Security
INFCIRC	Information Circulars
INSEN	International Nuclear Security Education Network
INSServ	International Nuclear Security Advisory Service
INSSP	Integrated Nuclear Security Sustainability Plan
IPPAS	International Physical Protection Advisory Service
IRRS	Integrated Regulatory Review Service
ISOP	International Network on Innovation to Support Operating Nuclear Power Plants
ITDB	Incident and Trafficking Database
KhNPP	Khmelnytskyy nuclear power plant
M-INSN	Mobile-Integrated Nuclear Security Network
ML	machine learning
MORC	nuclear and other radioactive material out of regulatory control
MPE	major public event
MR	microreactor

MSCFP	Marie Skłodowska-Curie Fellowship Programme
NHSI	Nuclear Harmonization and Standardization Initiative
NMAC	nuclear material accounting and control
NPP	nuclear power plant
NSF	Nuclear Security Fund
NSGC	Nuclear Security Guidance Committee
NSS	Nuclear Security Series
NSSC	Nuclear Security Support Centre
NSSC Network	International Network for Nuclear Security Training and Support Centres
NSS-OUI	Nuclear Safety and Security Online User Interface
NSTDC	Nuclear Security Training and Demonstration Centre
NUSEC	Nuclear Security Information Portal
NUSIMS	Nuclear Security Information Management System
PAAT	Personnel Alarm Assessment Tool
RBM	results based management
RCSM	radiological crime scene management
RIDP	Regulatory Infrastructure Development Project
RISS	Advisory Mission on Regulatory Infrastructure for Radiation Safety and Nuclear Security
RNPP	Rivne nuclear power plant
SADC	Southern African Development Community
SMRs	small and medium sized or modular reactors
SUNPP	South Ukraine nuclear power plant
TECDOC	IAEA Technical Document
TRACE	Tool for Radiation Alarm and Commodity Evaluation
UNODC	United Nations Office on Drugs and Crime
WCO	World Customs Organization
WebINFs	Web Incident Notification Forms
WINSI	Women in Nuclear Security Initiative
ZNPP	Zaporizhzhya nuclear power plant

Analytical Overview

A. General Nuclear Security Areas

A.1. Promoting Further Adherence to International Legal Instruments

Trends

1. Efforts to strengthen international norms supporting nuclear security continue through activities that support States in joining and in fully implementing obligations under relevant legally binding international instruments. These include the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment (A/CPPNM), the International Convention for the Suppression of Acts of Nuclear Terrorism and United Nations Security Council Resolution 1540.

2. Member States continue to support Agency activities aimed at the universalization of the CPPNM and its Amendment. The CPPNM was adopted on 26 October 1979, and entered into force on 8 February 1987. As of December 2024, there were 165 Parties to the CPPNM, an increase of 1 compared to the end of 2023. The A/CPPNM was adopted on 8 July 2005 and entered into force on 8 May 2016. As of December 2024, there were 137 Parties to the A/CPPNM, an increase of 2 compared to the end of 2023.

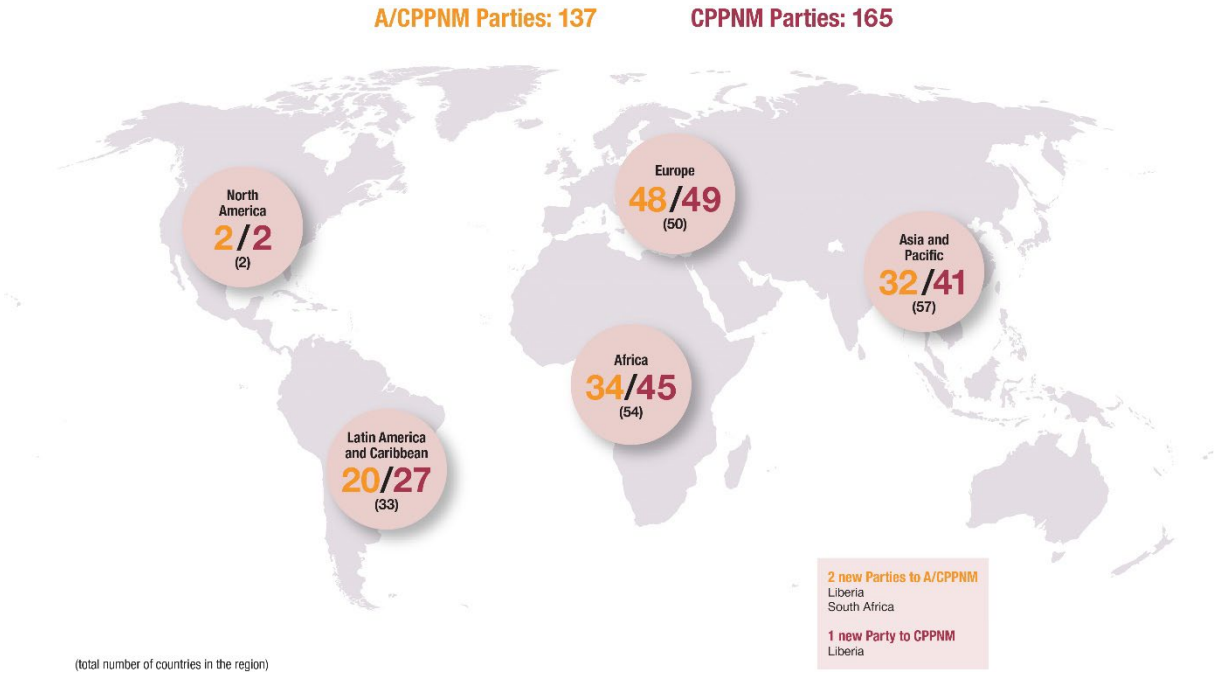

Figure 1: A/CPPNM and CPPNM parties in 2024.[2]

[2] Total number of parties includes EURATOM.

3. In 2024, the Agency continued conducting national, regional and international workshops and meetings to promote the universalization of the A/CPPNM, with a particular focus — at the request of Member States — on engaging decision makers as well as technical experts. The Agency also began hosting scenario-based national and regional policy discussions related to universalization of the CPPNM and its Amendment to help raise awareness and enhance understanding of the importance and benefits of joining and implementing the CPPNM and its Amendment. Further, the Agency began engagement with legislators through increased interactions with the Inter-Parliamentary Union with the aim of fostering greater public and political support for adherence to and effective implementation of these important instruments.

4. Member States continue to request legislative and technical assistance towards universal adherence to, and full implementation of, the CPPNM and its Amendment. States Parties continue to provide information on laws and regulations giving effect to the CPPNM and its Amendment and continue to designate Points of Contact for the CPPNM and its Amendment pursuant to Articles 14 and 5, respectively. During the reporting period, 14 States provided the Agency with updated information on their laws and regulations in accordance with Article 14.1, including 6 States that did so for the first time. This brings the total number of States that informed the Agency of their laws and regulations to 84, an increase of 6 compared to the end of 2023. In addition, 45 States provided the Agency with updated information of their CPPNM and/or A/CPPNM Points of Contact, including 1 State that provided such information for the first time. In total, the number of Points of Contact and Central Authorities designated under Article 5 is 138.

Related Activities

5. ***The Agency will continue assisting Parties in meeting their obligations under the CPPNM and its Amendment and will continue its efforts to promote universal adherence to the CPPNM and its Amendment. The Agency is planning to undertake the following related activities:***

- Prepare for a second Conference of the Parties to the Amendment to the Convention on the Physical Protection of Nuclear Material;
- Continue promoting and facilitating the exchange of information, on a voluntary basis, on the implementation of nuclear security provisions of international instruments relevant to nuclear security;
- Continue promoting universalization of the CPPNM and its Amendment through workshops and engagement with decision makers, legislators and legal and technical experts, as well as through other targeted activities;
- Further encourage States Parties to the CPPNM and to the A/CPPNM to identify the CPPNM and A/CPPNM Points of Contact pursuant to Article 5.1 and to inform the Agency of laws and regulations giving effect to the CPPNM and its Amendment pursuant to Article 14.1;
- Continue supporting Member States, through its legislative assistance programme, in adhering to and implementing the provisions of the CPPNM and its Amendment as part of national nuclear legislation; and
- In consultation with Member States, consider ways of further promoting and facilitating the exchange, on a voluntary basis, of information on the implementation of nuclear security provisions of international instruments relevant to nuclear security.

A.2. Nuclear Security Guidance and Peer Review and Advisory Services

Trends

6. The Agency remains committed to developing and releasing comprehensive consensus guidance documents as part of the Nuclear Security Series (NSS). These publications are consistent with, and complement, international nuclear security instruments, and form the basis of the Agency's nuclear security assistance to Member States. This effort involves collaboration with Member States and international organizations, including through the Nuclear Security Guidance Committee (NSGC), which started its fifth term in 2024. Membership of the NSGC expanded from 64 to 71 Member States and the number of observing international organizations increased from 9 to 10. This growth of the NSGC reflects growing interest in and commitment to strengthening nuclear security worldwide.

7. The Agency continues its work on enhancing the NSS publications. The Agency formally initiated the process to revise the Nuclear Security Fundamentals (IAEA Nuclear Security Series No. 20) and the Nuclear Security Recommendations (IAEA Nuclear Security Series No. 13, also published as INFCIRC/225/Rev 5, and Nos. 14 and 15), as approved by the NSGC in December 2024. In parallel, the Secretariat continues reviewing terminology used in the NSS to further facilitate the revision process.

8. The accessibility of NSS guidance is steadily improving as more publications are being translated into United Nations languages other than English. This ongoing effort ensures that these materials reach a broader global audience, facilitating the efforts of Member States and stakeholders in establishing and maintaining effective nuclear security measures.

Figure 2: NSS publications in 2024.

9. Member States remain committed to enhancing their nuclear security regimes, as evidenced through continued requests from Member States for Agency missions to support this area.

- Member States continue to request IPPAS missions. In 2024, the Agency conducted 6 IPPAS missions. Since 1996, a total of 108 IPPAS missions have been conducted, upon request, in 63 Member States. There is strong interest from Member States in utilizing the information of the Agency's IPPAS Good Practices Database, coordinated through the designated Points of Contact in Member States. To date, the database contains over 500 good practices on a range of nuclear

security topics, with the majority related to the module on physical protection systems and measures at nuclear and other radioactive material facilities.

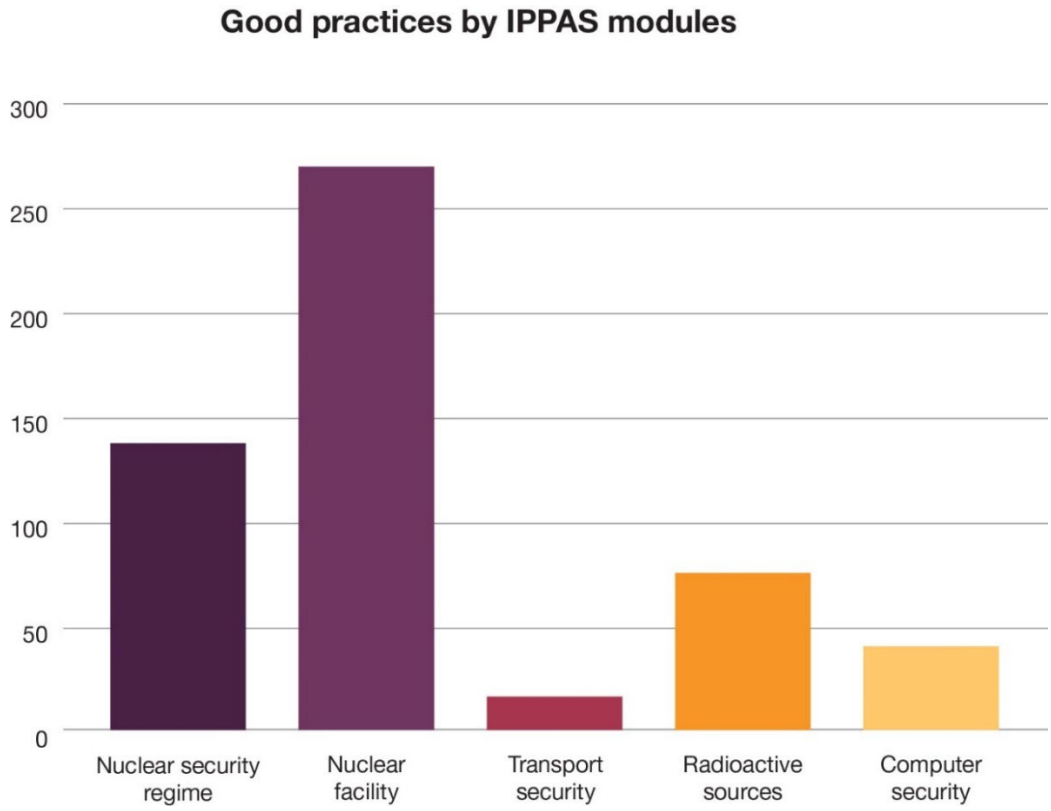

Figure 3: Distribution by IPPAS module of input in the Good Practices Database.

- Member State interest in the INSServ continues to increase. During the reporting period, the Agency conducted two INSServ missions, based on the revised INSServ guidelines published in 2019. Four INSServ missions are anticipated to be conducted in 2025. Additionally, six consultancy meetings on INSServ follow-up activities were conducted to assist Member States in addressing the recommendations and suggestions and developing a concrete plan of action that may be implemented by the State within the INSSP framework, with the assistance of the Agency and other donors. Since 2002, a total of 88 missions have been conducted, upon request, in 72 Member States.

- Since the Agency's initiation of the RISS in March 2022, interest in the missions has remained strong and is anticipated to continue. Thirteen RISS missions have been conducted since the start of the programme in 2022, including two in 2024.

- There is strong interest from Member States in requesting follow-up activities to implement mission recommendations and suggestions with potential assistance from the Agency and other international partners. The Agency has intensified efforts to ensure linkages between mission follow-up activities and the INSSPs of host countries.

Figure 4: Security related missions in 2024.

Related Activities

10. ***The Agency will continue developing and further strengthening its nuclear security guidance to address a wide range of nuclear security topics. The Agency will assist with the application of its nuclear security guidance by, inter alia, strengthening its peer review and advisory services and related self-assessment tools. The Agency is planning to undertake the following related activities:***

- Continue revising the NSS publications, starting with the limited revision of the Nuclear Security Fundamentals and three Recommendations-level publications, while adhering to the top-down approach outlined in the roadmap developed in consultation with the NSGC;
- Continue to review the terminology used in the NSS to ensure its consistent application throughout the Series, enhancing the quality of the NSS publications, and improving the understanding of the guidance provided;
- Continue to implement IPPAS, INSServ and RISS missions, upon request;
- Continue the maintenance and updating of good practices and lessons learned, and finalizing and publishing self-assessment guidelines for IPPAS;
- Continue the enhancement of the INSServ process, including the revision of the self-assessment questionnaire and its use by States hosting INSServ missions and the initiation of the revision of the *International Nuclear Security Advisory Service (INSServ) Guidelines* (IAEA Services Series No 39); and
- Continue efforts to ensure linkages between mission follow-up activities and the INSSPs of host countries.

A.3. Assessing Nuclear Security Needs and Priorities

Trends

11. The Agency remains committed to maximizing the impact and effectiveness of efforts to establish and maintain nuclear security regimes. To this end, in 2024, the Agency systematically implemented the upgraded INSSP framework, with a phased rollout to States undergoing their scheduled 3–4 year review cycle, ensuring a consistent and structured approach to nuclear security support. To date, 26 States have benefited from the upgraded INSSP conceptual approach launched in October 2023.

12. The Agency is shifting towards a more efficient approach to assessments of States' nuclear security capabilities, as evidenced by the successful launch of the digital Self-Assessment Tool on the secure web-based Nuclear Security Information Management System (NUSIMS) platform. This transition from hard copy questionnaires to a user-friendly online tool enables States to assess their nuclear security needs, identify priority areas for development or strengthening, and track progress over time, whether within or outside the INSSP framework. The Self-Assessment Tool is expected to enhance

the effectiveness of the INSSP process, allowing States to make data-driven decisions for improving their overall nuclear security regime, while also enabling the Agency to streamline its support, ultimately strengthening nuclear security globally.

13. The development and implementation of INSSPs continue to be a high priority. INSSPs are the main mechanism to identify and provide targeted nuclear security assistance to Member States, upon request, to address needs identified within the INSSP framework and in line with emerging and existing State priorities.

14. In 2024, the total number of States with approved INSSPs increased from 92 to 93. As of 31 December 2024, there were 17 INSSPs awaiting State acceptance (2 fewer than in 2023). In 2024, 16 States updated their INSSP (a similar number to 2023 and 2022). Overall, the total number of countries with approved INSSPs in place grew by 9.4% between 2019 and 2024. This illustrates States' continued interest in strengthening their national nuclear security regimes.

15. In 2024, physical protection regimes (in particular, the security of radioactive material and transport security of both nuclear and other radioactive material) remained the highest priority areas of needs identified by States within the framework of the INSSP.

16. Aligned with the Agency's actions towards a more efficient approach to identify and support Member States' needs, which includes ensuring efficient use of resources, the Agency strengthened its results based approach to nuclear security assistance delivery to Member States by formulating several new national, regional and international results based projects, and by improving both design and implementation.

Related Activities

17. ***The Agency will continue assisting Member States in providing, through INSSPs, a comprehensive framework for systematically identifying and prioritizing Member States' nuclear security needs, including through States performing nuclear security self-assessments on a voluntary basis. The Agency is planning to undertake the following related activities:***

- Actively promote the utilization of the NUSIMS Self-Assessment Tool through a dedicated outreach campaign, including a Technical Meeting of the Points of Contact for NUSIMS in June 2025;
- Continue the development and implementation of INSSPs in Member States, systematically rolling out the upgraded INSSP approach;
- Establish the INSSP and its associated implementation plan as the integration tool for all nuclear security needs assessed by the Agency, including through advisory services such as IPPAS, INSServ and RISS; and
- Streamline the clustering and sequencing responses to Member States' needs into a smaller number of larger projects along thematic and geographical lines, taking into account the graded approach and order of operations for training in establishing and sustaining national nuclear security regimes, and in accordance with RBM principles.

A.4. Capacity Building in Nuclear Security

Trends

18. The Agency's capacity building activities in the area of nuclear security continue to be implemented in close collaboration with Member States, including through the activities of the International Nuclear Security Education Network (INSEN), national NSSCs, the International Network for Nuclear Security Training and Support Centres (NSSC Network), and Collaborating Centres and Practical Arrangements:

- Member States continue to request assistance in establishing and enhancing educational programmes on nuclear security based on international guidance and recommendations primarily through the INSEN. INSEN membership continues to increase; 7 new States joined the network in 2024, bringing the total number of members and observers to 227 institutions from 75 States.

Spotlight on the INSEN

INSEN members share experiences and good practices on nuclear security education. Photo: IAEA

Based on a summary survey conducted among INSEN members, 64.1% were teaching courses on nuclear security in national programmes in 2024, in comparison to 54.0% in 2023. Additionally, INSEN members have been more actively contributing to research in the nuclear security field, with 48.7% publishing a research paper in a journal or book, an increase of 3% in comparison to 2023. Moreover, collaboration within the network has strengthened, with the proportion of INSEN institutions working together to implement educational programmes in nuclear security growing from 62.7% in 2023 to 69.2% in 2024.

- Member States continue to request assistance in establishing an NSSC or improving the effectiveness of an existing centre, based on identified needs. The Agency continues to play a central coordinating role in facilitating bilateral, regional and international cooperation among States with an NSSC, those with an interest in developing such a centre, and those with an interest in addressing the core functions of an NSSC within existing institutions, through the collaborative activities of the NSSC Network. The NSSC Network has grown since its inception in 2012, beginning with 29 Member States and now having representatives from 71 Member States (and 10 observer organizations). Through the work of 6 regional and subregional groups, members of the NSSC Network seek to enhance and optimize information and coordinate regional resources.

- Over the years, the Agency has intensified its efforts to increase the sustainability of workforces supporting nuclear security. The most recent example of this was the launch of the inaugural junior professional programme at the 2024 Annual Meeting of the NSSC Network. This programme was implemented to support early career professionals through their completion of a project to support the NSSC Network and its members. The biennial programme currently includes 18 participants from 17 Member States, 50% of whom are women.

Spotlight on the NSSC Network

The NSSC began publishing a biannual newsletter in 2018 as a key component of its communication and outreach efforts, targeting both members of the network and external stakeholders. The newsletter has gained significant traction since its first issue was published in March 2018 and distributed to 242 subscribers. In June 2024, it was distributed to 943 subscribers with 43% of recipients opening the newsletter. This open rate has surpassed the average open rate of 36% for all issues published between 2020 and 2024, highlighting the relevance of the newsletter's content and the effectiveness of the NSSC Network's communication efforts in fostering this community of practice.

The NSSC Network newsletter. Photo: IAEA

More info:

- Agency Collaborating Centres, through research and development and training, continue to assist the Agency in building capacity regionally and internationally. In 2024, there were 16 Agency training-related events in nuclear security hosted by Collaborating Centres, compared to 24 completed in 2023.
- States are seeing the value of establishing and operating Collaborating Centres — in 2024, two new Collaborating Centre agreements were signed, with Brazil and Jordan. An extension agreement was signed with the Collaborating Centre in the Russian Federation.

Figure 5: The Agency's Collaborating Centres for Nuclear Security in 2024.

- In 2024, the Agency signed two new Practical Arrangements, renewed two existing Practical Arrangements and signed two extensions. These Practical Arrangements help the Agency to build capacity and secure cooperation in the areas of nuclear forensics, transport security and MPEs, among other nuclear security topics.

	Institute/organization	Areas covered by Practical Arrangements
Americas (regional)	Police Community of the Americas (AMERIPOL)	Nuclear security
Australia	Australian Nuclear Science and Technology Organization (ANSTO)	Nuclear forensics
China	The State Nuclear Security Technology Centre (SNSTC)	Cooperation on major public events
China	The State Nuclear Security Technology Centre (SNSTC)	Nuclear forensics
European Commission	Joint Research Centre (JRC)	Nuclear security
Finland	Finnish Radiation and Nuclear Safety Authority (STUK)	Nuclear security
Global	International Criminal Police Organization - INTERPOL (ICPO-INTERPOL)	Nuclear security
Global	World Customs Organization (WCO)	Illicit trafficking of nuclear and other radioactive material
Japan	Japan Atomic Energy Agency (JAEA)	Information exchange, research opportunities, joint development of education/training in nuclear security
Pakistan	Pakistan Centre of Excellence for Nuclear Security (PCENS)	Training and capacity building in nuclear security
South Africa	National Radioactive Waste Disposal Institute (NRWDI)	Safe and secure borehole disposal of disused sealed radioactive sources
United Kingdom	Nuclear Transport Solutions (NTS)	Transport security of nuclear and other radioactive material
United Nations	United Nations Interregional Crime and Justice Research Institute (UNICRI)	Nuclear security

Figure 6: Nuclear security related Practical Arrangements, effective as of December 2024.

19. Based on its analysis of the needs of Member States and the capabilities of NSSCs in different regions, the Agency established the Nuclear Security Training and Demonstration Centre (NSTDC) at the Agency's laboratories in Seibersdorf, Austria. Equipped with state-of-the-art technical infrastructure and equipment, the NSTDC began operation in October 2023. In 2024, the NSTDC hosted 50 events with over 700 participants and experts, and 50 visits with over 1000 visitors.

20. The NSTDC complements and fills gaps in the existing national and international capabilities in nuclear security. By focusing on offerings that do not commonly exist among institutions in States and on new capabilities for the Agency, the NSTDC further enhances capacity building in nuclear security by providing hands-on training and by using advanced technology and expertise. As of December 2024, the NSTDC training programme includes 28 training courses and workshops covering national policy and strategy for nuclear security, as well as prevention, detection, response, and assurance and continuous improvement. Five new courses and workshops were added to the NSTDC training catalogue in 2024.

21. The Agency instituted a standardized sequence for training to ensure that the substance and sequence of the capacity building programme provided to Member States is complete and consistent with NSS guidance and provides for increased sustainability. Training on nuclear security topics is gradually shifting from the development of generalized competencies to job-specific training.

22. The Agency continues to focus on training the trainers in different aspects of nuclear security, including at the NSTDC, which offers 4 train the trainer courses among its 28 training courses and workshops. During the reporting period, one train the trainer course was conducted in a Member State and seven train the trainer courses were conducted at the NSTDC. By enabling those who complete the courses to train others, these types of courses have the potential to increase manyfold the number of individuals trained in different nuclear security topics.

Spotlight on the NSTDC

Hands-on training at NSTDC. Photo: IAEA

Analysis of the results of a survey of NSTDC trainees revealed that nearly 100% of respondents reported enhanced capabilities, either by successfully applying their newly acquired skills to achieve significant improvements in their work or by expressing confidence in their ability to do so in the near future. Notably, a higher percentage of respondents trained at the NSTDC (22.9%) — compared to 18.9% of those trained at other venues — indicated that they can perform at the expert level after the training. Also of note, female NSTDC trainees reported improvements in their practical abilities to implement inspection processes at facilities (18.3%), compared to 14.8% of female trainees of other venues. These results indicate the effectiveness of the NSTDC training which includes many practical components that enhance the practical skills of participants, thereby fostering a more knowledgeable and capable workforce in the field of nuclear security. Positive training outcomes, particularly among female participants, suggest that the NSTDC is also successfully contributing to gender equity in expertise and leadership within the sector.

23. The Agency continued to organize nuclear security training activities, implementing 157 training courses, workshops and schools in 2024, 25.6% more than in 2023.

24. Schools on Nuclear Security continue to be well attended, providing early-career professionals from Member States with the fundamental knowledge of nuclear security necessary to understand international requirements in this area, as well as of the measures that need to be taken to meet any obligations under the international nuclear security legal framework. In 2024, two International Schools on Nuclear Security were conducted: one in Trieste, Italy and one in Havana for Spanish-speaking countries.

25. Agency efforts to reduce disparities in workforce diversity, including gender equality and geographic diversity, have been well received. Women, as well as individuals from a broad range of

countries, regularly participate in the Agency's nuclear security conferences, consultancy meetings and training courses. The proportion of female participants in overall nuclear security training activities remained stable, with 25.6% female participation in 2024 — a slight increase from 24.9% observed in 2023.

26. The Agency continued to support the Marie Skłodowska-Curie Fellowship Programme (MSCFP), including through the organization, since 2021, of an annual International School on Nuclear Security exclusively for MSCFP participants. The most recent iteration of the school was held in Vienna in August–September 2024, and was attended in person or virtually by 46 fellows from 41 countries. The event included panel discussions on gender aspects. In 2024, a post-training evaluation was conducted for the participants of the four schools that were implemented between 2021 and 2023. The majority of survey respondents considered nuclear security as a potential field of further study or/and future professional activity, including through doctorate-level education (18.84% of survey respondents), internships (15.95%), training courses, workshops and conferences (39.13%), and participation in professional networks (11.59%). The results of the survey demonstrate the successful implementation of this important initiative, which is continuing based on Member States' financial support.

27. In 2024, the Agency continued to observe a high share of international training courses and workshops, accounting for 36.9% of the total number of events in nuclear security. This is a significant increase compared to 2023 (26.4%) and 2022 (19.9%). Thirty-four out of 58 international training events in 2024, or 60% of the total, were hosted at the NSTDC, highlighting the centre's utility for international training.

28. During the reporting period, 163 countries nominated 2990 participants for Agency training activities in nuclear security. In total, 8760 participants from 186 countries took part in 423 training activities during the period 2022–2024. The regional distribution of participants remained relatively stable throughout the period of 2022–2024.

29. Feedback surveys are conducted following each of the Agency's training courses, workshops and schools. These surveys show that participants highly appreciate the content and quality of the training materials; the experience and teaching skills of instructors, lecturers and facilitators; and the overall implementation of training events. Evaluations typically rate the quality of the Agency's nuclear security training events as between "good" and "excellent". The average rating of the Agency's training courses on nuclear security topics, based on 129 training events conducted in 2024, was 4.74 on a scale of 1 ("poor") to 5 ("excellent"). This rating demonstrates a continuously high level of training quality recognized by participants in the past few years — the ratings were 4.76 in 2023 and 4.75 in 2022.

30. In 2024, the Agency conducted a six-month post-training survey to evaluate the effectiveness of its nuclear security training events and their impact. The survey reached approximately 2800 participants and aimed to determine whether participants were able to apply the knowledge and skills gained from the training. Survey results revealed that Agency training events provide participants with knowledge that is applicable to their jobs and that there is added value in hands-on practical training as compared to lecture-style offerings.

31. Needs identified and prioritized by Member States through missions continue to reveal a high demand for national human resource development programmes in the area of nuclear security. The high number of participants from the Africa and the Asia and the Pacific regions reflects States' needs for capacity building, expressed through their respective INSSPs in these regions. To respond to this demand, the Agency conducted a Regional Workshop on Human Resource Development in Nuclear Security for French-speaking African countries. Additionally, the Agency implemented a new International Training Course on Adult Learning and Instructor Skills Development to provide guidance on developing instructor cadres.

32. During the reporting period, the Agency observed a continued high rate of e-learning usage. In 2024, over 2600 users from 141 States completed more than 5356 e-learning modules, an increase of 1000 users compared to 2023. The majority of participants (65%) indicated that personal development is their main reason for undertaking e-learning. Eleven percent of respondents noted that their e-learning was a requirement of their national authority or institution.

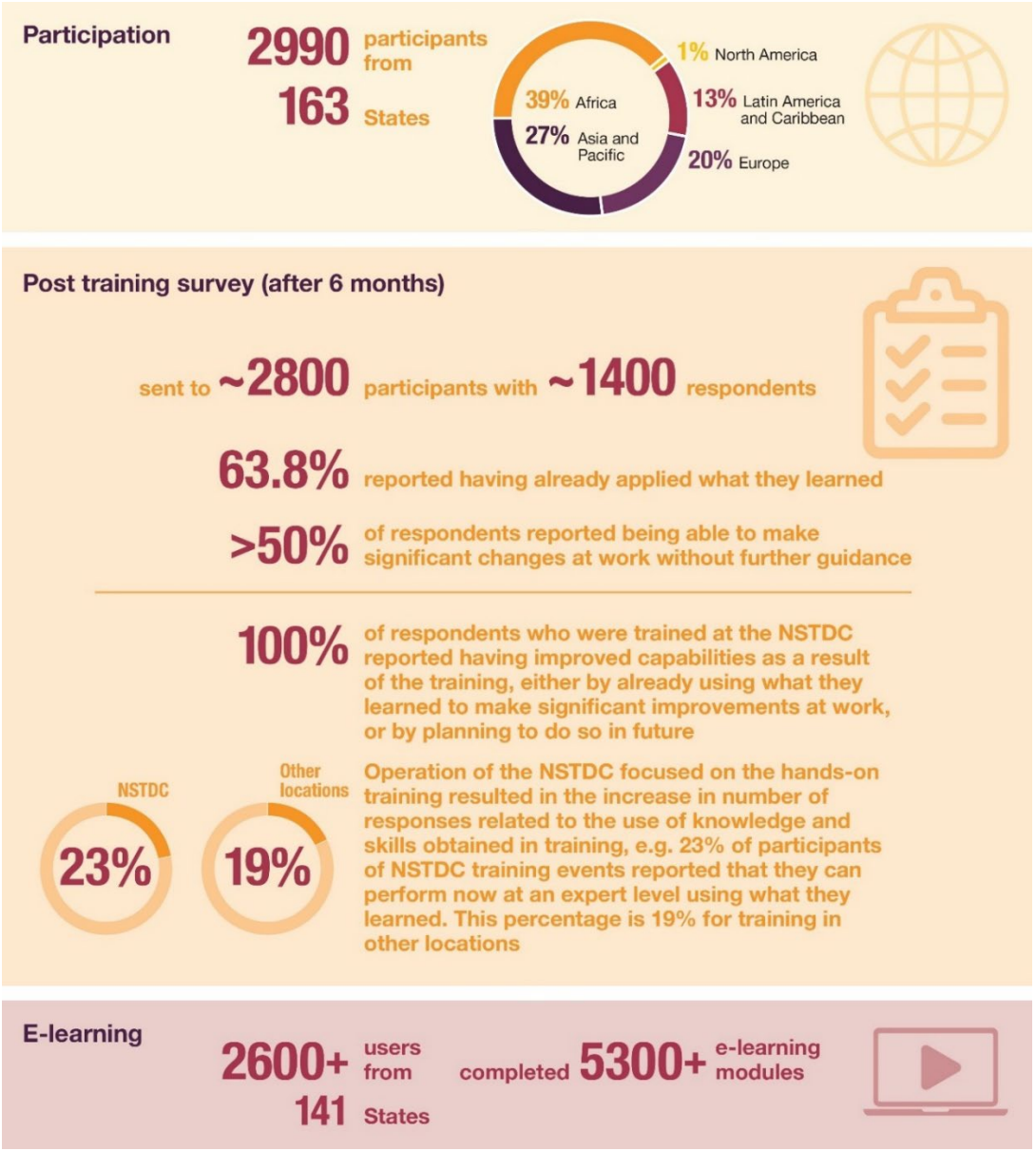

Figure 7: The Agency's nuclear security training in 2024.

Related Activities

33. ***The Agency will continue assisting Member States in strengthening capacity through the implementation of nuclear security education and training programmes, available to all States. The Agency is planning to undertake the following related activities:***

- Continue to develop a suite of training courses, based on NSS guidance, the results of gap analyses, and the needs of and requests from Member States, including through INSSPs, to identify areas where new and revised training courses are needed, and make these training courses available for delivery, including through the NSTDC and NSSCs;

- Continue implementing train the trainer programmes to increase sustainability of capacity building efforts in nuclear security at the national and regional levels;

- Continue the operation of the NSTDC, ensuring engagement with Members States and with due consideration of the planning of resources for its long term sustainability;

- Continue to assist Member States in establishing and implementing nuclear security education programmes through the INSEN;

- Continue to facilitate regional and international cooperation in human resource development, technical support and scientific support for nuclear security through the NSSC Network; and

- Continue to implement appropriate assessment measures and engage in follow-up activities with Member States in line with RBM principles to measure the impact of activities, including knowledge improvement resulting from instruction and knowledge application, as well as to measure increases in States' capacities, competencies or capabilities after the delivery of capacity building events.

A.5. Information and Computer Security

Trends

34. Member States continue to recognize the threat of cyber-attacks and their potential impact on nuclear security, as well as the need to take effective security measures against such attacks. Member States' direct support requests for assistance in the area of information and computer security, including requests for support for developing computer security regulations and computer security exercises, has increased by 25% since 2023. There has also been a 50% increase in the number of requests for computer security exercises to verify and validate computer security programmes.

35. In 2024, the Agency conducted 60 computer security-related events, including events focused on computer security regulations, computer security exercises, NSS guidance updates, new non-serial publications on computer security, coordinated research projects (CRPs), continued training, and the integration of computer security training modules across courses at the NSTDC to support capacity building for Member States. The Agency's computer security activities have been evolving from awareness raising to hands-on training, based on participant feedback. The impact assessment of computer security training provided to Member States revealed that 97.6% of participants applied or intend to apply the knowledge gained and 52.4% of participants engaged in activities to update or develop security, contingency or emergency plans. Examples of impact include drafting of inspections manuals and updating of regulations, and the development of seminars to share knowledge and raise awareness.

36. The Agency recognizes the growing importance of artificial intelligence (AI) and machine learning (ML), with potential applications in many areas in the nuclear sector, including reactor design and operation, food irradiation, radiation detection and physical protection and related linkages to nuclear security. However, the increased use of AI may introduce new computer security challenges and risks. To address potential challenges and risks, the Agency continues to engage with internal and external partners to provide expertise on information and computer security aspects aligned with NSS guidance. In 2024 the Agency started organizing a Technical Meeting on the Application of Artificial Intelligence for Nuclear Security to promote the use of AI and ML for nuclear security activities and facilitate interaction among experts.

37. The Agency continued its initiative to explore computer security aspects of SMRs and microreactors (MRs). SMR and MR innovations come at a time of significant advances in digital technologies that will be critical to the efficient operations of such reactors. However, recognizing the

threat of cyber-attacks and the increasing difficulty for qualification of safety I&C systems, it is important that the Agency continues to support SMR and MR computer security activities to address these challenges throughout SMR and MR life cycles, from design to operation and decommissioning.

38. To support Member States in developing and integrating advanced capabilities, the Agency is developing and integrating a computer security operations centre (CSOC) in the NSTDC, for operational technology and physical protection. CSOCs in States are essential for the nuclear industry to advance monitoring and detection of unauthorized acts, as they serve as a centralized hub for real-time threat detection, incident response and security monitoring, enabling nuclear facilities to proactively identify and mitigate potential cyber threats.

39. In implementation of one of the outcomes of the International Conference on Computer Security in the Nuclear World: Security for Safety (CyberCon23), held in Vienna in June 2023, the Agency facilitates an international community of practice that enables information sharing and builds an Agency computer security repository of frameworks, approaches and best practices, which will support Member States' projects and expert missions in establishing computer security programmes and will build capabilities to implement computer security regulations and inspections to increase nuclear security regimes.

Related Activities

40. ***The Agency will continue assisting Member States in raising awareness of the threat of cyber-attacks, and their potential impact on nuclear security, by promoting a nuclear security culture and supporting Member States in taking effective security measures against such attacks and improving their relevant nuclear security capabilities. The Agency is planning to undertake the following related activities:***

- Assist Member States, upon request, in the area of computer security by providing training courses, webinars and exercises, as well as developing new or updating existing related guidance, including schools on drafting computer security regulations and inspector training activities;
- Promote the exchange and sharing of information and experiences in computer security for nuclear security;
- Further develop training tools, including hands-on exercises and demonstrations, to support Agency training and exercises on computer security for nuclear security, and to raise awareness of the threat of cyber-attacks, and their potential impact on nuclear security;
- Continue research to address computer security for nuclear security topics through CRPs, including exploring new technologies such as SMR and MR computer security designs and potential benefits or risks related to the use of AI and ML; and
- Organize an International Conference on Computer Security for the Nuclear World: Securing the Future, to be held in 2026, to consolidate the progress made in this constantly and rapidly evolving domain.

A.6. Information Exchange and Sharing

Trends

41. Through the Incident and Trafficking Database (ITDB), States voluntarily report incidents of nuclear and other radioactive material out of regulatory control. The ITDB continues to serve as a valuable tool of information exchange. In the period between the inception of the ITDB in 1993 and 31

December 2024, States had reported — or otherwise confirmed to the ITDB — a total of 4390 incidents. In 2024, 147 incidents were reported to the ITDB, a decrease of 21 incidents compared to 2023.

42. The number of incidents reported by participating States to the ITDB in 2024 on illicit trafficking, thefts, losses and other unauthorized activities and events involving nuclear and other radioactive material continues to follow historical averages.

43. Three of the newly reported incidents were related to trafficking. The material involved in all three of these trafficking-related incidents was seized by the relevant competent authorities within the reporting State. These three incidents did not involve plutonium, highly enriched uranium or Category 1 radioactive sources, nor did they involve attempts to traffic materials across international borders. In recent years, incidents related to trafficking or malicious use have been reported at steady levels, although the frequency has remained low. Financial gain appears to be the principal incentive behind most confirmed trafficking incidents.

44. In 2024, there were 22 reported incidents in which the intent to conduct trafficking or malicious use could not be determined. These included 11 thefts, 3 unauthorized possessions and 8 incidents in which the material was reported as missing. In 6 of the incidents in which the material was reported as missing, the material had not been recovered at the time of reporting. In 1 of these 22 incidents, the materials involved a Category 2 source, which was recovered by the time of reporting. In another 1 of these 22 incidents, the materials involved a Category 3 source, which was not recovered by the reporting State at the time of reporting, however its activity decreased to the levels of the Category 4 sources by the time of reporting. The other 20 incidents involved sources that were lower risk than Category 3.

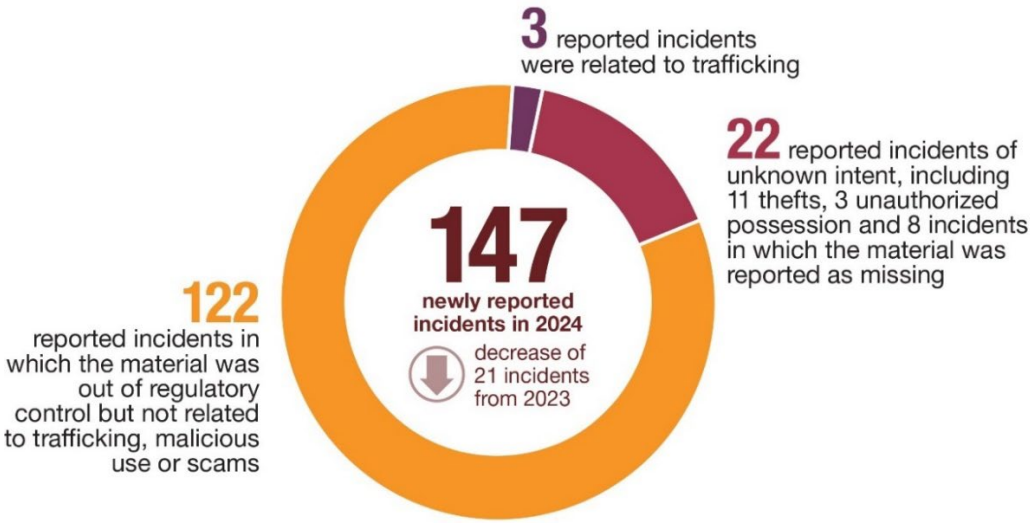

Figure 8: Incidents reported to the ITDB in 2024.

45. In 2024, there were also 122 reported incidents in which the material was out of regulatory control but not related to trafficking, malicious use or scams. Most of these incidents involved unauthorized disposals, unauthorized shipments, unauthorized or undeclared storage, discovery, loss and unauthorized possession of material. There were also seven thefts not related to trafficking, malicious use or scams. A number of incidents involved the detection of manufactured goods contaminated with radioactive material. Although these 122 incidents were not related to trafficking, malicious use or scams, they do indicate potential deficiencies in the systems used to control, secure and properly dispose of radioactive material.

46. Overall, during the reporting period, there were 20 thefts, 18 of which involved Category 4–5 sources used in industrial applications. Two thefts involved Category 2–3 sources which were recovered. Historically, the recovery rate for Category 1–3 sources is high, but the rate has been much lower for Category 4–5 sources. In 2024, 10 radioactive sources of Category 4 and 5 radioactive sources involved in theft incidents remained unrecovered by the reporting States at the time of reporting.

Spotlight on the ITDB

Participating States in the ITDB nominate national Points of Contact. Photo: IAEA

A survey conducted among national Points of Contact for the ITDB, revealed that 83% reported participation in ITDB events, which received a high rating for effectiveness. Notably, 61.6% of respondents indicated an increase in ITDB reporting after attending these events, reflecting improved awareness and reporting capabilities. The events were found to increase the quality of reports by clarifying reporting protocols rather than directly increasing the reporting rates. A significant majority of respondents (72.6%) regularly utilize ITDB analytical reports available on NUSEC, with 86.9% rating the reports as 'very useful' (39.3%) or 'useful' (47.6%), indicating strong overall satisfaction with their quality and relevance. The ITDB programme is particularly valued for fostering international collaboration and information sharing (79%) and enhancing situational awareness and threat assessment (73%).

47. Through national workshops on information sharing and cooperation, as well as an interregional workshop to facilitate communication between the ITDB network and frontline officers, there is evidence of a noticeable shift in understanding of the importance of increased collaboration between key national stakeholders, such as frontline officers and regulators, and a clearer understanding of the roles and capabilities within each function. Such cooperation improves coordination and reinforces the importance of mutual support in addressing nuclear security challenges. The aim of these ITDB initiatives is to support the overall objectives of the ITDB framework, contribute to more effective nuclear security efforts, and promote sustainable cross-network cooperation.

48. The Agency continues to host international conferences in order to facilitate information sharing and communication about new and ongoing nuclear security topics of interest. In May 2024, the Agency hosted the International Conference on Nuclear Security: Shaping the Future (ICONS 2024), the fourth quadrennial conference in this series. ICONS 2024 featured ministerial and scientific and technical segments, attracting 2066 registered participants from 142 Member States and 16 invited organizations. During the ministerial segment, which was attended by 49 ministers, deputy ministers and other high ranking officials, over 100 statements were delivered. During the scientific and technical segment, 52 technical sessions featured 367 presentations delivered by representatives from 89 Member States and invited organizations. The sessions were led by chairs from 41 Member States and invited organizations. There were also 60 'flash presentations' delivered by representatives from 30 Member States.

Figure 9: ICONS 2024 in figures.

49. Among other outcomes, ICONS 2024 succeeded in raising awareness on a wide range of nuclear security topics to maintain and further strengthen national nuclear security regimes, as well as underscoring the critical role of international cooperation to strengthen nuclear security globally; stressing the critical role that nuclear security plays for all countries, even those without nuclear power programmes; emphasizing the fundamental enabling role that nuclear security plays in the global pursuit of the 2030 Agenda for Sustainable Development; and orienting the international nuclear security community towards the threats and challenges that lie ahead so that countries can shape a future that is safe, secure and sustainable.

Figure 10: In his opening statement at ICONS 2024, IAEA Director General Rafael Mariano Grossi highlighted the important role of nuclear security.

50. The Agency increased its efforts to engage young professionals in the field of nuclear security through the organization of the Nuclear Security Delegation of the Future initiative. Twenty-four participants from 19 Member States were selected from a pool of over 200 applicants to attend the conference and take an active role in technical sessions and career development activities. Participants were also called upon to negotiate a Statement on Nuclear Security from the "Nuclear Security Delegation of the Future", which they presented at the closing session of the conference.

Figure 11: ICONS 2024 social media statistics.

51. In line with the Agency's systematic communication to raise awareness of its nuclear security activities, significant emphasis was placed on promoting ICONS on social media. On the platform X (formerly Twitter) alone, there were nearly 2000 posts using the hashtag #ICONS2024 with a potential reach of more than 21 million accounts. Further, #ICONS2024 was a trending hashtag on X in Austria for the first three days of the conference. The data suggest an increasing interest in nuclear security topics among a very wide audience.

52. The post-ICONS 2024 impact assessment questionnaire conducted six months after the conference garnered a 41% response rate among participants of the scientific and technical segments of the conference. A substantial 73.4% of respondents affirmed the high relevance of the conference topics to their professional roles or national nuclear security objectives, highlighting the significance of technology and cross-disciplinary approaches in addressing nuclear security challenges. Approximately 74.5% of respondents reported applying or intending to apply the insights gained. The conference also facilitated strong networking opportunities, with 78.3% of respondents maintaining contacts after the event. Responses also underscored future conference priorities such as cybersecurity, emerging technologies, threat response and capacity building.

53. Secure web-based systems provide valuable information exchange services to Member States. A growing number of registered users are using NUSEC, a web-based information tool for Member States that supports the exchange of information across the nuclear security community. In 2024, 900 new users were approved for access to NUSEC. In total, NUSEC has more than 8000 registered users from 183 States and 25 international organizations and non-governmental organizations.

Related Activities

54. ***The Agency will continue supporting international cooperation in nuclear security through assisting Member States in exchanging and sharing nuclear security information on a voluntary basis. The Agency is planning to undertake the following related activities:***

- Continue the maintenance and further enhancement of a comprehensive and secure information management system to provide stakeholders with accurate relevant information; and continue the facilitation, including through designated Points of Contact, of the exchange of information through secure electronic access to information contained in the ITDB;
- Continue outreach to Member States that do not participate in the ITDB to encourage their participation;
- Continue strengthening efforts with other Agency programmes to incorporate information on the ITDB in their events and outreach materials;
- Continue to organize regional as well as interregional events on ITDB activities to support Member States to strengthen their reporting capacities as well as national coordination related to ITDB procedures;
- Maintain a central coordinating role in nuclear security activities among international and regional organizations and institutions, including through regular Information Exchange Meetings and the coordination of complementary activities between members of the NSSC Network; and
- Continue the management and support of activities relevant to nuclear security information exchange and sharing while ensuring confidentiality.

A.7. Nuclear Security Research and Emerging Technologies

Trends

55. Member States continue to express increasing interest in addressing existing and emerging nuclear security threats and technologies. The Agency continues to undertake efforts to assist Member States, and anticipate current needs and evolving challenges to nuclear security, through the conduct of Technical Meetings, CRPs, and other technical projects and webinars. The input from States received in Technical Meetings and CRP proposals continues to provide insight into nuclear security needs.

56. The Agency continues to design and develop tools to assist with improving radiation alarm and commodity evaluation and to support command and control during detection and response operations. The Agency's activities and support for the development of tools and processes enable nuclear security activities to be effectively implemented and sustained, often using solutions developed in conjunction with Member States.

57. Based on input and interest from Member States, the Agency continues research into emerging technologies such as uncrewed aerial, ground and maritime systems; counterfeit, fraudulent and suspect items; active interrogation technologies; and ML in relation to radiation detection.

Figure 12: Nuclear security-related CRPs in 2024.

58. Member States also continue to request additional tools and guidance in the areas of maintenance, repair and calibration, and modernization of radiation detection equipment, as well as in the areas of enhancing the use and sustainability of nuclear security detection systems and measures used to detect nuclear and other radioactive material out of regulatory control at points of entry and exit and other trade locations.

59. During the reporting period, development of the Mobile-Integrated Nuclear Security Network (M-INSN) continued in response to Member State demand for support for command and control over radiation detection equipment during operations. M-INSN will enable the coordination, management and oversight of radiation detectors deployed for security as well as safety purposes. This vendor-neutral system continued to undergo testing and evaluation in four Member States and will, at the conclusion of its development, be provided at no cost to Member States.

60. Member States continue to enhance their technical capabilities using the Tool for Radiation Alarm and Commodity Evaluation (TRACE) through its mobile and desktop applications. TRACE plays a crucial role in assisting Member States by reducing the time required to train new operators and by streamlining the radiation alarm assessment process. In 2024, both the mobile and desktop versions of TRACE were upgraded, focusing on sustainability, operations and testing. Since its launch in 2017, TRACE has been downloaded more than 18 000 times by users across 162 countries. It currently has nearly 7 000 active users, with more than 170 new users in 2024.

61. Member States continue to express a need for tools to conduct assessments of persons who cause radiation alarms. Anticipating the need for an easily deployable tool that quantitatively evaluates the level of radiation emitted by a person reporting a nuclear medicine procedure, the Agency developed the Personnel Alarm Assessment Tool (PAAT), a smartphone application that easily guides front line officers through an assessment process that provides a consistent and defensible science-based evaluation. The application was made available for use by Member States at the 68th regular session of the General Conference in September 2024. As of the end of 2024, PAAT has 533 active users across 73 countries.

62. Member States continue to express interest in the Agency's capacity building application that has been used for computer security demonstrations, training and exercises, including computer security modules delivered at the NSTDC. The simulator enables many pre-configured simulated cyber-physical and cyber-attacks that can be deployed, visualized and analysed in real time up to the network level.

Related Activities

63. ***The Agency will continue to keep abreast of scientific, technological and engineering innovations, with a view to confronting current and evolving challenges and threats and also considering opportunities to enhance nuclear security from these innovations. The Agency is planning to undertake the following related activities:***

- Engage in dialogue with Member States and, as appropriate, the nuclear industry to identify key current and evolving challenges and threats to nuclear security;
- Continue implementing CRPs, technical projects and Technical Meetings to promote research and development in the area of nuclear security; and
- Continue assisting Member States to enhance their capabilities by utilizing the outcomes of the CRPs, technical projects and Technical Meetings.

B. Nuclear Security of Materials and Associated Facilities

B.1. Nuclear Security Approaches for the Whole Fuel Cycle

B.1.1. Physical Protection of Nuclear and Other Radioactive Material and Associated Facilities and Activities

Trends

64. Member States continue to request the development of practical technical guidance and training on the security of nuclear and other radioactive material and associated facilities, including during transport. In 2024, the Agency supported capacity building in these areas through 88 events, an increase from 73 in 2023.

65. Important nuclear security elements include the development or enhancement of regulatory infrastructures for nuclear security; nuclear material accounting and control systems at nuclear facilities for security purposes; and specific guidance on insider threats, nuclear security culture, threat-based and risk informed approaches, the safety–security interface and contingency planning.

66. The high number of State requests for technical assistance for risk reduction activities, advisory services and assessment missions on the physical protection of nuclear and other radioactive material, associated facilities and associated activities is anticipated to continue.

67. Member States continue to request assistance in establishing or further enhancing their regulatory frameworks for physical protection of nuclear material and nuclear facilities and building the capacity of regulatory staff to perform regulatory functions.

68. Agency assistance is used by Member States to characterize and assess threats; develop, use and maintain design basis threats or representative threat statements; conduct vulnerability analyses; and develop methodologies for performance assessment of physical protection systems. Requests through the INSSP within the area of threat and risk assessment continue to be received at steady rates. During the reporting period, these requests were addressed through one international, one regional and four national training events. Member States from all regions received support on the topic of threat assessment during the reporting period. Feedback received following the training events revealed a high level of direct impact to participating States, with 95.2% of participants reporting an improvement in capabilities as a result of the courses.

69. Member States continue to request the Agency's assistance in enhancing understanding of nuclear security culture and its application in practice. Feedback from the six-month post-training survey evaluating the effectiveness and impact of nuclear security culture training events held in 2023–2024 revealed that 26.8% of respondents shared the knowledge gained with their peers following the training; 22.7% reported improvements to inspection processes, with some incorporating nuclear security culture into their inspection plans; and 19.6% enhanced their security plans, with examples of integrating security culture into strategic departmental plans as an outcome of the training.

70. Member States continue to request assistance in enhancing their capacities for developing and testing contingency plans for response to malicious acts, such as unauthorized removal of nuclear and other radioactive material or sabotage of such material and associated facilities. All activities implemented in 2024 utilized exercises to focus on practical aspects of contingency response for facilities and material in transport. 100% of respondents surveyed six months after the course reported increased capabilities as a direct result of this course. Some examples of specific improvements included updated or improved site security plans and a clearer understanding of related roles.

Related Activities

71. ***The Agency will continue assisting Member States, upon request, in enhancing nuclear security of facilities and activities involving nuclear and other radioactive material under regulatory control, including during transport, decommissioning and lifetime extension of facilities. The Agency is planning to undertake the following related activities:***

- Continue the development of publications addressing nuclear security for the whole nuclear fuel cycle;
- Provide support to Member States, upon request, in the implementation of nuclear security activities for the whole nuclear fuel cycle, including support for capacity building activities; and

- Assist Member States, upon request, in the development and strengthening of nuclear security culture, including through publishing guidance, providing training and related self-assessment, and developing training materials and tools.

B.1.2. Nuclear Security of Advanced Reactors, Including SMRs

Trends

72. The growing participation of Member States in Agency activities related to SMRs reflects their strong interest in various SMR designs and a corresponding increase in requests from countries embarking on such technology for the development of guidance, tools and human resources to handle the challenges related to the secure deployment of SMRs.

73. Development of SMR technology and the unique characteristics of SMRs are leading to increased interest in, and the need for guidance related to, protecting nuclear material and associated facilities in new ways. Some areas of increased focus include using the latest possible technologies and strategies in developing and deploying physical protection systems to ensure detection, delay and response. Advanced technologies for physical protection systems will likely incorporate new and emerging technologies.

74. Security issues are an important consideration for SMR development and for the Agency's NHSI. Security considerations are being included in the work of both the Regulatory Track and the Industry Track on topics including but not limited to information sharing and physical protection of nuclear infrastructure. A Nuclear Security Working Group under the NHSI Regulatory Track was announced to be established for Phase 2 of the initiative in October 2024.

"It is essential that SMRs are deployed and operated in a safe and secure manner, and that SMRs are duly protected against criminal or other intentional unauthorized acts that might involve the removal of nuclear and other radioactive material or sabotage. Physical protection and computer security measures specific to SMRs must be implemented and maintained throughout their entire lifetime."

Lydie Evrard
Deputy Director General and
Head of the Department of
Nuclear Safety and Security
(2021–2025)

More info on NHSI:

75. The importance of nuclear security considerations for SMRs continues to be highlighted, including through the inclusion of multiple sessions dedicated to the topic at the International Conference on Small Modular Reactors and their Applications, held in Vienna in October 2024. The conference featured a dedicated track on nuclear security for SMRs, covering both physical protection and computer security for nuclear security. This track included four sessions focused on nuclear security regulations, computer security, nuclear security by design, and stakeholder perspectives on SMR security.

76. The development of new types of nuclear fuels for different types of reactors, including SMRs, will require consideration of potential new security challenges relating to nuclear facilities, transport and waste storage.

Related Activities

77. ***The Agency will continue assisting Member States, upon request, to address matters related to nuclear security of advanced reactors, including SMRs. The Agency is planning to undertake the following related activities:***

- Continue to highlight nuclear security challenges and considerations in Agency efforts on SMRs, including through supporting a Nuclear Security Working Group under the NHSI Regulatory Track;
- Continue the development of publications addressing nuclear security of SMRs through analysing and synthesizing the existing set of NSS publications and expanding its content by considering how the specific features of SMRs may affect the application of nuclear security recommendations for such reactors; and
- Support Member States, upon request, in developing and reviewing applicable research and guidance for addressing nuclear security of SMRs, including through international conferences and training events.

B.1.3. Enhancing Nuclear Security Using Nuclear Material Accounting and Control

Trends

78. There is increased demand from Member States for the development of practical technical guidance and training on nuclear material security using accounting and control for nuclear security purposes, including in connection with insider threats. Nuclear material accounting and control (NMAC) and measures to address insider threats share the common goal of preventing or mitigating the unauthorized removal of nuclear material or sabotage.

79. Interactive and hands-on training, including scenario development, virtual reality and video-based training tools that utilize the simulated Shapash Nuclear Research Institute, is in high demand. The overwhelming majority of participants indicated that the practical exercises and scenario-based activities had the biggest impact and were one of the most useful parts of courses related to NMAC.

80. There is strong demand for training on mitigating insider threats. In 2024, applications for training courses exceeded the capacity for each offering. Participant feedback confirms that the exercises in these courses provide practical knowledge that can be applied within Member State organizations and facilities. This is evident from the strong consensus that the course is relevant to current job functions (4.7 out of 5) and that the course provides additional possibilities for participants to improve performance of their current job functions (4.5 out of 5).

81. Impact assessment of NMAC related training conducted in 2023–2024 revealed that all respondents (100%) reported that they had already applied or intended to apply the knowledge gained. The training resulted in significant improvements across several key areas, including: 37.5% of respondents shared insights with colleagues through reports, workshops or training sessions, fostering broader awareness and understanding; 16.5% updated security, contingency or emergency plans; 15.5% reported improvements in regulatory or facility inspections; and 16.5% implemented updates to operational protocols and physical protection measures. Examples of the training's impact included: drafting or revising regulations related to physical protection and nuclear material security; enhancing physical protection systems; strengthening measures against insider threat by developing procedures and conducting vulnerability assessments; and proposing advanced technologies such as virtual reality simulations for facility assessments.

82. Training courses and consultancy meetings on the topic of NMAC are well attended, enhancing Member States' understanding of its role in nuclear security and providing an opportunity for collaboration amongst Member States. Feedback on course content has been used as a basis for updating the courses. Specifically, participant feedback indicated a need for more advanced, hands-on exercises to ensure practical skills are acquired during the courses, as well as a need to clarify the connection and differences between NMAC for nuclear security and NMAC for safeguards. Additional participant feedback indicated a desire for video-style case studies and examples of implemented NMAC measures, and for consideration of the development and implementation of a training course focused specifically on regulations and inspections for NMAC systems.

Related Activities

83. ***The Agency will continue assisting Member States in enhancing nuclear security of materials using accounting and control, including by addressing the need to counter insider threats. The Agency is planning to undertake the following related activities:***

- Continue to assist Member States in establishing effective and sustainable national nuclear security regimes that enhance nuclear material accounting and control for nuclear security purposes at facilities to mitigate insider threats; and
- Further develop and enhance training tools and hands-on exercises using the simulated Shapash Nuclear Research Institute.

B.1.4. Nuclear Security in the Transport of Nuclear and Other Radioactive Material

Trends

84. Each year, more than 20 million packages containing radioactive material are transported worldwide. There has been notable achievement in international adherence to the Agency's *Regulations for the Safe Transport of Radioactive Material* (IAEA Safety Standards Series No. SSR-6 (Rev. 1)), which have helped to keep people and the environment safe from radiological hazards for six decades. However, there is a need to remain vigilant, as transport is a potentially vulnerable phase of domestic and international commerce.

85. In the period 1993–2024, Member States reported to the ITDB 673 thefts of material, 53% of which occurred during transport and, in 55% of these transport-related cases (196 incidents), the stolen radioactive material was reported as unrecovered at the time of reporting. These data emphasize the critical importance of adequate physical protection during the transport of nuclear and other radioactive material.

86. The Agency assists Member States, upon request, in efforts to strengthen transport security arrangements at the national level, including in the development and improvement of relevant national regulatory infrastructures. In 2024, four Member States were supported in developing draft regulations on security of nuclear and/or radioactive material in transport.

87. Member States continue to request assistance in upgrading physical protection equipment for the transport of nuclear and other radioactive material.

88. During the reporting period, worldwide interest in the topic of transport security remained high: 8 international or regional workshops and training courses were held across 8 countries on 4 continents, with a total of 149 participants from 44 countries in attendance. Impact assessment of the conducted training revealed that all survey respondents reported that they had already applied the knowledge gained or planned to do so. Examples of the training's impact included revisions to transport security plans,

enhanced border procedures for the transport of radioactive material, and greater integration of security measures into transport authorizations. Participants also reported tangible regulatory changes, such as revised decrees on transport security, new inspection checklists, as well as application of the cybersecurity measures to transport infrastructure.

Related Activities

89. ***The Agency will continue assisting Member States in the security of nuclear and other radioactive material during transport. The Agency is planning to undertake the following related activities:***

- Assist Member States, upon request, in drafting transport security regulations;
- Support capacity building for Member States, upon request, in the area of security for nuclear and other radioactive material in transport, including through training courses and tabletop exercises; and
- Organize an International Conference on the Safe and Secure Transport of Nuclear and Radioactive Material in 2026.

B.2. Security of Radioactive Material[3] and Associated Facilities

B.2.1. Assistance Provided to States to Enhance the Security of Radioactive Material in Use and Storage and of Associated Facilities

Trends

90. There is an increased demand by States for assistance in the area of radioactive material security, with an emphasis on regulatory infrastructure development and risk reduction activities, such as trainings, physical protection enhancements including activities complementing the technical assistance provided under the Agency's technical cooperation programme, and the life cycle management of high activity radioactive sources. In 2024, the Agency conducted 22 training events related to security of radioactive material to support capacity building for Member States.

91. Impact assessment of training conducted related to radioactive material security revealed that nearly 100% of survey respondents reported that they had already applied the knowledge gained or were planning to do so. 56.5% of respondents indicated that inspection processes had been or would be updated, 46.5% indicated that security, contingency or emergency plans had been or would be updated, 41.0% indicated that existing regulations had been or would be updated or new regulations would be drafted, and 39.5% indicated that standard operating procedures had been or would be updated.

92. The number of States benefiting from the Agency's assistance in enhancing radiation safety and nuclear security through the RIDP continues to grow; 72 States from Africa, Latin America and the Caribbean participated in 2024, and 28 States are invited to join the new RIDP for the Asia and the Pacific region. Ensuring safe and secure management options for disused sealed radioactive sources (DSRSs) remains an important priority for States, as an increasing number of radioactive sources are reaching the end of their useful life.

93. Radioactive materials require security throughout their lifetime. In 2023, comprehensive assistance to States to ensure the safe and secure management of high activity DSRSs, including their repatriation

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[3] For the purpose of this section, "radioactive material" refers to "other radioactive material", as defined in *Objective and Essential Elements of a State's Nuclear Security Regime* (IAEA Nuclear Security Series No. 20).

and removal to authorized recipients, as well as their disposal, continued. In 2024, the Agency supported the removal of 11 high activity DSRSs from 2 States, continued work on the removal of more than 50 DSRSs from 10 States and the conditioning of 4 radioisotope thermoelectric generators, and initiated the removal of over 50 DSRSs from 5 States. This contributes to an overall effort to reduce radiological risk globally by securing materials that could be potentially used for malicious purposes. Since 2019, 39 countries have benefited from these types of assistance. To provide a broader perspective on the RIDP's global impact and ensure its continued effectiveness, the Agency conducted a survey to assess ongoing project efforts in participating countries. This assessment aimed to evaluate progress, identify challenges and guide future improvements.

94. Member States continue to express interest in sharing experiences related to the security of radioactive material, including approaches to providing cradle-to-grave security. The topic of life cycle security is expected to become an increasing focus of attention as global demand for radioactive sources, particularly for medical and industrial applications, grows.

Related Activities

95. ***The Agency will continue assisting States, upon request, in the security of radioactive material and associated facilities, including in the life cycle management of radioactive material, through the provision of comprehensive guidance and technical assistance. The Agency is planning to undertake the following related activities:***

- Continue to support States in enhancing their national regulatory infrastructure for radiation safety and the security of radioactive material;
- Continue to support States in enhancing their secure and safe management of sealed radioactive sources; and
- Continue to support States in strengthening their physical protection measures at facilities with high activity radioactive sources in use or in storage.

B.2.2. Support for the Implementation of the Code of Conduct on the Safety and Security of Radioactive Sources

Trends

96. Efforts to strengthen international norms supporting nuclear security continue through activities that support States in implementing the provisions of legally non-binding instruments such as the Code of Conduct on the Safety and Security of Radioactive Sources and its Supplementary Guidance on the Import and Export of Radioactive Sources and Guidance on the Management of Disused Radioactive Sources.

97. Commitment to implement the Code of Conduct on the Safety and Security of Radioactive Sources is expanding. In 2024, 4 Member States made a political commitment to implement the Code, bringing the total number to 153. This is comparable to the level of political commitments made in 2023.

98. In 2024, 5 Member States notified the Director General of their intention to act in a harmonized manner with the Supplementary Guidance on the Import and Export of Radioactive Sources, increasing the total number of Member States that have done so to 139. During the reporting period, no additional Member States nominated points of contact for facilitating the import and export of radioactive sources, maintaining the total number of Member States that have done so at 153.

99. In 2024, 10 Member States made a political commitment to implementing the supplementary Guidance on the Management of Disused Radioactive Sources, bringing the total number of Member States that have done so to 74.

100. At the Open-ended Meeting of Technical and Legal Experts on States' Implementation of the Guidance on the Import and Export of Radioactive Sources, held in Vienna in May 2024, Member States identified areas for future focus, based on current needs, in order to support continued progress towards implementing the Supplementary Guidance. These include reviewing and revising responses to the Importing and Exporting States Questionnaire frequently and engaging competent authorities, industry, end users and other relevant national stakeholders in a coordinated effort for implementing the Supplementary Guidance. Interactive sessions, which were well received by participants, identified enhanced cooperation as the greatest accomplishment since the publication of the supplementary Guidance back in 2014.

Related Activities

101. ***The Agency will continue assisting Member States in the implementation of the Code of Conduct on the Safety and Security of Radioactive Sources. The Agency is planning to undertake the following related activities:***

- Continue to assist States in meeting the provisions of international instruments relevant to the security of radioactive material, such as the Code of Conduct on the Safety and Security of Radioactive Sources; and
- Continue outreach activities to communicate the benefits of implementing Code of Conduct and related Agency activities.

C. Nuclear Security of Materials Out of Regulatory Control

C.1. Nuclear Security Measures for Material Out of Regulatory Control

Trends

102. Member States continue to request guidance, training and assistance to establish and further enhance the nuclear security systems and measures for nuclear and other radioactive material out of regulatory control (MORC). Using a phased approach, Member States, supported by the Agency, identify their specific needs related to developing plans and procedures for response to criminal or intentional unauthorized acts involving MORC, which are addressed through the provision of associated training, exercising of those plans and procedures, and the procurement of necessary equipment.

103. The Agency continued hosting the annual International Training Course on Essential Elements of Nuclear Security for Nuclear and Other Radioactive Material Out of Regulatory Control. Taking into account the sustained high level of interest of States in this international training course, the Agency initiated the development of a new training curriculum for a one-week regional workshop on the nuclear security regime for MORC, which is planned to be introduced in 2025.

Related Activities

104. ***The Agency will continue assisting Member States in establishing and sustaining effective nuclear security regimes for MORC. The Agency is planning to undertake the following related activities:***

- Continue to provide assistance to Member States based on their needs through ongoing and newly developed capacity building programmes; and
- Finalize the strategic review by addressing science and technology and the holistic approach to support Member States with regards to MORC, including piloting a tabletop exercise on detection and response to criminal or unauthorized acts involving MORC at borders.

C.2. Nuclear Security Detection Architecture

Trends

105. Member States continue to request guidance, training and assistance to establish and sustain their capabilities for detecting criminal or intentional unauthorized acts involving MORC.

106. The International Network of Front Line Officers and Organizations for Nuclear Security Detection (FLO Network) remains a valuable source of information sharing. An assessment of the overall impact of the FLO Network, provided strategic guidance for the formulation of the work plans for the regional working groups. 71% of survey participants reported substantial growth in nuclear security detection knowledge and skills through the FLO Network, while 63% of participants indicated that the FLO Network significantly or considerably contributed to the development of detection strategies in their respective countries or organizations. Furthermore, 74.8% of participants stated that they have implemented best practices or knowledge gained from the FLO Network.

107. Member States continue to request loaned or donated hand-held radiation detection equipment in support of their detection systems, including nuclear security assistance for preparation and support for MPEs and training in radiation detection equipment operation, frontline maintenance and calibration. In 2024, the Agency loaned radiation detection equipment to five Member States to support their MPEs or other nuclear security activities. To this end, 404 items of equipment in total were loaned from over 1590 items of nuclear security detection and monitoring equipment maintained by the Agency. The Agency also donated radiation detection equipment to six Member States to support specific activities in nuclear security detection and response. These donations were supported by associated trainings for the use of this equipment at the NSTDC.

108. Overall, for training in nuclear security detection, the assessment of training impact demonstrated that 67% of respondents have applied their training to make significant work improvements within 6 months of training completion. Among the respondents, 33.8% shared knowledge with front line officers and decision makers and facilitated broader understanding by conducting workshops, preparing reports, or providing training sessions. 20.7% updated security, contingency or emergency plans (including, strengthening cooperation agreements and coordination among emergency response institutions, customs, and other agencies); 15.2% implemented updates to operational protocols or physical protection measures and 15.2% improved the inspection process; 14.5% reported improvements to regulatory frameworks.

Related Activities

109. ***The Agency will continue assisting Member States in strengthening and maintaining effective national nuclear security detection architectures, and in enhancing and improving capabilities in detecting, locating and interdicting MORC. The Agency is planning to undertake the following related activities:***

- Continue to support activities implemented to assist Member States in detecting nuclear and other radioactive material, including support for identifying a strategy based on risk and threat

assessment and, subsequently, for the establishment of detection operations at strategic locations, including border crossings; and

- Promote the integration of nuclear security systems and measures in major urban areas.

C.3. Response to Nuclear Security Events

Trends

110. Member States continue to request guidance, training and assistance to establish and further enhance the infrastructure needed to implement nuclear security measures in response to criminal or intentional unauthorized acts involving nuclear and other radioactive MORC, including for radiological crime scene management (RCSM).

111. Using a phased approach, Member States, supported by the Agency, identify their specific needs related to developing plans and procedures for response to criminal or intentional unauthorized acts involving MORC, which are addressed through the provision of associated training, exercising of those plans and procedures, and the procurement of necessary equipment. In 2024, five Member States benefited from the Agency's assistance in this area, comparable to the level of support provided in previous years.

112. To further support development of capabilities for nuclear security response, the Agency initiated the development of training materials on the topic in cooperation with two Collaborating Centres. The impact assessment of conducted training revealed that 97.8% of respondents reported that they had applied the knowledge gained or intended to do so. Key outcomes included knowledge enhancements to security response plans and updates to standard operating procedures.

113. There has been increased demand from Member States for training courses and workshops in the area of RCSM, and for support in linking national RCSM capabilities to national nuclear forensics capabilities. In order to meet this need, the Agency developed and launched the International Integrated Workshop on Radiological Crime Scene Management and Nuclear Forensics at the NSTDC, using the facility's unique capabilities. Two pilot workshops held in 2024 were well attended.

Related Activities

114. ***The Agency will continue assisting Member States in establishing and sustaining effective infrastructure and arrangements to protect people, property, the environment and society in response to criminal or intentional unauthorized acts involving MORC. The Agency will continue assisting Member States in building capacities for managing radiological crime scenes. The Agency is planning to undertake the following related activities:***

- Continue to develop publications within the NSS on nuclear security infrastructure, addressing nuclear security measures in response to criminal or intentional unauthorized acts involving MORC;
- Continue to support Member States in establishing and sustaining effective nuclear security response framework;
- Continue to support Member States in RCSM by planning and implementing training courses, workshops and expert missions, based on their needs and upon request; and
- Expand the Agency curriculum in RCSM, developing awareness through regional workshops, building capacity through national workshops, and supporting the sustainability of RCSM through train the trainer activities.

C.4. Major Public Events

115. Requests to support Member States' MPEs continue to be received, with States increasingly recognizing the benefits of engaging the Agency to support their nuclear security activities for MPEs. Launched in 2004, the programme has supported a total of 78 MPEs in 48 Member States in the 20 years of the programme's existence. In 2024, the Agency supported the planning or implementation of six MPEs, the same number as in 2023. Of note, the Agency supported the 29th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP29) in Azerbaijan. This was the third consecutive year in which the Agency was asked to support this high profile, global United Nations conference.

Figure 13: Agency support for MPEs in 2024.

116. To meet continuing demand from Member States for support in strengthening the implementation of nuclear security measures before and during MPEs, during the reporting period, the Agency organized, for the first time, train the trainer courses on nuclear security measures and emergency response arrangements for MPEs and associated training on the equipment. Three courses were held in 2024 at the NSTDC. These trainings were beneficial in providing experts with instructions on the planning and execution of nuclear security measures and emergency response arrangements for an MPE, ensuring that these experts can become trainers for future Agency MPE workshops for States hosting such events.

117. Continued and growing demand for Agency support and Member State use of Agency guidance for implementing nuclear security measures during MPEs have led to a revision of the Implementing Guide *Nuclear Security Systems and Measures for Major Public Events* (IAEA Nuclear Security Series No. 18). The revision will incorporate many of the lessons and good practices identified by States implementing nuclear security measures at their MPEs, and will consider developments in methodologies and technology since the guidance was originally published in 2012.

118. Member States express strong interest in sharing experiences and learning about how to integrate nuclear security into MPEs. As a result of this ongoing interest, the Agency organized a Technical Meeting in Dubai, United Arab Emirates (UAE), in November 2024 to facilitate this experience sharing. During the meeting, Members States highlighted that early effective planning, interagency coordination

and collaboration and availability of resources are key factors for successfully integration of nuclear security into MPEs.

Related Activities

119. ***The Agency will continue assisting Member States in preparation and conduct of MPEs through utilizing nuclear security measures for MPEs. The Agency is planning to undertake the following related activities:***

- Continue to support Member States, upon request, in the implementation of nuclear security systems and measures before and during MPEs through training, workshops, exercises, loans of equipment and expert support, among others;
- Continue the review and update of IAEA Nuclear Security Series No. 18 and the publication of Agency reports to share Member States' experiences of hosting of MPEs; and
- Continue building capacity for MPE experts at the NSTDC through the delivery of train the trainers courses on nuclear security measures and emergency response arrangements for MPEs and on MPEs for radiation detection equipment specialists.

C.5. Nuclear Forensics Science

Trends

120. The Agency continued to the support Member States in their establishment and development of nuclear forensics capabilities through a comprehensive training programme. This phased approach ranges from awareness building to laboratory-based training. In 2024, the Agency held five training courses at the regional and international levels, enabling stakeholders to enhance their respective national nuclear forensics programmes.

121. Member States continue to request support from the Agency in the development of nuclear forensics at the national and regional levels, as well as more impactful training courses and workshops that lead to the sustainable development of nuclear forensics. Member States also continue to request more frequent opportunities for participation in Agency training courses and workshops in nuclear forensics, as well as more advanced training courses and workshops that build upon previous capacity-building activities. To promote regional cooperation, collaboration, and training in nuclear forensics, the Agency developed and piloted a Regional Peer-to-Peer Workshop on Nuclear Forensics in Indonesia in 2024. This workshop was well received by Member States and will be continued in the future.

122. The Agency continued to support Member States in sharing applied practices, methodology, legal requirements and analytical techniques of nuclear forensic examination in the context of relevant response plans for events involving nuclear and other radioactive MORC. Follow-up surveys for the impact assessment of training showed that 85% of participants in Agency nuclear forensics training courses and workshops are already using the knowledge they have acquired in their line of work, or have a specific plan to use it in the future. Training course and workshop participants have used the knowledge acquired to update national response plans, improve training documents, and teach nuclear forensics concepts to regional partners.

123. The Agency has also developed CRPs in nuclear forensics to provide Member States with the opportunity to conduct essential research and development focused on the characterization of the physical, elemental, chemical and isotopic properties of nuclear and other radioactive MORC.

124. In 2024, the Agency continued to support Members States in enhancing their RCSM capacity through four workshops on this topic. Follow-up surveys for the impact assessment of training showed

that 100% of participants in radiological crime scene management workshops have shared the knowledge and information gained with their colleagues and peers. Additionally, workshop participants have used the knowledge acquired to organize trainings for national in-field teams and to strengthen cooperation with customs and border officers.

Related Activities

125. ***The Agency will continue assisting Member States in building capacities for collecting evidence for use in subsequent legal proceedings, and undertaking nuclear forensics examinations to support investigations and help determine the origin and history of the material. The Agency is planning to undertake the following related activities:***

- Support Member States nuclear forensic science by planning and implementing training courses, workshops and expert missions, based on their needs and upon request; and
- Expand the Agency curriculum in nuclear forensics, developing awareness through regional workshops, building capacity through national workshops, and supporting the sustainability of nuclear forensics through the creation of a fellowship programme.

D. Nuclear Security Interfaces

Trends

126. Member States continue to encourage the Secretariat to facilitate a coordination process to address safety and security interfaces, while acknowledging the distinctions between nuclear safety and security.

127. The Agency is placing more emphasis on assisting Member States in the effective management of the interface between radiation safety and nuclear security to avoid undue interference between safety measures and security measures. This is in response to the increasing number of Member State requests for Agency peer reviews to evaluate management of the interfaces between safety and security. The Agency also plans to address this emerging issue by developing Safety Guides and other publications, holding Technical Meetings and conducting training courses, including on the leadership and cultural aspects associated with the interfaces between safety and security.

128. There is an increasing demand from Member States to include in the work programme of RIDPs assistance for the effective management of the interfaces between safety and security at the national and organizational levels. The Agency is therefore planning additional capacity building activities for regulatory authorities to effectively address the regulatory control of safety and security interfaces, including the interfaces between safety culture and nuclear security culture.

129. The Agency's Integrated Regulatory Review Service (IRRS) missions include a dedicated module on the interfaces of nuclear safety with nuclear security. Furthermore, RISS peer review missions continue to provide advice to requesting Member States on the establishment or enhancement of their regulatory framework for radiation safety and nuclear security.

130. As is evident from requests received by the Agency from Member States for consolidating or removing and enhancing the physical protection of DSRSs, an increasing number of radioactive sources are becoming disused and are no longer considered an asset. Ensuring continuous safe and secure management options for DSRSs remains an important priority for Member States.

Related Activities

131. ***The Agency will ensure that safety standards and nuclear security guidance take into account the implications for both nuclear safety and nuclear security whenever appropriate, recognizing that the activities that address nuclear safety and nuclear security are different. The Agency is planning to undertake the following related activities:***

- Develop the methodology of a capacity building programme for regulatory bodies on the effective management of the interface between radiation safety and security of radioactive material;
- Assist DSRS removals through the evaluation of removal bids by the relevant Agency safety and security organizational units; and
- Continue to offer the module on interfaces of safety with nuclear security under IRRS missions, and continue to provide RISS peer review missions to requesting Member States to establish or enhance their regulatory framework for radiation safety and nuclear security.

E. Nuclear Security Fund

Trends

132. In 2024, the Agency received contributions to the NSF from the following donors: Australia, Belgium, Canada, China, Estonia, the European Union, Finland, France, Germany, Hungary, Italy, Japan, the Kingdom of the Netherlands, New Zealand, Pakistan, the Republic of Korea, Spain, Sweden, Switzerland, the UAE, the UK, the USA, and 16 non-governmental donors. In total, 38 donors contributed to the NSF compared to 35 in the previous year. The total budget allotment[4] in 2024 was €28 million. In 2019, 2020, 2021, 2022 and 2023, the budget allotment was €28 million, €94 million, €23 million, €20 million and €48 million respectively. At the end of 2024, the balance of reserve NSF funds was €67 million (in comparison with €68 million at the end of 2023). These funds are being used to implement the nuclear security programme in 2025 in line with priorities, approved work plans, contribution agreements and pledges.

133. In implementing activities in 2024, the Agency utilized funds from contributions received in 2024, as well as from previous contributions, including those received in 2023 from Belgium, China, Estonia, the European Union, Finland, France, Germany, Japan, the Kingdom of the Netherlands, New Zealand, Pakistan, the Republic of Korea, the Russian Federation, Spain, Switzerland, the UK and the USA, as well as from 18 non-governmental donors. The Agency also used funds received in earlier years, including those contributed by the European Union. The Agency completed a three-year multi-donor action in nuclear security with the European Union, and began implementing a new multiple-donor action including €7.2 million from EU for the period 2024–2027.

134. Overall, 48 Member States, the European Union, and other governmental and non-governmental organizations have contributed to the NSF since its establishment. Over the past 5 years (2020–2024), 25 of those Member States, the European Union and 28 non-governmental donors have contributed to the NSF.

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[4] See footnote 1.

135. The Agency maintains efficiency in the technical and financial implementation (expenditure) of NSF budget allotment. In 2024, NSF expenditure (€33 million) was higher than NSF budget allotment[5] (€28 million), meaning that annual expenditure set against annual budget allotment was 116%. In comparison, the annual rate of NSF expenditure set against budget allotment was 67% in 2023 and 135% in 2022. During the COVID-19 pandemic, when the Agency implemented a reduced number of in-person events, the annual rate of NSF expenditure set against budget allotment was 16% in 2020 and 107% in 2021. Rigorous planning and robust processes have allowed the Agency to achieve some of its highest rates of NSF expenditure from 2022 to 2024.

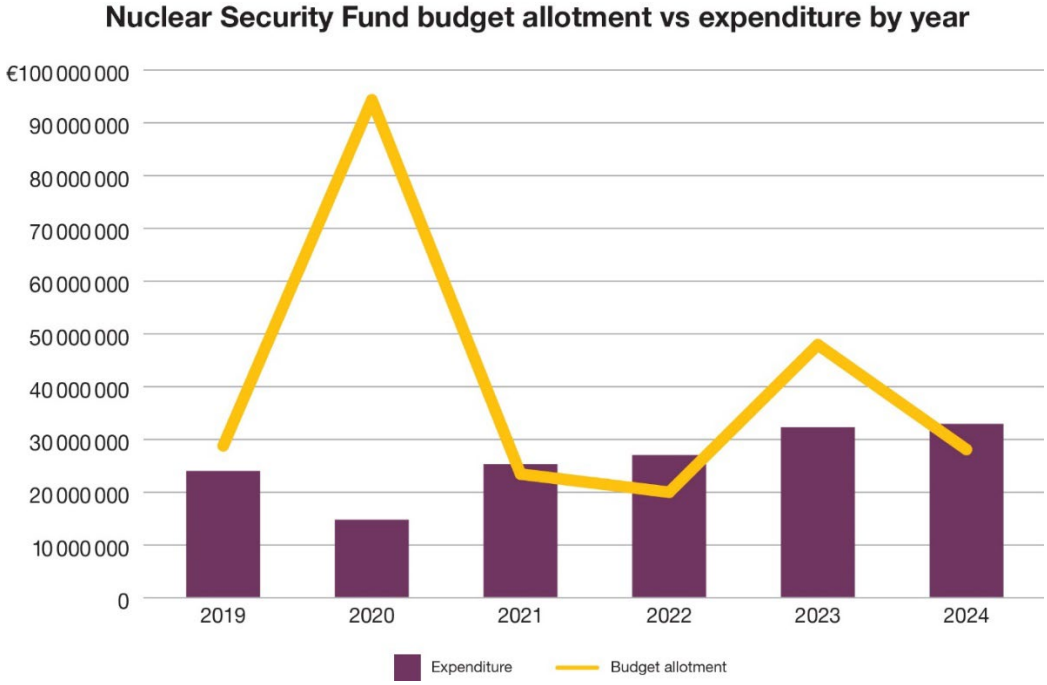

Figure 14: Budget allotment versus expenditure, 2019–2024.

136. In 2024, NSF expenditure increased by more than 120% compared to 2023 in the technical area of nuclear security guidance development, by over 60% in education and training, by almost 50% in nuclear forensics and by over 30% in radioactive sources security. The increase in the number of activities (and corresponding expenditures) in those areas in 2024 reflects the Agency's greater attention to the areas identified as priorities by Member States within the framework of the INSSP (as referred to in section A.3 of this report). The high NSF expenditure compared to budget allotment, along with the information about the increased activities and impact presented in this report, demonstrate a high level of efficiency in implementing the Agency's nuclear security programme.

137. In 2024, the Agency saw a significant increase in contributions to the NSF that can be used in line with the structure of Programme 3.5 within the Agency's Programme and Budget, rather than being earmarked for specific activities — €3.9 million in 2024 compared to €2 million in 2023. Such contributions, which have fewer restrictions on their use, allow the Agency to more efficiently plan, implement and fund the nuclear security programme, addressing Member States' needs effectively and

[5] The expenditure-to-net allotment ratio in 2023 is lower compared to 2024, primarily because the net allotment in 2023 significantly exceeded the actual expenditures. The main reasons for this are effective resource mobilization efforts in 2023, increased interest and financial support from the donors towards the NSTDC, as well as unspent funds from 2022 due to the COVID-19 pandemic. During 2022, the organization held fewer in-person events, and the unused funds in 2022 were re-allocated to postponed activities carried out in 2023.

in line with the principles of RBM. The Agency continues to engage with donors with the goal of better aligning contributions to programmatic areas requiring funding.

138. Effective alignment of donor contributions with the Agency's Programme and Budget has improved resource mobilization by reducing funding gaps in the nuclear security programme. However, these contributions currently still make up only a small portion of total contribution to the NSF — 9% and 8% of contributions in 2024 and 2023, respectively. The Agency still requires a significant amount of funding in order to implement the activities that have been identified as Member State priorities during the past several years. The following graph presents a snapshot of currently unfunded activities, all of which have been presented to donors and are awaiting funding. These activities cannot be funded by existing contributions due to donor conditions on the use of the funds.

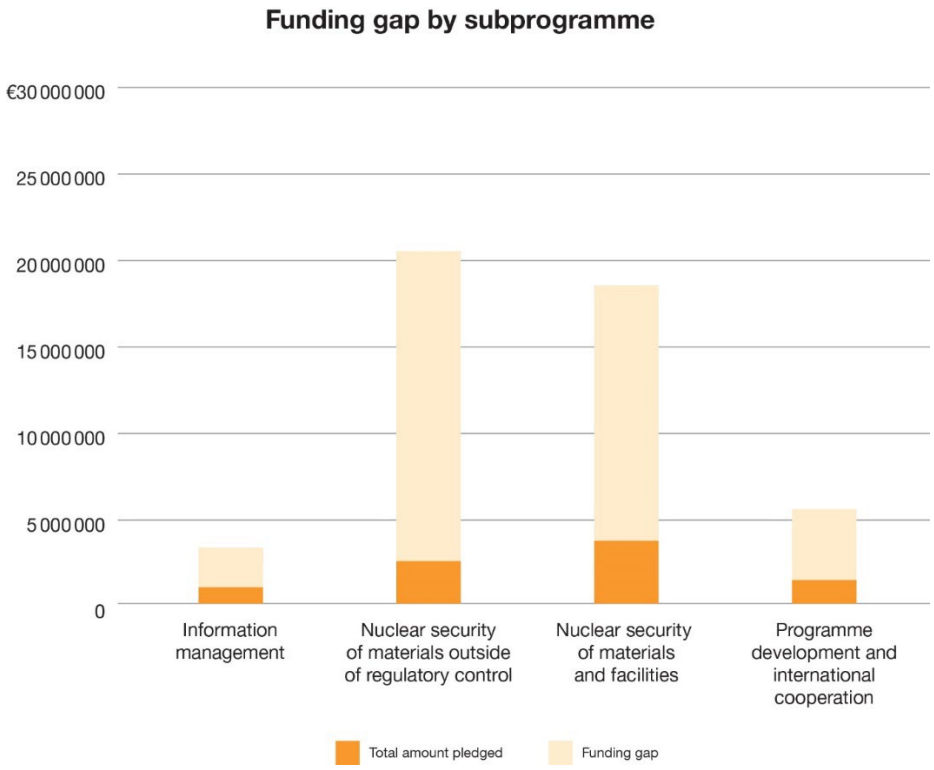

Figure 15: Agency's funding gap for specific projects in nuclear security as of January 2025.

139. The Agency further strengthened its data analytics capacity for NSF management in 2024. These efforts included the development of a number of dashboards used internally to support effective fund management, as well as external visualizations for donors to the NSF. The donor visualizations are a reflection of the Agency's ongoing efforts to provide insights in the usage of extrabudgetary contributions and support donors in decision making and planning. During the reporting period, the Agency shared visualizations with 17 NSF donors.

140. The Agency continues to actively engage with potential new donors to the NSF as well as legacy donors, with the goal of broadening the donor base to ensure the sustainability of the nuclear security programme. In addition to traditional financial contributions, the Agency's nuclear security programme is supported through in-kind contributions such as expertise, equipment or venues for activities. In 2024, three donors that had not contributed within the previous five years provided financial or in-kind contributions. In addition, the Agency has increasingly diversified funding of nuclear security activities through a co-funding approach. In 2024, 49% of events were co-funded, compared to 31% in 2023.

141. The Agency also expanded its engagement with non-governmental donors to the NSF, which include organizations from the private sector, academia and civil society. Until recently, contributions from non-governmental donors to the NSF have been mostly limited to pledges from organizations that use exhibition spaces at Agency conferences. However, the Agency used the construction of the NSTDC as an opportunity to strengthen engagement with non-governmental donors, with donors having pledged in-kind contributions in the form of specialized equipment. The Agency will continue to pursue opportunities for collaboration with non-governmental donors interested in corporate social responsibility within the framework of the SDGs.

Related Activities

142. ***The Agency will continue ensuring that contributions to the NSF are used prudently. The Agency is planning to undertake the following related activities:***

- Continue to use the NSF in compliance with Agency policies and procedures, while concurrently providing transparency to donors, in order to ensure efficient performance and utilization of extrabudgetary contributions;
- Continue to coordinate and engage with Member States, through the existing mechanisms of bilateral consultations, bilateral coordination meetings and multilateral coordination meetings, in order to ensure that contributions to and expenditures from the NSF are aligned with Member State requirements and expectations;
- Continue to engage with Member States to streamline existing funding processes in order to ensure greater predictability and the alignment of funding with the Agency's Programme and Budget for impactful results;
- Continue to prioritize funding of projects and programmes based on Member States expressed needs; and
- Continue to engage with Member States to demonstrate results and share information.

F. Technical Support and Assistance to Ukraine

Trends

142. The Agency continued to closely monitor the situation at Ukraine's nuclear facilities as well as activities involving radioactive sources, focusing on the implications for nuclear safety and security. The Agency continued sharing information with Member States, international organizations and the public on the nuclear safety and security situation in Ukraine.

143. The Agency maintained the continued presence of its staff at the five nuclear sites in Ukraine (Khmelnytskyy NPP (KhNPP), South Ukraine NPP (SUNPP), Rivne NPP (RNPP), Zaporizhzhya NPP (ZNPP) and the Chornobyl NPP site), without any interruption, and continued to provide other technical support and assistance to help ensure the safe and secure operation of nuclear facilities and activities involving radioactive sources in Ukraine through its comprehensive programme of assistance (see Figure 16). This programme, in addition to the continued presence and other in-person missions, includes delivering nuclear safety- and security-related equipment, providing medical assistance for Ukrainian operating personnel, and providing assistance with radiation safety and nuclear security of radioactive sources and for mitigating the consequences associated with the destruction of the Kakhovka dam.

Figure 16: The Agency's technical support and assistance to Ukraine (2022—end 2024).

144. In 2024, the Agency expanded the assistance programme to Ukraine by taking a more proactive stance to help ensure stability of critical energy infrastructure so that it does not impact nuclear safety. Agency staff present at the five nuclear sites in Ukraine continued to monitor and assess the situation against the seven indispensable pillars for ensuring nuclear safety and security during an armed conflict ('Seven Pillars') that were first outlined on 2 March 2022. Agency staff present at the ZNPP continued to monitor and report on observance of the five concrete principles for protecting the ZNPP ('Five Principles') established on 30 May 2023.

145. The armed conflict continued to threaten nuclear safety and security in Ukraine throughout 2024. The KhNPP, the RNPP and the SUNPP continued to operate safely and securely despite the challenging circumstances imposed by the armed conflict. However, the military activities on the territory of Ukraine resulted in frequent reports of drones observed flying in close proximity to the NPPs, frequent air raid alarms at the sites and impacts on energy infrastructure, resulting in instability of the electrical grid and increasing the risk to the safe and secure operation of the plants.

146. In 2024, the situation at the ZNPP continued to be precarious, with all Seven Pillars being compromised fully or partially. On 7 April 2024, the ZNPP suffered direct attacks, threatening its physical integrity and the overall nuclear safety and security of the site, in violation of the first of the Five Principles. Military activities including explosions, drone attacks and gunfire in the vicinity of the ZNPP, as well as the presence of Russian armed troops and military equipment on site, continued to be reported and to put the Five Principles and the overall nuclear safety and security of the plant at great risk.

147. The Agency continued to cooperate closely with Member States and international organizations in the interests of efficiency.

Related Activities

148. ***The Agency will continue to closely monitor the nuclear safety and security situation in Ukraine. The Agency will also continue to provide technical support and assistance to Ukraine in the area of nuclear safety and security and maintain the continuous presence of its experts at all Ukrainian NPPs. The Agency is planning to undertake the following related activities:***

- Continue the delivery of technical support and assistance to Ukraine as needed, across all components of the comprehensive programme of assistance;
- Continue sharing information on the nuclear safety and security situation in Ukraine and on the Agency's activities with Member States, international organizations and the public; and
- Continue close cooperation with Member States and international organizations to ensure efficiency in the provision of technical support and assistance.

Appendix A

Agency Activities in 2024

A. General Nuclear Security Areas

A.1. Promoting Further Adherence to International Legal Instruments

Figure A-1: The Agency organized the annual Technical Meeting of the Representatives of Parties to the CPPNM and its Amendment in November 2024. (Photo: IAEA)

1. In order to facilitate and improve mechanisms for information exchange and experience sharing among States Parties to the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment (A/CPPNM), the Agency convened the annual Technical Meeting of the Representatives of Parties to the CPPNM and its Amendment (Points of Contact Meeting) in November 2024 in Vienna.

2. To continue promoting universalization of the CPPNM and its Amendment, during the reporting period the Agency conducted three regional workshops: for the Indian Ocean and Pacific Island States in April, for Asia in August, and for Latin America and the Caribbean in October. The Agency also conducted a national workshop for Venezuela in December; and two outreach missions to Uganda in March and Lao People's Democratic Republic in August.

3. In June, the Agency organized, jointly with the United Nations Office on Drugs and Crime (UNODC), an IAEA–UNODC Seminar to Promote the Universalization of the Amendment to the Convention on the Physical Protection of Nuclear Material and the International Convention for the Suppression of Acts of Nuclear Terrorism. The Agency also conducted a Technical Meeting to Promote the Universalization of the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment, held immediately after the annual Points of Contact Meeting in November 2024 in Vienna.

4. During the reporting period, the Agency conducted 11 awareness-raising meetings, 4 interregional, regional and subregional workshops and 6 national workshops, covering all technical cooperation regions, to increase understanding of the elements of comprehensive national nuclear legislation and the importance of adhering to the relevant international legal instruments, including the CPPNM and its Amendment.

Figure A-2: IAEA Director General Rafael Mariano Grossi and Youngor Sevelee Telewoda, Resident Representative of the Republic of Liberia to the IAEA, at the annual Treaty Event on the sidelines of the 68th regular session of the IAEA General Conference, when Liberia became a Party to the CPPNM and its Amendment. (Photo: IAEA)

A.2. Nuclear Security Guidance and Peer Review and Advisory Services

Figure A-3: The IPPAS mission in Romania in December 2024 was the 108th mission conducted by the Agency since the programme began in 1995. (Photo: IAEA)

5. Four Technical Guidance publications were issued in 2024:

- *Regulatory Authorization and Related Inspection for Nuclear Security During the Lifetime of a Nuclear Facility* (IAEA Nuclear Security Series No. 45-T);
- *Security of Nuclear and Other Radioactive Material in Transport* (IAEA Nuclear Security Series No. 46-T);

- *Detection in a State's Interior of Nuclear and Other Radioactive Material out of Regulatory Control* (IAEA Nuclear Security Series No. 47-T), co-sponsored by five international organizations;
- *Identification and Categorization of Sabotage Targets, and Identification of Vital Areas at Nuclear Facilities* (IAEA Nuclear Security Series No. 48-T);

6. Two Technical Guidance publications were discontinued following the release of *Identification and Categorization of Sabotage Targets, and Identification of Vital Areas at Nuclear Facilities* (IAEA Nuclear Security Series No. 48-T), which supersedes *Engineering Safety Aspects of the Protection of Nuclear Power Plants against Sabotage* (IAEA Nuclear Security Series No. 4) and *Identification of Vital Areas at Nuclear Facilities* (IAEA Nuclear Security Series No. 16).

7. Following the issuance of the new nuclear security guidance publications and the discontinuation of older ones, as of December 2024, the total number of NSS publications is 46.

8. The Agency continues to translate NSS publications into languages other than English. In 2024, five Implementing Guides were made available in Chinese and six in Russian. Eleven Technical Guidance documents were made available in Arabic, six in French, six in Russian, and eight in Spanish.

9. Along with all Safety Standards Series publications, all NSS publications are available online via the Nuclear Safety and Security Online User Interface (NSS-OUI) platform. NSS-OUI enables users to search a uniform knowledge base and provides information on the relationships between publications, allowing easy navigation between related guidance and recommendations from other documents. It also facilitates the provision of feedback.

10. The NSGC began its fifth three-year term in 2024 and held meetings in Vienna, with the option of virtual attendance, in June and December 2024. One of the meetings included a joint session with the Radiation Safety Standards Committee and the Transport Safety Standards Committee, where topics of mutual interest, including the safety–security interface, were discussed.

11. The new term of the NSGC will use the roadmap, developed from the comprehensive review of the NSS conducted during the committee's fourth term, as a working document to guide the planning of future development and revisions of NSS publications, beginning with the revision of the Nuclear Security Fundamentals and Recommendations. To further enhance the quality of the NSS set of publications and ensure consistent use of terms and definitions throughout, the Agency continues to review the terminology used in the publications and hosted a consultancy meeting in April 2024.

12. The Agency conducted IPPAS missions to the USA in March–April 2024, to Japan in July–August 2024, to Congo in October 2024, to Rwanda in October–November 2024, to Zimbabwe in November 2024 and to Romania in December 2024. Additionally, the Agency held four IPPAS preparatory meetings for upcoming missions, and seven IPPAS national workshops: in Kigali in January 2024, in Brazzaville in March 2024, in Victoria Falls City, Zimbabwe, in May 2024, in Nairobi in June 2024, in Cernavodă, Romania, in August 2024 and in Islamabad in September 2024.

13. To enhance the IPPAS programme, the Agency held an International Seminar on IPPAS in Brussels in October 2024. The purpose of the seminar was to share and discuss the benefits, challenges and lessons learned during the preparation and conduct of IPPAS missions and follow-up activities, as well as the options for further enhancement of the programme.

14. The Agency conducted an INSServ mission to Costa Rica in March 2024 and to Thailand in September 2024. It also conducted a series of six consultancy meetings as a follow-up to the INSServ missions to Jordan in May 2024, Georgia in June 2024, Costa Rica and Cambodia in July 2024, Malaysia in September 2024 and Sudan in November 2024 in order to discuss and address the implementation of

the INSServ missions' recommendations and areas for potential assistance from the Agency, through the States' INSSPs and other international partners.

Figure A-4: In September 2024, the Agency conducted an INSServ mission in Thailand to assess the country's nuclear security regime for nuclear and other radioactive material out of regulatory control. (Photo: IAEA)

A.3. Assessing Nuclear Security Needs and Priorities

15. Revised self-assessment questionnaires were systematically used as an integral part of the INSSP process for all States where an INSSP finalization or review mission, as well as an update of the INSSP took place in 2024.

16. Three regional workshops were conducted to coordinate the implementation of INSSPs: for the Pacific and Indian Ocean Islands in Melbourne, Australia, in April 2024; for Europe in Bar, Montenegro, June 2024; and for the Latin American region in Santiago in November 2024.

A.4. Capacity Building in Nuclear Security

Figure A-5: More than 20 participants from 14 countries attended an NSTDC training course specifically designed for countries participating in or planning to join the Agency's Rays of Hope initiative. (Photo: IAEA)

17. The Agency continued to assist States in establishing and implementing nuclear security education programmes through the INSEN. The Agency hosted the 2024 INSEN Leadership Meeting in Vienna in January–February 2024, at which members of the INSEN leadership and the IAEA Secretariat identified new topical areas to strengthen the INSEN and nuclear security education promotion and sustainability.

18. In August 2024, the Agency conducted the Meeting of the INSEN's Working Groups, in Vienna. Event participants jointly reviewed implementation of the Action Plans of the INSEN's working groups and discussed the newly identified topical areas. For the first time, the INSEN achieved gender parity among the event's participants. Further, the Agency hosted an online INSEN Annual Meeting in October 2024. Since 2016, the INSEN has regularly organized panel sessions on women in nuclear security at its annual meetings. Additionally, 50% of the chairs of the INSEN and its working groups are women.

19. The Agency held International Schools on Nuclear Security, including a School hosted jointly with the Abdus Salam International Centre for Theoretical Physics in March in Trieste, Italy; an International School on Nuclear Security in Spanish, hosted by Cuba in Havana in February–March 2024; and a School for fellows of the MSCFP in August–September in Vienna. Gender parity sessions were included at these schools.

20. The Agency conducted an International Training Course on the Development of Detection and Response Equipment Life Cycle Management Programmes, held at the NSTDC in February 2024. In July 2024, a second international training course on the same subject was conducted. All participants of these training courses are now prepared to take a sustainable and systematic approach to developing a technical support programme as described in *Establishing and Operating a National Nuclear Security Support Centre* (IAEA-TDL-010).

21. In August 2024, the Agency held an International Workshop on Project Support and Management Approaches for Nuclear Security Support Centre Projects. Participants are now prepared to reduce project implementation risk and improve the sustainability of projects related to the establishment and operation of NSSCs.

22. The Agency held four Technical Meetings for regional groups of the NSSC network: in February 2024 for the Africa Regional Group, in July 2024 for the Asia Regional Network, in September 2024 for the Southeast Asian Nations Sub-Regional Group, and in October 2024 for the Arab States in Asia Sub-Regional Group. Participants of the events worked together to finalize the Terms of Reference for the regional groups, to identify priority activities for 2024 and 2025, and to identify collaboration opportunities.

23. The Agency held an International Workshop on Establishing and Operating a National Nuclear Security Support Centre in Tokai, Japan, in July 2024 to support States in implementing a systematic and sustainable approach to the establishment and operation of an NSSC.

24. In addition, the Agency provided support to Cuba, Tajikistan and the United Republic of Tanzania regarding the establishment and operation of NSSCs.

25. The Agency held the Regional Workshop on Human Resource Development in Nuclear Security for French-speaking countries in Morocco in September–October 2024.

26. The Agency published a revised e-learning module on preventive and protective measures against insider threats in English and subsequently updated modules in all other official United Nations languages in October 2024.

A.5. Information and Computer Security

27. The Agency continued responding to Member State requests in 2024 by delivering four Training Courses on Computer Security Fundamentals for Nuclear Security, two Training Courses on Computer Security Incident Response for Nuclear Facilities, one Training Course on Computer Security for Industrial Control Systems at Nuclear Facilities, three Computer Security Exercises for Nuclear Security, three Workshops on Drafting Computer Security Regulations, one Training Course on Conducting Computer Security Inspections for Nuclear Facilities, and one Training Course on Conducting Computer Security Assessments for Nuclear Facilities.

28. To raise awareness of and capabilities for protecting against cyberthreats across the entire nuclear security regime, computer security training modules were integrated into training courses for the NSTDC.

29. During the reporting period, the Agency started a new CRP entitled "Enhancing Computer Security of Small Modular Reactors and Microreactors", which aims to assess and advance computer security for SMRs, considering safety, security, operational modes, emergency preparedness, human factors, novel technologies (disruptive, innovative, and emerging) and methodologies applied to I&C, physical protection systems, communications, network infrastructure, accountancy and control, and other associated systems.

30. The Agency's computer security capacity building application, which has been successfully used in many demonstrations, training courses and exercises including Agency-supported events and activities, has been deployed on the Agency website. It provides a valuable tool for Member States to enhance their preparedness and response to nuclear security threats. The simulator offers a realistic and interactive environment for training, allowing users to practise and improve their skills in detecting and responding to cyberthreats.

A.6. Information Exchange and Sharing

Figure A-6: More than 100 ITDB Points of Contact met in Vienna in October 2024 and discussed the ITDB system and the benefits for global nuclear security. (Photo: IAEA)

31. In October 2024, the Agency hosted the Triennial Meeting of States' Points of Contact for the ITDB in Vienna. The meeting resulted in a suggestion to increase the frequency of the meeting and of the Points of Contact training event, to increase the online activities of the ITDB in the area of training

and capacity building, and to organize consultancy meetings to review some of the operational structures for reporting to the ITDB.

32. In 2024, the Agency continued to maintain the secure ITDB restricted area on NUSEC by providing ITDB Points of Contact and other authorized users with the ITDB incident notification forms (Web Incident Notification Forms (WebINFs)), regular analysis reports and other relevant ad hoc information (such as MPE reports) in a timely and accurate manner.

33. In 2024, the Agency processed 147 WebINFs in a timely manner, 4 reports in support of MPEs, and numerous ad hoc requests for ITDB data and analysis.

34. The Agency further conducted outreach to Member States not participating in the ITDB to encourage their participation through invitations to regional workshops as well as the incorporation of ITDB-related information into other programmes such as INSSP, IPPAS, INSServ and various Agency nuclear security-related training activities.

A.7. Nuclear Security Research and Emerging Technologies

35. During the reporting period, the Agency continued to keep abreast of scientific, technological and engineering innovations in relation to nuclear security. Examples of related work include the hosting of the Technical Meeting on Processes and Tools for Secondary Inspections and Assessments of Radiation Alarms, held in Cairo in November 2024; the Technical Meeting on the Nuclear Security Implications of Counterfeit, Fraudulent and Suspect Items, held in Vienna in September 2024; and four Research Coordination Meetings of CRPs, held in Vienna in September, November and December 2024. These meetings provided participants with opportunities to discuss and share information about new innovations.

36. The Agency continued to enhance the features and functionality of M-INSN. Efforts are ongoing to support the publishing of the M-INSN source code in an open-source repository, and to update the software with new features and capabilities. Additionally, M-INSN underwent a computer security audit to identify potential risks and develop a computer security plan to ensure its continued security.

37. In 2024, the Agency's Minimum Detectable Quantity and Alarm Threshold Evaluation Tool was deployed in ten Member States, an increase of three countries compared to 2023. The tool enables Member States to use a risk informed approach for establishing alarm threshold values and estimating the operational impact of those values on traffic through a radiation portal monitor. The tool is currently being upgraded with a focus on sustainability and training considerations, in preparation for its next version release in 2025.

38. Ten TRACE mobile scenario-based exercises were developed during a consultancy meeting with six Member States in June 2024. Once cleared, these scenarios will be used in future Agency meetings and World Customs Organization (WCO) training sessions, as requested by the WCO's Radiological and Nuclear Detection Awareness Project.

B. Nuclear Security of Materials and Associated Facilities

B.1. Nuclear Security Approaches for the Whole Fuel Cycle

B.1.1. Physical Protection of Nuclear and Other Radioactive Material and Associated Facilities and Activities

Figure A-7: Hands-on training on physical protection equipment installation, integration, operation and maintenance was conducted at the NSTDC from 30 September to 25 October 2024. (Photo: IAEA)

39. During 2024, the Agency continued the development of publications addressing nuclear security for the whole nuclear fuel cycle, including the draft NSS publications provisionally entitled *Establishment and Implementation of a Trustworthiness Programme in Nuclear Security*; *Evaluation of Physical Protection Systems at Nuclear Facilities*; *Regulatory Inspection Programme and Enforcement Measures for Nuclear Security During the Lifetime of a Nuclear Facility*; and *Concepts and Application of Security by Design.*

40. In 2024, the Agency held multiple international training courses to support Member States in the implementation of nuclear security activities for nuclear material, associated facilities and associated activities. At the NSTDC, these included one on Central Alarm Station Design and Operation for Facilities Using Nuclear or Other Radioactive Material, two on Operational and Performance Testing of Physical Protection Systems, one on Insider Threats Using the Shapash 3D Model at the NSTDC in August 2024, two on Regulatory Functions for the Security of Nuclear Material, Nuclear Facilities and Associated Activities, one Hands-On Training for Domestic Inspectors on Inspection of Equipment for Nuclear Security at Facilities Using Nuclear or Other Radioactive Material, one Hands-on Training on Physical Protection Equipment Installation, Integration, Operation and Maintenance, and one on the Implementation of Facility-level Nuclear Material Accounting and Control Measures for Nuclear Security.

41. In addition, the Agency held various regional and national training courses to support Member States in the implementation of nuclear security activities for nuclear material, associated facilities and associated activities. Regional courses included: one on the Establishment of a Nuclear Security Regime for Nuclear Power Programmes in Vienna, one on Physical Protection Inspections at Nuclear Facilities in Obninsk, Russian Federation, and one on Control of Nuclear Material in Use, Storage and Movement in Budapest. A National Training Course on Control of Nuclear Material in Use, Storage and Movement was held in Pakistan.

42. The Agency held an International Workshop on Management of the Response to a Nuclear Security Event, held at the State Nuclear Security Technology Centre in Beijing in April 2024; a Regional Workshop on Management of the Response to a Nuclear Security Event at Nuclear Facilities, in Lomé in November 2024, for English- and French-speaking African countries; an International Workshop on Project Support and Management Approaches for Nuclear Security Upgrade Projects, at the NSTDC in December 2024; and an International Workshop on the Development and Conduct of Contingency Response Performance Testing Exercises, at the Pakistan Centre of Excellence for Nuclear Security (PCENS) in October 2024.

43. During the reporting period, the Agency delivered six training courses to provide a step-by-step methodology to develop, use and maintain a design basis threat (DBT) assessment, including a threat assessment that can serve as the basis for the development of a national, site or activity-specific DBT. These included one international workshop, one regional workshop and four national workshops.

B.1.2. Nuclear Security of Advanced Reactors, Including SMRs

Figure A-8: A side event on nuclear security of SMRs was organized by the Agency during the International Conference on Small Modular Reactors and their Applications in October 2024. (Photo: IAEA)

44. During the reporting period, the Agency continued its efforts towards the development of publications addressing the nuclear security of SMRs, in particular a draft IAEA Technical Document (TECDOC) on the nuclear security of SMRs and a draft IAEA Technical Report provisionally entitled *Design of Safety and Security Considerations of Floating Nuclear Power Plants (FNPPs)* and conducted analysis of the applicability of NSS publications Nos. 20, 13, 27-G, 26-G and 35-G for FNPPs on design safety and security considerations for floating NPPs (FNPPs).

45. Nuclear security matters are addressed within the Agency-wide working groups related to SMRs, including on the NHSI and the SMR Platform Implementation Team.

46. The Agency is also engaged in developing guidance on security of nuclear material and facilities for nuclear fusion-based reactors and nuclear hydrogen facilities. Contributions relating to nuclear security will be included in the INPRO Case Study on Nuclear-Hydrogen Systems: Drivers and Institutional, Economic and Legal Impediments, which is expected to be published in 2025.

B.1.3. Enhancing Nuclear Security Using Nuclear Material Accounting and Control

47. The Agency conducted a Regional Training Course on Nuclear Material Accounting and Control for Nuclear Security Purposes at Facilities, in Tokai, Japan, in February 2024 to advance NMAC concepts and capacities in the region.

48. The Agency updated its relevant training materials to produce a new course design containing new practical exercises to provide participants with hands-on experience. These updates were utilized in the International Training Course on Control of Nuclear Material in Use, Movement and Storage, held in Hungary in November 2024. A National Training Course on the same topic was conducted in Islamabad in November 2024.

49. The Agency conducted the new International Training Course on the Implementation of Facility-level Nuclear Material Accounting and Control Measures for Nuclear Security at the NSTDC in April and December 2024. Participants gained practical measurement experience to enhance their understanding of the NMAC system at the facility level, enriched knowledge through tours and descriptions of equipment and laboratories, and a clearer understanding of the relationship between safeguards and nuclear security.

50. The Agency drafted a TECDOC provisionally entitled *Contents of a Facility Nuclear Material Accounting and Control Plan* and completed the new IPPAS module 6, "Nuclear Material Accounting and Control System", which will be published on NUSEC for Member State use.

B.1.4. Nuclear Security in the Transport of Nuclear and Other Radioactive Material

51. The Agency held an Open-Ended Meeting of Legal and Technical Experts on the Draft Code of Conduct on the Facilitation of the Safe and Secure Transport of Radioactive Material to discuss the draft Code of Conduct on the Facilitation of the Safe and Secure Transport of Radioactive Material submitted by the Denial of Shipment Working Group, pursuant to General Conference resolution GC(67)/RES/7.

52. The Agency held a Regional Workshop on Conducting a Transport Security Inspection for the Latin America Region in Cuba in September 2024, and a Regional Workshop on Conducting a Transport Security Inspection in Côte d'Ivoire in September 2024, to enhance competent authorities' theoretical knowledge and practical skills in conducting inspections of transport security systems.

53. The Agency conducted an International Training Course on the Security of Non-Nuclear Radioactive Material in Transport, in Bahadurgarh, India, in April 2024 to enhance Member State representatives' understanding of the need for security measures during the transport of any radioactive material that is not nuclear material, and to equip them with the necessary knowledge to develop and implement national transport security requirements.

54. In October 2024, the Agency conducted an International Workshop on Transport Security Planning in Beijing to provide Member State representatives with a better understanding of the need to implement a transport security plan and the knowledge to develop, design, maintain and evaluate such a plan.

55. In September 2024, the Agency conducted an Expert Mission to Assess the Nuclear Security Regime in Cameroon for the Security of Radioactive Material in Transport to evaluate the existing legal and regulatory infrastructure that supports the transport security of radioactive material throughout Cameroon, and to help inform any follow-up and future transport security activities.

56. The Agency conducted three transport security tabletop exercises to assist Member States in developing the knowledge and tools to plan, implement and maintain an effective transport security

programme for radioactive materials. The exercises were held in Georgia in July 2024, in Colombia in November 2024, and in Zambia in December 2024.

57. The Agency conducted a National Workshop for Response Force Personnel on Best Practices in Transport Security of Nuclear and Other Radioactive Material, in Abuja in May 2024.

58. The Agency conducted a Regional Training Course on the Security of Nuclear Material in Transport in the Europe Region, in Kazakhstan in October–November 2024, to provide Member States with an enhanced understanding of the need for security measures during the transport of nuclear material, and with the necessary knowledge to develop and implement national transport security requirements.

Figure A-9: In October-November 2024, in Kazakhstan, the Agency conducted a regional training course on the security of nuclear material in transport. (Photo: Institute of Nuclear Physics, Kazakhstan)

B.2. Security of Radioactive Material[6] and Associated Facilities

B.2.1. Assistance Provided to States to Enhance the Security of Radioactive Material in Use and Storage and of Associated Facilities

59. In 2024, the Agency assisted seven States – Colombia, Dominican Republic, Ecuador, El Salvador, Honduras, Iraq and Uganda – in the review of draft laws for the security of radioactive material in use and storage and of associated facilities and activities. The Agency also assisted three States in the review or drafting of regulations on radiation safety and security of radioactive material in use and storage – the Bahamas, Barbados and Saint Kitts and Nevis.

60. The Agency held one School for the Elaboration of National Policy and Strategy Documents for Radiation Safety and Security of Radioactive Material, in Vienna in July 2024, for Antigua and Barbuda, Barbados and Saint Lucia.

61. The Agency held an International Train the Trainers Course on the Security of Radioactive Material and Associated Facilities, at the NSTDC in March 2024, to provide radioactive material security experts with adult learning fundamentals training and to familiarize them with Agency training modules related to security of radioactive material and associated facilities. The Agency held two

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[6] For the purpose of this section, "radioactive material" refers to "other radioactive material", as defined in *Objective and Essential Elements of a State's Nuclear Security Regime* (IAEA Nuclear Security Series No. 20).

National Training Courses on the Regulatory Control of Radiotherapy Practices for Kenya, one in a virtual format and the other in Nairobi in January 2024. The courses enhanced participants' awareness of international best practices in the regulation of radiation safety and security of radioactive material from selected radiotherapy practices.

62. Two National Training Courses on the Security of Radioactive Material in Use and Storage were held in Pakistan in July 2024 and in Belgium in September 2024; and two National Training Courses on Preventive and Protective Measures Against Insider Threats to Radioactive Material and Associated Facilities were held in Niger in June 2024 and in Senegal in October 2024.

63. The Agency held multiple regional training courses and workshops on radiation safety and nuclear security to enhance participants' understanding of key Agency guidance on the security of radioactive material and associated facilities in use and storage. These included two courses for New Regulators in Radiation Safety and Security of Radioactive Material, held over the course of six weeks in Morocco and Ghana, one course on the Authorization and Inspection of Radiation Safety and Nuclear Security for Industrial Practices in Ethiopia, one course on the Security of Radioactive Material in Use and Storage for the Caribbean States in Belize, and three Regional Training Courses on Introduction to Design and Evaluation of Physical Protection Systems for Radioactive Material and Associated Facilities in Panama, Tunisia and Kenya, two workshops on the Development of National Policies and Strategies for the Management of Disused Sealed Radioactive Sources in Senegal and Bolivia, one workshop on the Development and Implementation of Procedures for Authorization and Inspection of Radioactive Sources in Uruguay, and one workshop on Organization and Staffing of an Effectively Independent Regulatory Body in Vienna for the Caribbean States.

64. The Agency conducted two RISS missions: to Eswatini in May 2024 and to Rwanda in August 2024.

65. One International Training Course on Design and Evaluation of Physical Protection Systems for Radioactive Material and Associated Facilities was held in the Russian Federation in July 2024.

66. Projects to strengthen physical protection measures at facilities with high activity radioactive sources are ongoing in nine countries.

67. The Agency conducted expert missions to Mozambique in March 2024, to Colombia in April 2024, to Ethiopia in May 2024, to Namibia in September 2024 and to Thailand in October 2024to support the completion of national inventories of radioactive sources and provide expert guidance on the establishment of centralized storage facilities. The Agency also conducted an expert mission to Ethiopia in August 2024 to support the disassembly and packaging of a teletherapy head in a hospital and a site visit to the DSRS Storage Facility in Cuba to provide additional information to the bidders to support the removal process.

68. The Agency conducted 21 virtual coordination meetings with 21 countries in relation to the project entitled "Enhancing the Safe, Secure and Sustainable Management of Disused Sealed Radioactive Sources — Phase II".

69. In February 2024, the Agency conducted an expert mission assessing the current situation in Venezuela in relation to high activity radioactive sources and providing support for their safe, secure and sustainable management, and a fact-finding mission to support the safe and secure management of the national inventory of radioisotope thermoelectric generators in Egypt.

70. New training material was developed for a new Training Course on Introduction to Life Cycle Security of Radioactive Material and Associated Facilities in Cancer Care, which is specifically aimed

at States participating in the Rays of Hope initiative, and the pilot course was held at the NSTDC in November 2024.

71. In 2024, nine high activity DSRSs previously used in medical applications were removed from temporary storage facilities in the Dominican Republic. These sources were packaged and transferred to a recycling facility abroad. This operation marked the country's complete removal of all high activity sources, significantly reducing the risk of radioactive material misuse both within the Dominican Republic and across the wider Caribbean region. Additionally, the Agency continued its support to Ghana and Malaysia in the implementation of borehole disposal for DSRSs.

B.2.2. Support for the Implementation of the Code of Conduct on the Safety and Security of Radioactive Sources

Figure A-10: The fourth Open-ended Meeting of Technical and Legal Experts on States' Implementation of the Guidance on the Import and Export of Radioactive Sources was held in Vienna in May 2024. (Photo: IAEA)

72. The Agency held three Regional Meetings to Share Experiences and Lessons Learned in Implementing the Code of Conduct on the Safety and Security of Radioactive Sources and its Supplementary Guidance: in Mexico in February 2024 for Latin America and the Caribbean States, in the UAE in October 2024 for Arab States, and in Zimbabwe in November 2024 for African States.

73. In May 2024, the Agency held the Open-ended Meeting of Technical and Legal Experts on States' Implementation of the Guidance on the Import and Export of Radioactive Sources in Vienna.

74. In Namibia in September–October 2024, the Agency held the Africa Regional Technical Meeting of the Points of Contact for the Purpose of Facilitating the Import and Export of Radioactive Sources in Accordance with the Guidance on the Import and Export of Radioactive Sources.

75. The Agency continues outreach efforts (through various Agency activities such as side events at meetings and conferences, event sessions and Technical Meetings) to communicate the benefits of implementing the Code of Conduct to States that have not made a political commitment to do so.

C. Nuclear Security of Materials Out of Regulatory Control

C.1. Nuclear Security Measures for Material Out of Regulatory Control

76. In May 2024, the Agency held an International Training Course on Essential Elements of Nuclear Security for Nuclear and Other Radioactive Material out of Regulatory Control, in Lemont, USA.

77. The Agency held a Regional Workshop on Developing a National Framework for Managing the Response to Criminal or Intentional Unauthorized Acts involving Material Out of Regulatory Control, in Rio de Janeiro, Brazil, in September–October 2024.

78. The Agency supported the procurement of equipment for nuclear security response capability development for three Member States.

C.2. Nuclear Security Detection Architecture

79. During the reporting period the Agency conducted a range of Regional Workshops on nuclear security detection architecture: on Nuclear Security Detection Architecture Risk Informed Strategy, in Montevideo in March; on Sustainable Training Programmes for Nuclear Security Detection, in Hanoi in July; on the Expert Support for the Assessment of Alarms and Alerts for Nuclear and Other Radioactive Material out of Regulatory Control, in Manila in August; on Evaluation of Nuclear Security Detection Architecture, in Amman in September; and on Threat Assessment and a Risk Informed Approach for Nuclear and Other Radioactive Material out of Regulatory Control, in Muscat in November.

80. The Agency implemented at the NSTDC two basic and three advanced international training courses on the use and maintenance of hand-held detection instrumentation.

81. The Agency conducted two meetings of the Network of Front Line Officers: in Vienna in March 2024, and in Luxor, Egypt, in October 2024.

C.3. Response to Nuclear Security Events

82. The Agency drafted a Technical Guidance publication provisionally entitled *Developing Nuclear Security Procedures for Responding to Criminal or Intentional Unauthorized Acts involving Nuclear or other Radioactive Material* (NST052).

83. Additionally, the Agency developed a new training course supporting the development of national capabilities for nuclear security response and conducted a pilot national workshop on this topic in Qinhuangdao and Beijing, China, in November 2024.

84. The Agency held a Regional Workshop on Developing a National Framework for Managing the Response to Criminal or Intentional Unauthorized Acts involving Material Out of Regulatory Control, in Rio de Janeiro, Brazil, in September–October 2024.

85. The Agency supported the procurement of equipment for nuclear security response capability development for three Member States.

C.4. Major Public Events

Figure A-11: The Agency supported Azerbaijan, which hosted COP29 in November 2024, with hands-on training in the use of radiation detection equipment as part of the nuclear security measures during the conference. (Photo: IAEA)

86. During the reporting period, the Agency organized three International Train the Trainers Courses on Nuclear Security Measures and Emergency Response Arrangements for Major Public Events, at the NSTDC (two in February and one in July); and one Train the Trainers Course on Major Public Events for Equipment Specialists in Vienna in June.

87. The Agency organized several national events to assist countries in preparation for various MPEs, including a National Training Course on Equipment Operation, Testing and Maintenance in Preparation for Major Public Events, held in Vienna in July 2024 for Zimbabwe, in preparation for the SADC Summit; two National Workshops on Developing and Implementing Nuclear Security Systems and Measures for Major Public Events, held in Accra in January and in Harare in June; and three National Workshops on Arrangements for Notification, Reporting and Assistance in Nuclear or Radiological Incidents and Emergencies: in Accra in February, in Kampala in April, and in Victoria Falls, Zimbabwe, in July.

88. The Agency arranged a technical visit for experts from Argentina, Ghana, Jamaica, Mexico, Samoa, Thailand and Uganda to observe the implementation of nuclear security measures at the Super Bowl LVIII, in Paradise, USA in February 2024.

89. The Agency conducted two missions on the implementation of nuclear security measures for MPEs, in Côte d'Ivoire during the 2024 Africa Cup of Nations, and in Mexico in November to assist the country's preparedness to host the 2026 FIFA World Cup.

90. The Agency donated 62 pieces of radiation detection equipment to Zimbabwe during the SADC Summit in August 2024.

91. The Agency provided a tailored ITDB analysis report on nuclear security threats, trends and patterns focusing on the host country and neighbouring countries, to four Member States hosting MPEs.

92. In September 2024 the Agency held an International Workshop on Nuclear Security Measures and Emergency Response Arrangements for Major Public Events, in Washington DC. The event aimed to enhance participants' awareness and understanding of the planning and execution of nuclear security measures and emergency response arrangements for an MPE.

93. The Agency organized a Regional Workshop on Developing and Implementing Nuclear Security Systems and Measures for Major Public Events, in Kigali in October 2024, for English-speaking countries in Africa.

94. The Agency supported Azerbaijan in the preparation of nuclear security measures during COP29, which was hosted in Baku in November 2024, by conducting a National Workshop on Developing and Implementing Nuclear Security Measures for Major Public Events and a National Training Course on Equipment Operation, Testing and Maintenance in Preparation for Major Public Events, both in October 2024.

C.5. Radiological Crime Scene Management and Nuclear Forensics Science

Figure A-12: The Agency organized a regional training course on the practical applications of forensic science in nuclear security in France. (Photo: French Alternative Energies and Atomic Energy Commission/National Institute for Nuclear Science and Technology)

95. The Agency held an International Training Course on Nuclear Forensics Methodologies at the Joint Research Centre in Karlsruhe, Germany, in October 2024.

96. During the reporting period the Agency conducted regional training courses on nuclear forensics: two on Introduction to Nuclear Forensics in Nairobi in June 2024, and in Cairo in November 2024 and two on Practical Introduction to Nuclear Forensics in Saclay, France, and in Budapest, both in September–October 2024.

97. The Agency held the Fourth Seminar on Introduction to Nuclear Forensics in Belgrade in July 2024.

98. The Agency held one National Workshop on Radiological Crime Scene Management in Sofia in June 2024, and three Regional Workshops on Radiological Crime Scene Management: in Yaoundé in July 2024, in Tbilisi in November 2024, and in Gaborone in December 2024. The Agency also provided RCSM training kits to two Member States to support their specific training activities.

99. In August 2024, the Agency developed and piloted a Regional Peer-to-Peer Workshop on Nuclear Forensics, held in Indonesia. The purpose of this workshop is to promote regional cooperation, collaboration and training in nuclear forensics, with an emphasis on the sharing of good practices developed by participating States. This workshop was well received by Member States, who found the group activities centred around analytical techniques and regional exchanges of capabilities and experiences particularly beneficial.

100. The Agency developed and launched the International Integrated Workshops on Radiological Crime Scene Management and Nuclear Forensics at the NSTDC in May 2024 and in July–August 2024. The purpose of this workshop is to familiarize participants with the key techniques and approaches commonly used in RCSM and nuclear forensics and the significance of the correlation between these two fields.

D. Nuclear Security Interfaces

101. During the reporting period, the Agency continued drafting a new joint Safety Guide and Nuclear Security Implementing Guide on managing the interfaces between nuclear and radiation safety and nuclear security.

102. The Agency published *Regulatory Oversight of the Interfaces between Nuclear Safety and Nuclear Security in Nuclear Power Plants* (Technical Reports Series No. 1003).

103. The Agency held two six-week Regional Training Courses for New Regulators in Radiation Safety and Security of Radioactive Material: in Rabat in May–June 2024, and in Accra in May–July 2024. These events focused on training newly hired regulators in the performance of core regulatory functions and processes: notification and authorization, review and assessment, inspection, enforcement, regulations and guides, and communication and consultation with interested parties.

104. Within the framework of the RIDP, the Agency organized a Regional School for the Elaboration of National Policy and Strategy Documents for Radiation Safety and Security of Radioactive Material, held in Vienna in July 2024. This course focused on countries that are in the process of developing national policy and strategy documents in line with the Agency's Fundamental Safety Principles and *Objective and Essential Elements of a State's Nuclear Security Regime* (IAEA Nuclear Security Series No. 20).

105. The Agency conducted a Regional Workshop on Organization and Staffing of an Effectively Independent Regulatory Body, in Vienna in August 2024, for RIDP participating countries in the Caribbean region, in order to assist regulatory bodies in identifying the human resources competencies needed to perform regulatory functions, plan human resource needs, assess and develop related staffing competencies, and to identify tools and approaches to improve capacities and capabilities accordingly.

106. The Agency conducted two RISS missions— in Mbabane in May 2024 and in Kigali in August 2024 — to advise on the improvement of national regulatory infrastructure for radiation safety and security of radioactive material.

107. In May 2024, during ICONS 2024, the Agency held a session on interfaces between nuclear security and state systems of accounting and control.

108. The Agency addressed AI applications for nuclear security and computer security challenges for SMRs during the Steering Committee meetings of the International Network on Innovation to Support Operating Nuclear Power Plants (ISOP), which were held in Vienna in February, May and November 2024. Additionally, the Agency held a consultancy meeting in September 2024 to discuss computer security for advanced I&C for innovation in operating NPPs, in preparation for establishment of the ISOP Working Group on Advanced Instrumentation and Control, which is scheduled to launch during the ISOP Steering Committee Meeting in early 2025. Furthermore, the computer security for I&C of SMRs was addressed at the Sixth Meeting of the Technical Working Group on Small and Medium Sized or Modular Reactors, held in December 2024.

E. Nuclear Security Fund

109. In 2024, the Agency held two multilateral donor coordination meetings. The Agency also held bilateral donor coordination meetings with 13 donors: Australia, Canada, the European Union, France, Germany, India, Japan, New Zealand, Republic of Korea, Sweden, the UAE, the UK, and the USA.

110. On the margins of ICONS 2024, the Agency organized a side event on the NSF and its role in implementing the Agency's nuclear security programme.

111. The Agency developed 164 individual reports and sent them to donors in accordance with donor requirements.

112. For greater visibility and accountability, the Agency developed donor-specific NSF visualizations and shared these with 16 NSF donors.

F. Technical Support and Assistance to Ukraine

113. In 2024, the Agency continued providing technical support and assistance to Ukraine across all the components of the comprehensive programme of assistance. The programme expanded by taking a more proactive stance to help ensure the stability of critical energy infrastructure so that it does not impact nuclear safety.

114. A total of 86 mission rotations have been deployed as part of the continued presence of Agency staff at the 5 nuclear sites in Ukraine (13 to the ZNPP, 19 to the ChNPP site, and 18 each to the KhNPP, the RNPP and the SUNPP).

115. The Agency implemented nine additional missions to Ukraine: two visits of the Director General to Ukraine, including his fourth and fifth visits to the ZNPP in February and September 2024, three medical assistance-related missions in April, September and November 2024, three missions to the electrical substations critical for nuclear safety in September, October and December 2024, and the second IAEA Support and Assistance Mission on the Safety and Security of Radioactive Sources in November 2024.

116. The Director General continued to provide briefings to the United Nations Security Council and to hold high level talks with officials from Ukraine and the Russian Federation to help stabilize the nuclear safety and security situation.

117. In 2024, 58 deliveries of procured nuclear safety- and security-related equipment and medical equipment and supplies to various organizations in Ukraine were organized, bringing the total number of deliveries to 91. In total, over €14.23 million worth of equipment has been delivered to 23 organizations in Ukraine since the start of the armed conflict.

118. The Agency continued with delivery of remote mental health training sessions for NPP staff and managers and their mental health teams to assist them in building skills to manage the impact of the stressful and traumatic experience of the armed conflict, and supported the delivery of an in-person workshop in November 2024. Additionally, the Agency delivered remote and in-person training for NPP staff and management on leadership for safety, human performance, and management observation and coaching in October and November 2024.

119. The Agency held regular coordination meetings with the State Nuclear Regulatory Inspectorate of Ukraine and the Ukrainian focal point of the Ministry of Energy to coordinate the provision of technical support and assistance within the comprehensive programme of assistance and to exchange information on the nuclear safety and security situation at all NPPs.

120. The Agency held regular coordination meetings with the European Commission, as well as with a number of Member States and organizations, including the European Bank for Reconstruction and Development (EBRD), to ensure effective coordination in the provision of assistance and to secure the necessary funding. Moreover, the Agency participated in a meeting on the information-sharing initiative pertaining to assistance to Ukraine in Prague in May 2024, the G7 Nuclear Safety and Security Group Meeting in Rome in February and November 2024, and the assembly meeting of the EBRD's International Chernobyl Cooperation Account in July and December 2024.

121. The Agency continued sharing information with Member States, international organizations and the public on the nuclear safety and security situation in Ukraine. The Agency issued a public report entitled *Two Years of IAEA Continued Presence at the Zaporizhzhya Nuclear Power Plant* [7], marking two years since the establishment of the continued presence of Agency staff at the ZNPP. The Director General provided detailed reports on the situation in Ukraine to the Agency's Board of Governors in March, June, September and November 2024, which were made available to the public, and also provided a detailed report on the situation in Ukraine to the 68th regular session of the General Conference (GC(68)/8). The Agency continued providing regular updates on the situation in Ukraine on its website with over 63 updates published throughout the year. Finally, the Agency launched a new webpage[8] consolidating all information regarding nuclear safety, security and safeguards in Ukraine and the comprehensive programme of assistance.

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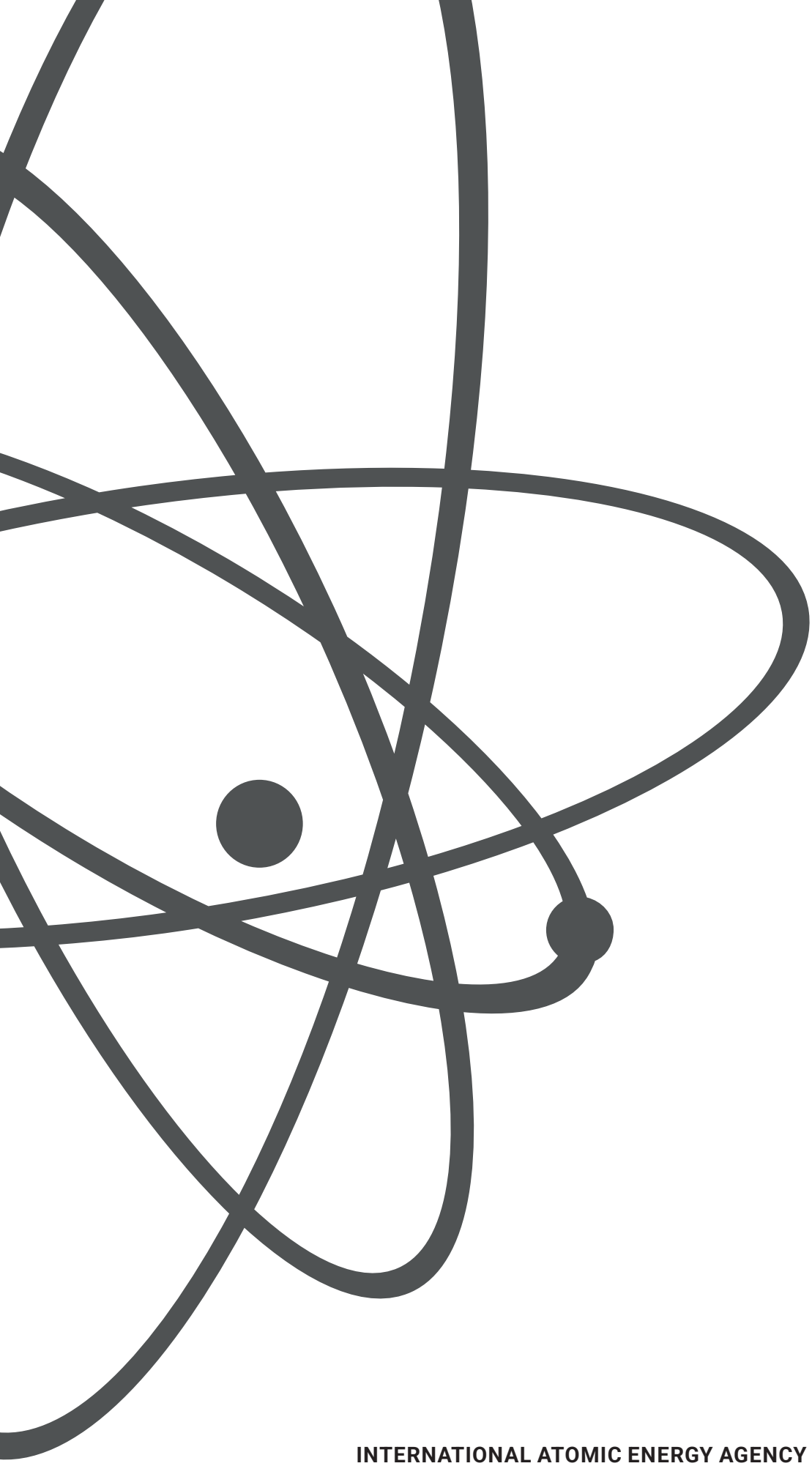
[7] Two years of IAEA continued presence at the Zaporizhzhya nuclear power plant: the IAEA's unwavering support for nuclear safety, security and safeguards in Ukraine is available here: two-years-of-iaea-continued-presence-at-the-zaporizhzhaya-nuclear-power-plant.pdf.

[8] Available here: Nuclear Safety, Security and Safeguards in Ukraine | IAEA.



INTERNATIONAL ATOMIC ENERGY AGENCY
Department of Nuclear Safety and Security
Vienna International Centre, PO Box 100, 1400 Vienna, Austria
iaea.org/ns | Official.Mail@iaea.org

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