


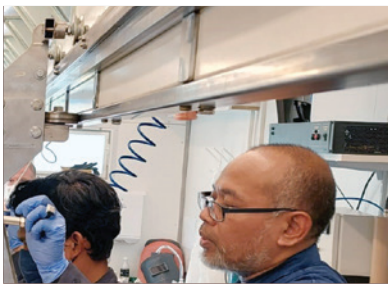

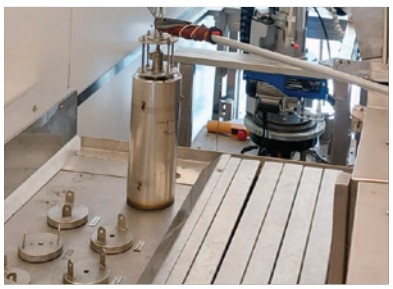

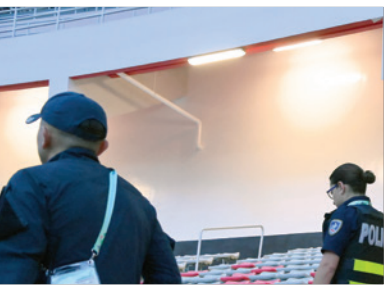
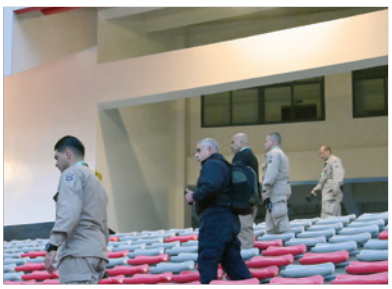

Nuclear Security Review 2023



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NUCLEAR SECURITY REVIEW 2023

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Nuclear Security Review 2023
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Foreword

The *Nuclear Security Review 2023* includes the global trends and the Agency's activities in 2022. It also presents priorities for 2023 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 2023* was submitted to the March 2023 session of the Board of Governors in document GOV/2023/4. The final version of the *Nuclear Security Review 2023* 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 2023

Report by the Director General

Executive Overview

1. The *Nuclear Security Review 2023* reflects the global trends in nuclear security in 2022. It shows that the international community is committed to further advancing nuclear security around the world. It also presents planned Agency activities for 2023 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 2022 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;
- 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 and national Collaborating Centres;
- Establishing the Nuclear Security Training and Demonstration Centre at the Agency's Seibersdorf laboratories;
- Hosting the International Conference on Computer Security in the Nuclear World: Security for Safety and continuing to assist States, upon request, in strengthening the protection of sensitive information and computer-based systems, recognizing the 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 facilitate, in close cooperation with Member States, upon request, a coordination to address the management of the interface between nuclear safety and security, as appropriate, and to develop safety and security publications, as well as joint publications, as appropriate, to ensure consistency and foster nuclear security culture among Member States;
- Ensuring that contributions to the Nuclear Security Fund are used efficiently and according to the principles of results based management;
- Preparing for the International Conference on Nuclear Security 2024 through the activities of the Programme Committee with the active involvement of Member States and relevant international organizations;
- Continuing strengthening 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; and
- Continuing to provide assistance regarding the safety and nuclear security of 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 2023,* intends to complement the *Nuclear Security Report 2023*, which focuses on the activities undertaken by the Agency to implement the relevant General Conference resolutions and covers the period 1 July 2022 to 30 June 2023. The Agency conducted bilateral and multilateral meetings, including a meeting with the Group of 77 (G-77) in April 2023, at which matters related to the Nuclear Security Review, the Nuclear Security Report and the Nuclear Security Plan were discussed. 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, has been considered in the development of the *Nuclear Security Report 2023* and the present report.

3. Global events in 2022, notably the conflict in Ukraine, have highlighted the importance of nuclear security. The Agency and Member States continue to place the safety and security of nuclear and radioactive materials and facilities 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 2022, the Agency began 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.

6. 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, as well as specialized agencies within the United Nations system, such as the United Nations Office of Counter-Terrorism, the United Nations Office on Drugs and Crime, and the United Nations Office for Disarmament Affairs, and has established formal arrangements for cooperation with a number of international organizations.

7. The Agency continued its efforts to strengthen international norms supporting nuclear security, including through activities that support States in joining relevant legally binding international instruments and implementing obligations thereunder, such as the Convention on the Physical Protection of Nuclear Material (CPPNM) and its Amendment. In March-April 2022, the Agency hosted a Conference of the Parties to the Amendment to the Convention on the Physical Protection of Nuclear Material pursuant to Article 16.1 of the CPPNM as amended. The conference reviewed the implementation of the CPPNM as amended and its adequacy as concerns the preamble, the whole of the operative part and the annexes in the light of the then prevailing situation.

8. Work on the Agency's nuclear security guidance continues to focus on enhancing the set of Nuclear Security Series publications. To ensure that the publications remain up to date, the Agency continued its review of the Nuclear Security Fundamentals and Recommendations with the aim of determining whether these publications should be updated in the near future.

9. The Advisory Group on Nuclear Security (AdSec) continues to advise the Director General on nuclear security matters, including on the Agency's nuclear security programme. AdSec and the International Nuclear Safety Group also highlighted the importance of the safety and security interface, and finalized a joint publication on the topic.

10. The Agency continued its systematic approach to external communication on nuclear security. This included providing nuclear security-related communications and outreach through different

channels, including social media. The Agency published 26 articles and 7 press releases on nuclear security-related topics on its website. Nuclear security was also mentioned in many Agency communications and outreach materials not primarily focused on nuclear security.

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

12. Information and computer security remain 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, other fuel cycle and spent fuel storage facilities, non-power reactors, radioactive source applications, novel advanced reactors, including small and medium sized or modular reactors (SMRs), and decommissioned nuclear facilities. Vulnerability to theft and/or manipulation of sensitive information or operational technology via cyberattack is a challenge across all aspects of the digitally connected world.

13. Increased interest in SMRs will likely require new approaches to security and the development of guidance, tools and human resources to handle challenges related to the secure deployment of SMRs. Nuclear security is being considered in the Agency's Nuclear Harmonization and Standardization Initiative (NHSI), and security experts are engaged in all aspects of the initiative.

14. Recognizing that advances in science, technology and engineering present opportunities to enhance nuclear security, and aware of the need to address existing, evolving and emerging challenges, and threats to nuclear security, the Agency develops tools to assist States in addressing nuclear security challenges. These forward-looking tools and expert capacity building activities, include smartphone applications to assess radiation alarms caused by persons, vehicles and cargo, and a freely available software system to securely connect radiation detectors to State-controlled command centres for oversight of nuclear security detection operations.

15. The Agency receives a high volume of requests for support in education and training across all technical areas of nuclear security. To address these requests and to help States establish and sustain national nuclear security regimes more broadly, the Agency places considerable emphasis on its human resource development programme. Training activities based on a systematic approach support 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.

16. The Agency continues to establish its Nuclear Security Training and Demonstration Centre (NSTDC) at its Seibersdorf laboratories. Once completed, the NSTDC will complement training opportunities offered in Member States and Nuclear Security Support Centres, and will enhance nuclear security capacity building through the use of advanced technology and expertise.

17. Increasing diversity in nuclear security - in terms of both geographic and gender representation - remains important to Member States and the Agency. Efforts to increase representation are well received. In 2022, the Agency continued to promote gender parity and equality in the nuclear sector through two major programmes - the Women in Nuclear Security Initiative and the Marie Skłodowska-Curie Fellowship Programme.

18. Member States continue to benefit from the Agency's expert missions and the Integrated Nuclear Security Support Plan (INSSP) programme. When used together, INSSPs and missions enable a systematic review of a State's national nuclear security regime and tailored recommendations to strengthen the regime and target assistance requests.

19. Over the past five years, the top three areas of needs identified by States within the framework of the INSSP programme, in order of importance, are: physical protection regimes (in particular the security of radioactive material and transport security of both nuclear and other radioactive material); sustaining national nuclear security regimes (in particular computer and information security, education and training, and nuclear security culture); and legislative and regulatory frameworks (in particular the development/revision of nuclear security regulations, raising the awareness of senior officials and decision makers, and technical reviews of draft nuclear laws). The needs expressed for 2023-2024 point to a continued focus on these three areas.

20. The Incident and Trafficking Database (ITDB) continues to serve as a valuable resource in the exchange of information. Through the ITDB, States voluntarily report incidents of nuclear and other radioactive material out of regulatory control. The number of reports continues to follow historical averages. Analysis of the ITDB allows for identification of trends in vulnerabilities, and areas for increased focus and efforts to expand security.

21. The Agency's programme to support States' major public events (MPEs) is supporting a wide variety of MPEs, from large sporting events to major international conferences, such as the 27th session of the Conference of the Parties of the United Nations Framework Convention on Climate Change, and international cultural and religious events.

22. Efforts by the Secretariat to engage in collaborative projects across Agency disciplines have been met with high regard. Examples of such projects include regulatory infrastructure development projects, the project "Enhancing Nuclear Security through the Sustainable Management of Disused Sealed Radioactive Sources", and the pilot borehole disposal project in Ghana and Malaysia, as well as activities related to the Code of Conduct on the Safety and Security of Radioactive Sources.

23. 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 Nuclear Security Fund (NSF). Interactions with States are facilitated through nuclear security support arrangements between the Agency and individual 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 enhance the effectiveness of the Agency-wide programme on nuclear security and enable the efficient use of resources.

24. In 2022, the Agency received contributions to the NSF from Member States. The total revenue in 2022 was €29 million.[1] The Agency is committed to utilizing contributions to the NSF in an expedient and prudent manner. Expenditures increased in 2022 following a period of restrictions owing to the COVID-19 pandemic.

25. The Agency remains committed to providing guidance and assistance for Member States to establish 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 and responding to potential nuclear security events.

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[1] For purposes of this report, ‘revenue’ refers to funds that have been recognised as revenue and deferred revenue in accordance with the International Public Sector Accounting Standards.

Abbreviations

A/CPPNM	Amendment to the Convention on the Physical Protection of Nuclear Material
AdSec	Advisory Group on Nuclear Security
AI	artificial intelligence
CFSIs	counterfeit, fraudulent and suspect items
CPPNM	Convention on the Physical Protection of Nuclear Material
CRP	coordinated research project
DBT	design basis threat
DSRS	disused sealed radioactive source
I&C	instrumentation and control
INSAG	International Nuclear Safety Group
INSEN	International Nuclear Security Education Network
INSServ	International Nuclear Security Advisory Service
INSSP	Integrated Nuclear Security Support Plan
IPPAS	International Physical Protection Advisory Service
ITDB	Incident and Trafficking Database
M-INSN	Mobile-Integrated Nuclear Security Network
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
NPP	nuclear power plant
NSF	Nuclear Security Fund
NSGC	Nuclear Security Guidance Committee
NSS	Nuclear Security Series
NSS-OUI	Nuclear Safety and Security Online User Interface
NSSC	Nuclear Security Support Centre
NSSC Network	International Network for Nuclear Security Training and Support Centres
NSTDC	Nuclear Security Training and Demonstration Centre

NUSEC	Nuclear Security Information Portal
NUSIMS	Nuclear Security Information Management System
PAAT	Personnel Alarm Assessment Tool
RIDP	Regulatory Infrastructure Development Project
RISS	Advisory Mission on Regulatory Infrastructure for Radiation Safety and Nuclear Security
RPM	radiation portal monitor
SAT	systematic approach to training
SMRs	small and medium sized or modular reactors
TECDOC	IAEA Technical Document
TRACE	Tool for Radiation Alarm and Commodity Evaluation
UAS	uncrewed aerial system
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 2022, there were 164 Parties to the CPPNM, a number that has remained stable since 2021. The A/CPPNM was adopted on 8 July 2005 and entered into force on 8 May 2016. As of December 2022, there were 131 Parties to the A/CPPNM, an increase of 4 compared to the end of 2021. In 2022, the Agency further increased the number of national and regional workshops promoting 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.

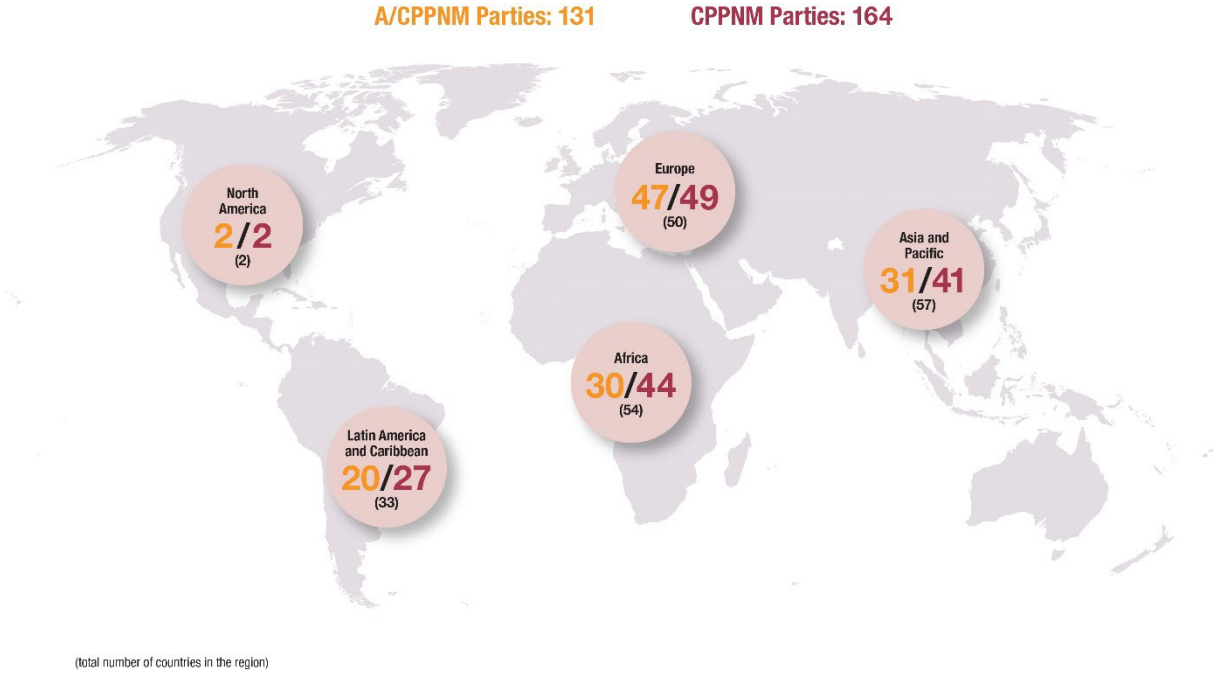

Figure 1: A/CPPNM and CPPNM Parties in 2022.

3. 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. As of December 2022, 76 States had informed the Agency of their laws and regulations

in accordance with Article 14. This represents an increase of 11 compared to the end of 2021. In the reporting period, 3 more States provided the Agency with details of their CPPNM and/or A/CPPNM Points of Contact, bringing the total number of Points of Contact and Central Authorities designated under Article 5 to 133.

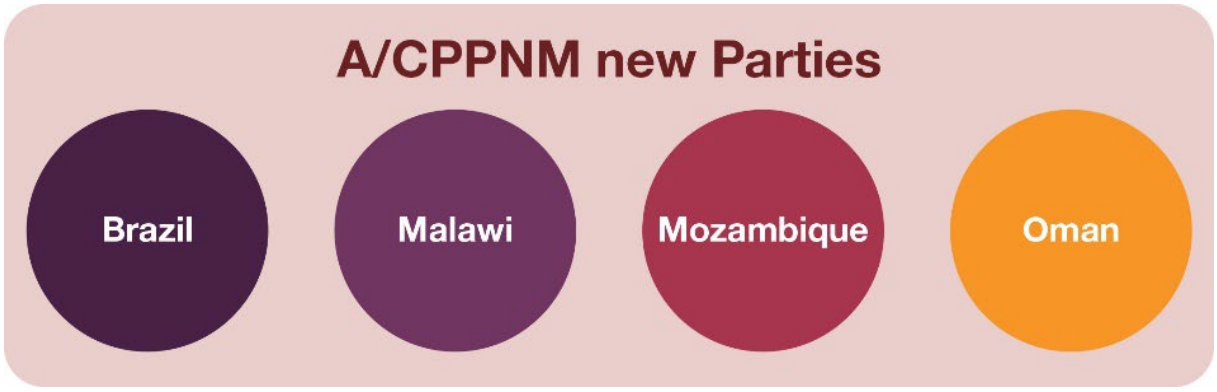

Figure 2: A/CPPNM new Parties in 2022.

Related Activities

4. ***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:***

- 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 and technical experts, as well as through other targeted activities;
- 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

5. The Agency continues to place considerable emphasis on the development and publication of comprehensive guidance as part of the Nuclear Security Series (NSS), with the involvement of Member States, including through the Nuclear Security Guidance Committee (NSGC) and in accordance with the road map drawn up in consultation with the NSGC. 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.

6. Work on the Agency's nuclear security guidance continues to focus on further enhancing the set of NSS publications. To ensure that the publications remain up to date, the Agency continued its review of the Nuclear Security Fundamentals and Recommendations publications with the aim of determining whether these publications should be updated in the near future.

Figure 3: NSS publications.

7. Member States remain committed to ensuring the physical protection of nuclear and other radioactive material, as evidenced through continued requests from Member States for Agency missions to support this area.

- Member States continue to request International Physical Protection Advisory Service (IPPAS) missions. In 2022, the Agency conducted one IPPAS mission. Since 1996, a total of 98 IPPAS missions have been conducted, upon request, in 57 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 Point of Contacts in States.
- Member State interest in the International Nuclear Security Advisory Service (INSServ) continues. In 2022, the Agency conducted three INSServ missions based on the revised INSServ guidelines published in 2019, and the same number of missions is anticipated to be conducted in 2023. Since 2002, a total of 80 missions have been conducted, upon request, in 66 Member States.
- In March 2022, the Agency initiated a new service, the Advisory Mission on Regulatory Infrastructure for Radiation Safety and Nuclear Security (RISS). Six missions were conducted through the year in the framework of the Regulatory Infrastructure Development Project (RIDP).

Figure 4: Security related missions in 2022.

Related Activities

8. ***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 to gather and analyse feedback from Member States on the application of the top tier of the NSS — the Nuclear Security Fundamentals and three Recommendation-level publications — to determine whether any revisions are needed in the near term, taking into account NSGC recommendations in this regard;
- Continue to implement IPPAS, INSServ and RISS missions, upon request; and
- Continue to analyse data and feedback from Member States to increase the effectiveness of IPPAS, INSServ and RISS missions, including the maintenance and updating of good practices and lessons learned, as well as the development of self-assessment tools.

A.3. Assessing Nuclear Security Needs and Priorities

Trends

9. The development and implementation of Integrated Nuclear Security Support Plans (INSSPs) continue to be a high priority. INSSPs assist States, upon request, in applying a systematic and comprehensive approach to enhancing their nuclear security regimes. Targeted assistance is provided to States, upon request, to address needs identified within the INSSP framework and in line with emerging and existing Member State priorities, in line with the INSSP review cycle.

10. In 2022, the total number of States with approved INSSPs remained at 92 (no change from 2021). As of 31 December 2022, there were 16 INSSPs awaiting Member State acceptance and 5 INSSPs at the initial drafting stage. This illustrates States' continued interest in strengthening their national nuclear security regimes.

11. Over the past five years, the top three areas of needs identified by States within the framework of the INSSP in order of number of identified needs are:

- Physical protection regimes (in particular, the security of radioactive material and transport security of both nuclear and other radioactive material);
- Sustaining national nuclear security regimes (in particular, computer and information security; education and training, and nuclear security culture); and
- Legislative and regulatory framework (in particular, development or revision of nuclear security regulations, raising awareness among senior officials and decision makers, and technical reviews of draft nuclear laws).

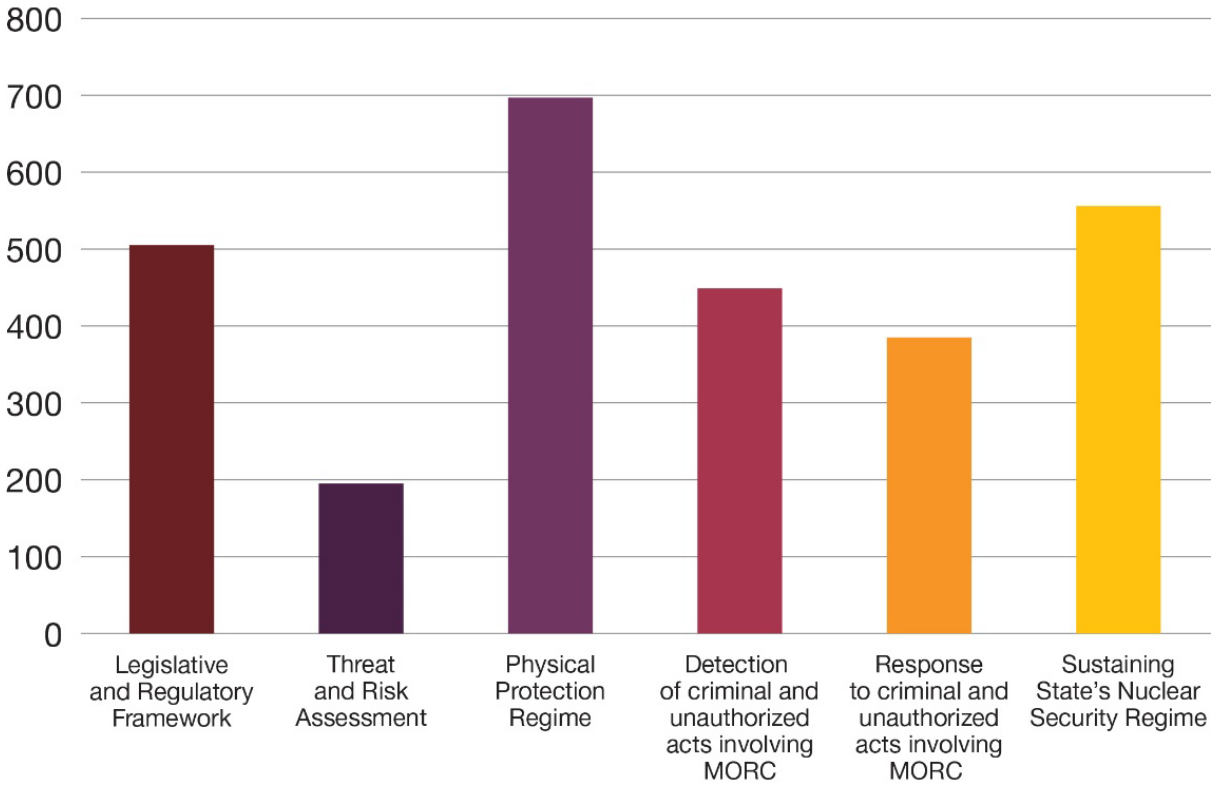

Figure 5: Needs expressed by States through the INSSP process, 2018-2022.

12. In 2022, the number of requests in five of the six functional areas that currently constitute the INSSP increased as compared to 2021. The number of requests within the area of threat and risk assessment remained constant. With the exception of detection of criminal and unauthorized acts involving material out of regulatory control (for which the relevant guidance had already been translated into Arabic, French, and Spanish), the functional areas were covered in NSS guidance publications that were translated into Arabic, Chinese, French, Russian and Spanish in 2022.

13. Member States continue to request Agency assistance to enhance their nuclear security regimes and continue to utilize, on a voluntary basis, the nuclear security self-assessment tool hosted on the web-based Nuclear Security Information Management System (NUSIMS). In total, 98 Member States have nominated points of contact for NUSIMS, a number that has remained stable since 2017.[2] NUSIMS self-assessment questionnaires were upgraded in 2022 for two Member States, and the results of questionnaires continue to be systematically used in INSSP finalization and review meetings.

Related Activities

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

- Further develop and improve the INSSP framework and methodology as a comprehensive tool to support the planning and prioritization of the provision of Agency nuclear security assistance to States, as well as to facilitate international cooperation and coordination in meeting States' nuclear security needs;

[2] This had previously been reported in the *Nuclear Security Review 2022* as 99 Member States owing to the erroneous inclusion of a test entry in the database.

- Continue to develop and promote self-assessment tools and methodologies that are based on NSS publications and can be used by States on a voluntary basis to perform self-assessments of their nuclear security regimes and implement activities to ensure effective and sustainable national nuclear security infrastructure;
- Finalize the restructuring of the NUSIMS self-assessment tool to increase its complementarity with the INSSP functional areas, improve the user-friendliness of the interface and maximize the use of a systematic, structured and comprehensive approach to strengthening a State's nuclear security regime; and
- Continue to conduct regional workshops to coordinate the implementation of INSSPs through provision of an overview of the current status at the regional level of nuclear security recommendations, determining common challenges and needs, and identifying potential projects and interested Member States and experts.

A.4. Capacity Building in Nuclear Security

Trends

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

- Member States continue to request assistance in establishing and enhancing educational programmes on nuclear security based on international guidance and recommendations by supporting the INSEN. Membership in INSEN increased by 11 institutions from 9 States and 3 observer institutions in 2022, for a total of 212 institutions from 70 States. Based on summary surveys in 2021 and 2022, there was an increase in the number of INSEN members offering new degree programmes in nuclear security. There was also an increase in the number of INSEN members teaching courses or modules in existing programmes.
- Member States continue to request assistance with the development of NSSCs as a means to strengthen the sustainability of nuclear security through programmes in human resource development, technical support and scientific support for the prevention and detection of, and the response to, nuclear security events.
- Member States continue to share information and resources to promote coordination and collaboration among States with an NSSC, or those with an interest in developing such a Centre, through the NSSC Network. The NSSC Network has grown since its inception in 2012, beginning with 29 Member States and now having representatives from 68 Member States and 10 observer organizations. This is an increase of 2 Member States and 1 observer organization in 2022.
- Agency Collaborating Centres[3], through research and development and training, continue to assist the Agency in building capacity regionally and internationally. Two new Member State institutions were designated in 2022, bringing the number of Collaborating Centres in different areas of nuclear security to ten. In 2022, there were 24 Agency training-related events in nuclear security hosted by Collaborating Centres, a marked increase over the 9 completed in 2021.

[3] Additional information about the Agency's Collaborating Centres can be found in Appendix C.

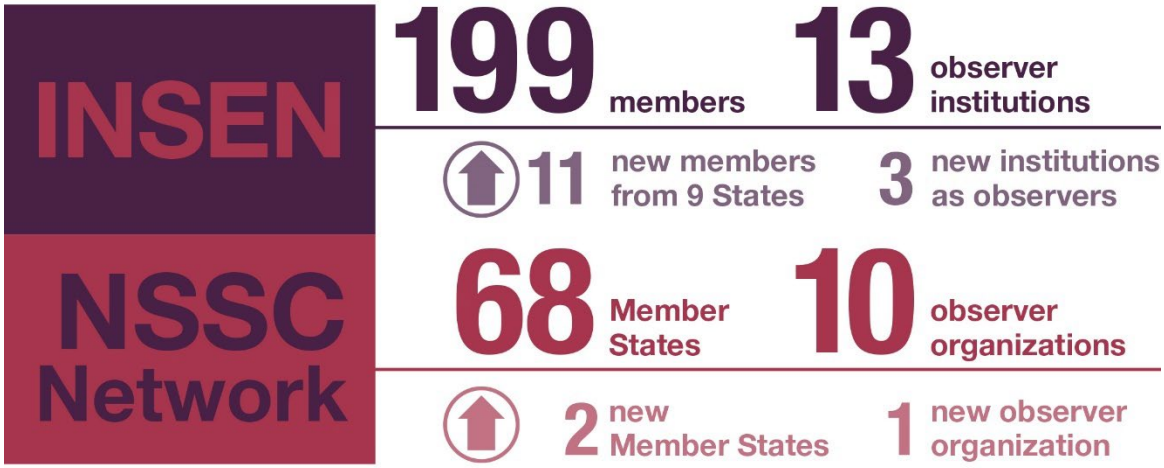

Figure 6: INSEN and NSSC Network in 2022.

16. Based on its analysis of the needs of Member States and capabilities of NSSCs in different regions, the Agency is building a Nuclear Security Training and Demonstration Centre (NSTDC) at its Seibersdorf laboratories. Construction of this specialized facility is under way, and the NSTDC is scheduled to be operational at the end of 2023. It will provide support to States through the use of state-of-the-art technical infrastructure and equipment.

Figure 7: The Agency's NSTDC.

17. Schools on Nuclear Security continue to be well attended. These Schools represent prominent Agency capacity building activities, and provide early career professionals from Member States with fundamental knowledge of nuclear security necessary to understand international requirements in this area, as well as the measures to be taken in order to meet any obligations under the international nuclear security legal framework.

18. Agency efforts to reduce disparities in workforce diversity, including gender equality and geographic diversity, have been well received. There are increasing numbers of women, as well as participants from a range of countries, in the Agency’s nuclear security training efforts.

19. The number of Agency nuclear security training activities (including training courses, workshops and schools) more than doubled between 2021 and 2022, from 59 to 123, while the number of webinars decreased from 51 to 17. The share of in-person training event participants nearly quadrupled (from 16% to 61%) in 2022, with 20 more countries (158 in total) represented at in-person events than in 2021. The increase in in-person training events and the decrease in webinars are due in some part to responses to the COVID-19 pandemic and reduced restrictions on travel and in-person gatherings in 2022. The Agency also observed a slight increase in the share of female participants in overall training activities, increasing from 23.91% in 2021 to 25.83% in 2022.

Figure 8: Security training in 2022.

20. Training on nuclear security topics is gradually shifting from the development of generalized competencies to job-specific training. Topical areas gaining high attendance include a practical introduction to nuclear forensics, protecting computer-based systems for nuclear security, and courses for front-line officers and regulatory bodies. Additionally, there is increased demand for training targeting senior and middle-level managers.

21. There is increased demand from Member States for e-learning modules that can be used for many purposes, including as a prerequisite for joining virtual training courses, as part of a hybrid learning approach, as a tool to bridge knowledge gaps, or as a self-study or knowledge-checking tool. In 2022, over 2200 users from 159 States completed more than 5100 e-learning modules, a 17% increase in the number of completions from 2021.

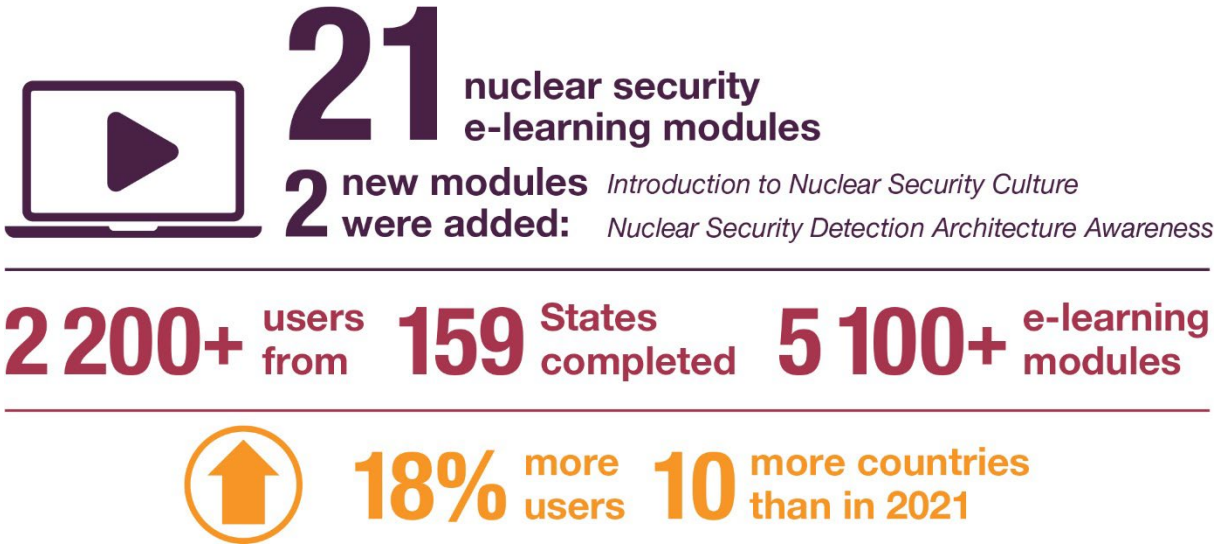

Figure 9: Nuclear security e-learning in 2022.

22. Feedback summaries received on the Agency's training courses, workshops, schools and webinars 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 106 training events conducted in 2022, was 4.75 on a scale of 1 ('poor') to 5 ('excellent'). This was a slight increase from the average rating of 4.70 in 2021. The increase in the average rating was most noticeable in the quality of training materials (from 4.62 to 4.71), followed by the quality of instructors and facilitators (from 4.71 to 4.79) between 2021 and 2022.

Related Activities

23. ***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 the development of a suite of training courses, based on NSS guidance and the results of gap analyses, to identify areas where new and updated training courses are needed, and make these training courses available for delivery, including through NSSCs;
- Implement train-the-trainer programmes to increase sustainability of capacity building efforts in nuclear security;
- Continue the establishment of the NSTDC at the Agency's Seibersdorf laboratories, ensuring engagement with Members States and with due consideration to the planning of resources for the long-term sustainability of the Centre;
- Conduct needs analyses biennially to update and adapt the NSTDC training programme to ensure that the optimal support is provided to States, and that it will complement and fill gaps in capabilities that do not commonly exist among institutions in States, including NSSCs;
- Continue to assist States in establishing and implementing nuclear security education programmes through INSEN; and
- Continue to assist States in developing NSSCs to facilitate regional and international cooperation in human resource development, technical support and scientific support for nuclear security.

A.5. Information and Computer Security

Trends

24. Member States continue to recognize the threat of cyberattacks and their potential impact on nuclear security, as well as the need to take effective security measures against such attacks. Member State demand for assistance in the area of information and computer security, including requests for support for developing computer security regulations, has increased and is expected to continue rising. In 2022, the Agency conducted 46 computer security-related events, which is a 28% increase over 2021, with the majority focusing on national-level support for computer security regulations/inspections and computer security exercises.

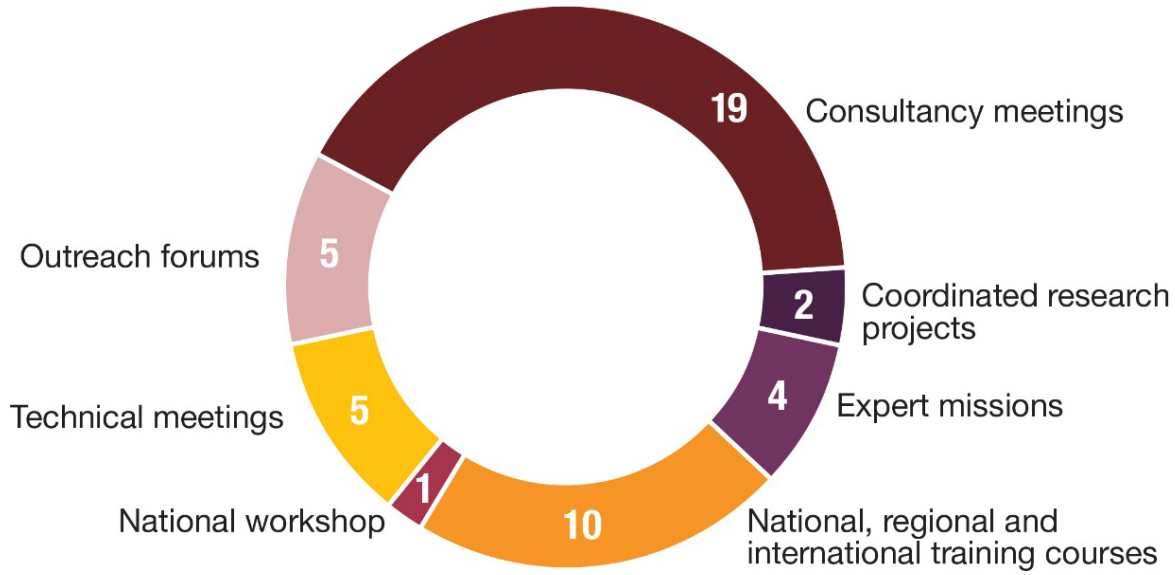

Figure 10: The Agency's computer security-related events in 2022.

25. Artificial intelligence (AI) based approaches to nuclear technologies are emerging in applications, methodologies, and software-based tools to improve reactor design and operation. AI applications are being used to enhance efficient operations and to detect anomalies and track complex problems for safety and security solutions. Expanded use of AI will increase vectors for potential computer and information security vulnerabilities and threats.

26. The Agency continued its initiative to explore computer security aspects of small and medium sized or modular reactors (SMRs) and microreactors (MRs). Increased digital automation, unique environmental conditions, remote supervisory control and remote maintenance, and reduced on-site staffing, reinforce the need for instrumentation and control (I&C) solutions that incorporate computer security measures. These measures need to be considered and maintained during the SMR and MR life cycles, from design to operation and decommissioning. 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 cyberattacks and the increasing difficulty for qualification of safety I&C systems, it is important that the Agency will continue to support SMR and MR computer security activities to address these challenges.

Related Activities

27. ***The Agency will continue assisting Member States in raising awareness of the threat of cyberattacks, and their potential impact on nuclear security, by promoting a nuclear security culture and supporting 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 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;
- Further improve international cooperation in the area by bringing together experts and policymakers to promote the exchange and sharing of information and experiences in computer security for nuclear security;
- Continue research to address computer security for nuclear security topics, including through coordinated research projects (CRPs);
- Continue to explore AI applications in order to address challenges, including issues with transparency, trust and software-based security protection to help ensure safe and secure uses of AI in nuclear technologies, including SMRs and MRs;
- Further develop training tools, including hands-on exercises and demonstrations to support Agency training on computer security for nuclear security, and to raise awareness of the threat of cyberattacks, and their potential impact of nuclear security; and
- Host the International Conference on Computer Security in the Nuclear World: Security for Safety in June 2023.

A.6. Information Exchange and Sharing

Trends

28. Secure web-based systems provide valuable information exchange services to States. A growing number of registered users are using the Nuclear Security Information Portal (NUSEC) which is a web-based information tool for Member States that supports the exchange of information across the nuclear security community. In 2022, more than 601 new users were approved for access to NUSEC. In total, NUSEC has more than 7100 registered users from 177 Member States and 23 international organizations and non-governmental organizations.

29. 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 represent a valuable key component of information exchange. In the period between the inception of the ITDB in 1993 and 31 December 2022, States had reported — or otherwise confirmed to the ITDB — a total of 4075 incidents. 146 incidents were newly reported to the ITDB in 2022, an increase of 26 incidents from 2021.

30. The number of incidents reported by participating States to the ITDB demonstrates that illicit trafficking, thefts, losses and other unauthorized activities and events involving nuclear and other radioactive material continue to follow historical averages.

Figure 11: Incidents reported to the ITDB in 2022.

31. Five of the newly reported incidents were related to trafficking, three of which involved scams (including attempts). All of the material involved in these trafficking related incidents was seized by the relevant competent authorities within the reporting State. No incidents involved plutonium, highly enriched uranium, or Category 1 sources. No incidents involved 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.

32. In 2022, there were 23 reported incidents in which the intent to conduct trafficking or malicious use could not be determined. These included 15 thefts. In 13 of these thefts, the materials had not been recovered at the time of reporting. In 1 of these 15 incidents, the unrecovered materials involved a Category 3 source; the other 14 incidents involved sources that were a risk lower than Category 3.

33. In 2022, there were also 118 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 discovery, unauthorized shipments, unauthorized or undeclared storage, unauthorized disposal, unauthorized possession and loss of material. There were also five 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 118 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.

34. Overall, during the reporting period, there were 20 thefts, the majority of which (18) involved Category 4–5 sources used in material analysis and industrial applications. The other two thefts involved Category 3 sources. Historically, the recovery rate for Category 1–3 sources is high, but the rate has been much lower for Category 4–5 sources.

Related Activities

35. ***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 management and support of activities relevant to nuclear security information exchange and sharing, with due respect to confidentiality, including through convening conferences, working group meetings, and other information and technical exchanges on nuclear security matters;
- Continue to play a central and coordinating role in nuclear security activities among international organizations and initiatives, taking into account their respective mandates and memberships, and working jointly, as appropriate, with relevant international and regional organizations and institutions, including through regular Information Exchange Meetings and the coordination of cooperation and complementary activities between NSSCs;
- Continue the maintenance and further enhancement of a comprehensive and secure information management system to provide users with accurate relevant information;
- Further facilitate, including through designated points of contact, the exchange of information through secure electronic access to information contained in the ITDB; and
- Continue outreach to Member States that do not participate in the ITDB to encourage their participation.

A.7. Nuclear Security Research and Emerging Technologies

Trends

36. Member States continue to express increasing concerns in relation to existing and emerging nuclear security threats. The Agency continues to undertake efforts to assist States, and anticipate needs, to address current and evolving challenges to nuclear security, including through CRPs. The topical proposals received from Member States continue to provide insight into nuclear security needs. The Agency's activities and support for the development of tools and processes enable nuclear security arrangements to be effectively implemented and sustained, often using solutions developed in conjunction with Member States.

Figure 12: Security related CRPs in 2022.

37. Agency activities in 2022 were diverse, based on input and interest from Member States, and included areas such as uncrewed aerial, ground and maritime systems; counterfeit, fraudulent and suspect items; active interrogation technologies; and AI technologies. Member States also continue to express needs for 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.

38. Increased Member State demand for support for command and control over radiation detection equipment during operations led to the development of the Mobile-Integrated Nuclear Security Network (M-INSN). Examples of operational needs include activities such as nuclear security for major public events, radiation source searches, and border monitoring and national inventory management. This secure system makes it possible to network individual detectors to command locations in countries, enabling the coordination, management and oversight of radiation detectors deployed for security as well as safety purposes. The M-INSN is a vendor neutral system, developed by the Agency, that Member States can operate on a local, regional or national level. In 2022, M-INSN was deployed in two Member States.

39. Member States continue to enhance their technical capabilities using the outcomes of completed CRPs, including the smartphone application Tool for Radiation Alarm and Commodity Evaluation (TRACE). By December 2022, the TRACE mobile application had a total user base of more than 17 000 users in 175 countries, representing an increase of 15 countries and several thousand users since the end of 2021.

Figure 13: Detection tools in 2022.

40. 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 a

smartphone application that easily guides front line officers through an assessment process that provides a consistent and defensible science-based evaluation.

Related Activities

41. ***The Agency will continue implementing CRPs to promote research and development in the area of nuclear security and will assist Member States in utilizing the outcomes of the CRPs for enhancement of States' technical capabilities. The Agency is planning to undertake the following related activities:***

- Continue to keep abreast of scientific, technological and engineering innovations, including through dialogues with Member States and, as appropriate, with the nuclear industry, with a view to confronting current and evolving challenges and threats to nuclear security, and also considering opportunities to enhance nuclear security from these innovations;
- Continue to initiate and manage CRPs to address emerging nuclear security threats and technologies identified through relevant conferences, Information Exchange Meetings and Technical Meetings, with due attention to the possibility of shortening the duration of project activities in order to quickly provide guidance, specifications, best practices and new tools, where appropriate, on focused topical areas of high priority;
- Continue to expand the equipment types and manufacturers that are integrated into M-INSN, including non-radiation detection equipment, as well as to expand analysis capabilities by integrating other tools;
- Continue to support and enhance the first freely available tool for Member States to characterize their radiation portal monitors (RPMs) and determine the alarm thresholds necessary for detection of Member State determined minimum detectable quantities (MDQs); the Agency's MDQ 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;
- Continue to enhance understanding and applications of new technologies and emerging threats ranging from portable active interrogation devices to uncrewed systems; and
- Provide RPM kits to Member States, including through NSSCs, upon their request, to support the sustainment of their RPMs; and provide initial support through train-the-trainers activities for developing and maintaining Member States' expert capacities for repairing and calibrating their detection equipment.

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

42. 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.

43. Important nuclear security elements include: 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.

44. 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 materials, facilities and activities is anticipated to continue.

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

46. Agency assistance is used by Member States to characterize and assess threats; the develop, use and maintain design basis threats or representative threat statements; conduct vulnerability analyses; and the develop methodologies for performance assessment of physical protection systems.

47. Member States continue to support the Agency's efforts to enhance States' understanding of nuclear security culture and its application in practice.

48. 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.

Related Activities

49. ***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;
- Continue to support Member States in the implementation of nuclear security activities for the whole nuclear fuel cycle, including support for capacity building activities; and
- Continue to assist Member States, upon request, in the development and consolidation 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

50. The growing participation of Member States in Agency activities related to SMRs reflects Member States' strong interest in various designs of SMRs 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, including the safety, security and safeguards by design of novel advanced reactors.

51. Development of SMR technology and the unique characteristics of SMRs are leading to increased interest in, and the need for guidance related to, protecting facilities and materials 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, such as artificial intelligence, computer modelling and simulations, infrared cameras and uncrewed aerial vehicles.

52. Members of the SMR Regulators' Forum have acknowledged the need to enhance their international cooperation in dealing effectively with regulatory challenges associated with the formulation of a balanced and risk informed approach to the implementation of nuclear security measures in decision making, planning and design activities over the life cycle of SMRs in order to achieve the secure deployment of SMRs at the global level.

53. Security issues are an important consideration for SMR development and for the Agency's Nuclear Harmonization and Standardization Initiative (NHSI). This initiative is seeking to increase regulatory collaboration among Member States to avoid duplication of regulatory efforts, increase efficiency and facilitate the attainment of common regulatory positions without compromising nuclear safety, nuclear security or national sovereignty.

54. The development of new types of nuclear fuels for different types of reactors, including SMRs, high temperature gas reactors and molten salt reactors, will call for considerations with regard to potential new security challenges for facilities, transport and waste storage.

Related Activities

55. 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 the development of publications addressing nuclear security of SMRs by identifying specific features of SMRs, analysing and synthesizing the existing NSS publications considering how the specific features of SMRs may affect the implementation of nuclear security recommendations for such reactors;
- Continue to highlight nuclear security challenges and considerations in Agency efforts on SMRs, including the NHSI;
- Develop guidance to ensure facility and material security related to the potential deployment of nuclear fusion based reactors; and
- Organize a Technical Meeting on Instrumentation and Control and Computer Security for Small Modular Reactors and Microreactors.

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

Trends

56. 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 the threat posed by insiders. Nuclear material accounting and control and measures to address insider threats share the common goal of preventing or mitigating the unauthorized removal of nuclear material or sabotage.

57. Training courses and consultancy meetings on the topic of nuclear material accounting and control are well attended and enhance Member State understanding and collaboration. Interactive training, including gamification, virtual reality and video-based training tools that utilize the simulated Shapash Nuclear Research Institute, is in high demand.

Related Activities

58. 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 States in establishing effective and sustainable national nuclear security regimes that enhance accounting and control for nuclear security purposes at facilities to mitigate insider threats; and
- Further develop training tools, including gamification, virtual reality and video-based training tools using the simulated Shapash Nuclear Research Institute.

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

Trends

59. 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*, 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.

60. In the period 1993–2022, Member States reported to the ITDB 650 thefts of material, 52% of which occurred during transport and, in 57% of these transport related cases (191 incidents), the stolen radioactive material was reported as unrecovered at the time of reporting.

61. 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. Four Member States were supported in finalizing the draft regulations on security of radioactive material in transport in 2022.

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

Related Activities

63. 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:

- Continue supporting Member States' transport security regime development, upon Member States request, through the assistance in drafting transport security regulations, providing capacity building to regulators on inspection and to carriers on transport security planning, and evaluating the effectiveness of transport security regimes through exercises; and
- Continue the development of publications within the NSS in the area of the secure transport of nuclear and other radioactive material.

B.2. Security of Radioactive Material[4] 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

64. There is an increased demand by States for assistance in the area of radioactive material security, with emphasis on regulatory infrastructure and risk reduction activities, such as physical protection enhancements, including activities complementing the technical assistance provided under the Agency's

[4] 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).

technical cooperation programme, and the life cycle management of high activity radioactive sources. In 2022, Agency assistance supported the removal of 21 high activity radioactive sources from 4 States.

65. The number of Member States benefiting from the Agency's assistance in enhancing radiation safety and nuclear security through the RIDP continues to grow; 68 States participated in 2022, which is 15 more participating States than in 2021.

66. Ensuring safe and secure management options for disused sealed radioactive sources (DSRSs) remains an important priority for Member States, as an increasing number of radioactive sources are reaching the end of their useful life. In 2022, the number of States benefiting from comprehensive assistance to ensure the safe and secure management of high activity DSRSs, including their repatriation or removal to authorized recipients, increased from 19 to 33.

67. Member States continue to express interest in sharing experiences related to the security of radioactive material, including on approaches to provide cradle-to-grave security. This topic of lifecycle security is expected to garner increased attention as global demand for radioactive sources, particularly for medical and industrial applications, grows.

Related Activities

68. ***The Agency will continue assisting States in the security of radioactive material and associated facilities, including in the life cycle management of radioactive material. 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; in strengthening their physical protection measures at facilities with high activity radioactive sources in use or storage; and in enhancing safe and secure management of sealed radioactive sources through the provision of comprehensive guidance, technical assistance, Technical Meetings, regional and national workshops and training courses, and peer review and advisory missions;
- Continue assistance to States through the project entitled "Strengthening Physical Protection at Facilities with High Activity Radioactive Sources in Use and Storage towards Enhancing Nuclear Security Globally", and increase the number of States benefiting from this project, upon their request; and
- Continue to assist States, upon request, with the aim of, inter alia, enhancing national regulatory infrastructures and building national capacities needed to ensure the safe, secure and sustainable management of disused sources, as well as the removal and repatriation of high activity disused sources, notably through the implementation of projects addressing borehole disposal and assisting in the safe and secure storage of disused radioisotope thermoelectric generators.

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

Trends

69. Efforts to strengthen international norms supporting nuclear security also 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.

70. Commitment to implement the Code of Conduct on the Safety and Security of Radioactive Sources is expanding. In 2022, 5 Member States made a political commitment to implement the Code, bringing the total number to 144.

71. Six 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 128. Three additional Member States nominated points of contact for facilitating the import and export of radioactive sources, increasing the total number of Member States that have done so to 148.

72. Eight 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 50.

Related Activities

73. ***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 developing plans for the life cycle management of disused radioactive sources and to meet 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

74. 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 material out of regulatory control (MORC). Using a ‘road map approach’, 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.

75. In 2022, five Member States benefited from the Agency’s assistance in this area, which is comparable with the level of support provided in previous years. In 2022, three more Member States developed road maps, bringing the total number of Member States utilizing the road map approach for developing plans and procedures for response to criminal or intentional unauthorized acts involving MORC to seven.

Related Activities

76. ***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 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; and
- Continue to support Member States in establishing and sustaining effective nuclear security infrastructure.

C.2. Nuclear Security Detection Architecture

Trends

77. Member States continue to request guidance, training and assistance to establish and sustain their capabilities for detecting and responding to criminal or intentional unauthorized acts involving MORC. In 2022, 5 additional States from the Africa region drafted their road maps for the design and implementation of their national nuclear security detection architectures, bringing the total number of Member States utilizing the road map approach for nuclear security detection architecture to 36.

78. There is increased demand for the Train-the-Trainers Course for Instructors of Front Line Officers on the Detection of Nuclear and Other Radioactive Material out of Regulatory Control. Seven Member States participated in the course in 2022. Since its inception, the curriculum has evolved to address Member State interests and needs. The current curriculum was implemented in 2018, and, to date, 62 instructors from 21 countries have been trained through 4 such training courses. These trainees are now ready to train front line officers in their own countries.

79. 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 major public events (MPEs), and training in radiation detection equipment operation, frontline maintenance and calibration. In 2022, 7 Member States received equipment through a loan process, while 4 others received donations of equipment; 655 items of equipment in total were loaned from over 1000 items of nuclear security detection and monitoring equipment maintained by the Agency. In 2022, the Agency's equipment laboratory held six training events.

Related Activities

80. ***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 the development of publications within the NSS on nuclear security detection and response architecture;
- Continue to support activities implemented to assist 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. Major Public Events

Trends

81. Requests to support States' MPEs continue to be received for an expanding variety of types of events. Launched in 2004, the programme is currently supporting a wide variety of MPEs, from large sporting events to major international conferences, such as the 27th session of the Conference of the Parties of the United Nations Framework Convention on Climate Change (COP27), and international

cultural and religious events. The Agency's support to COP27 in Egypt was delivered in response to the first request for support for the implementation of nuclear security measures at such a globally significant MPE. The Agency was requested to provide similar support to COP28, to be held in 2023 in the United Arab Emirates.

82. The programme to promote nuclear security in major urban areas continues to be implemented, with great interest from Member States. The programme focuses on raising awareness and providing guidance to inform responsible authorities about, inter alia, the importance of nuclear security, the reality of high consequence threats and the need for necessary resources. The programme also highlights the importance of, and provides models for, interagency cooperation and information sharing for security measures.

83. There is increased Member State demand for support in strengthening the implementation of nuclear security measures before and during MPEs. In 2022, the Agency provided support for 9 MPEs in 8 Member States, and loaned 911 items of radiation detection equipment. This was an increase compared to 2021, when the Agency supported 8 MPEs and loaned 761 items of hand-held detection equipment. Arrangements are already under way for Agency support to three Member States for MPEs in 2023.

84. There is interest from Member States in sharing experiences and learning about how to integrate nuclear security into MPEs. In cooperation with the host Member States, the Agency is developing a number of MPE reports, detailing the support provided, the nuclear security measures implemented and the lessons learned during MPEs, through which information and the experiences of host Member States can be shared for the benefit of all States wishing to host MPEs in the future.

Related Activities

85. ***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 States, upon request, in the preparation and conduct of MPEs, through the implementation of training activities, technical visits, expert missions and free-of-charge loans of radiation detection equipment;
- Refine its programme of assistance in relation to MPEs by establishing a comprehensive MPE programme at the NSTDC, which will comprise training courses and workshops, demonstrations and exercises, and cover a wide range of scenarios at different types of MPEs, including an awareness programme for senior officials on nuclear security measures for MPEs; and
- Develop Agency reports, in cooperation with Member States hosting MPEs, describing individual MPEs, associated nuclear security arrangements and lessons learned from the preparation and conduct of those MPEs.

C.4. Radiological Crime Scene Management and Nuclear Forensics Science

Trends

86. Building capacity in the fields of radiological crime scene management and nuclear forensics science remains important to Member States based on needs expressed to the Agency.

87. Assistance requests for supporting the development and sustainability of national nuclear forensics capabilities as part of a nuclear security infrastructure are regularly received.

88. Links between nuclear forensics and traditional forensics and investigation through information exchange channels between judicial authorities or other investigative bodies are being built. Similarly,

a need exists to build strong links between the scientific, law enforcement and prosecutorial communities.

89. Interest continues in scientific research and development on in-field techniques and methods, new methods for origin assessment of nuclear or other radioactive material collected at radiological crime scenes, and signature study for sealed radioactive sources.

Related Activities

90. ***The Agency will continue assisting Member States in building capacities for managing radiological crime scenes, 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:***

- Continue to develop publications within the NSS, as well as technical documents, on radiological crime scene management and nuclear forensics science to support law enforcement and nuclear security vulnerability assessments as required to investigate a nuclear security event; and
- Continue to provide capacity building activities to States upon request in the areas of radiological crime scene management and nuclear forensics science, including demonstrations, exercises, training courses, and fellowship programmes.

D. Nuclear Security Interfaces

91. Member States continue to encourage the Secretariat to facilitate a coordination process to address safety and security interfaces, while recognizing their distinctions.

92. The Advisory Group on Nuclear Security (AdSec) continues to advise the Director General on nuclear security matters, including on the Agency's nuclear security programme. The AdSec and the International Nuclear Safety Group (INSAG) continue to support efforts to facilitate an improved safety and security interface. The groups are working together as evidenced by the completion of a joint publication on the topic, which has been approved for publication.

93. Some Member States expressed an interest in considering the application of a holistic approach to safety–security–safeguards by design for nuclear installations and nuclear fuel cycle facilities, without prejudice to Member States' legal commitments, the IAEA Statute and the relevant General Conference Resolutions. There is strong emphasis on this topic in relation to SMRs, in the early stages of the design process, as well as in sharing experience in the development of technical publications and organizing educational and training activities.

94. The Secretariat's efforts to promote collaboration and synergies within the Agency are widely welcomed by Member States, including through the provision of nuclear security support to complement the Agency's technical assistance. Some examples of this work include the Rays of Hope initiative, the Agency's flagship borehole disposal project, the development of the Personnel Alarm Assessment Tool and the maintenance of the Agency's library of medical isotopes.

95. Member States continue to express interest in expert knowledge and understanding of cross-cutting nuclear science and technology applications, such as the use of uncrewed aerial systems for radiation detection and surveillance, the use of high-resolution radiation detectors, the use and enhancement of freely available gamma spectroscopy analysis tools, and active interrogation technologies that use neutron and X-ray emissions for detection of special nuclear material. The

Secretariat remains committed to working on Agency-wide projects, including continuing to host joint Technical Meetings, webinars and workshops on cross-cutting topics.

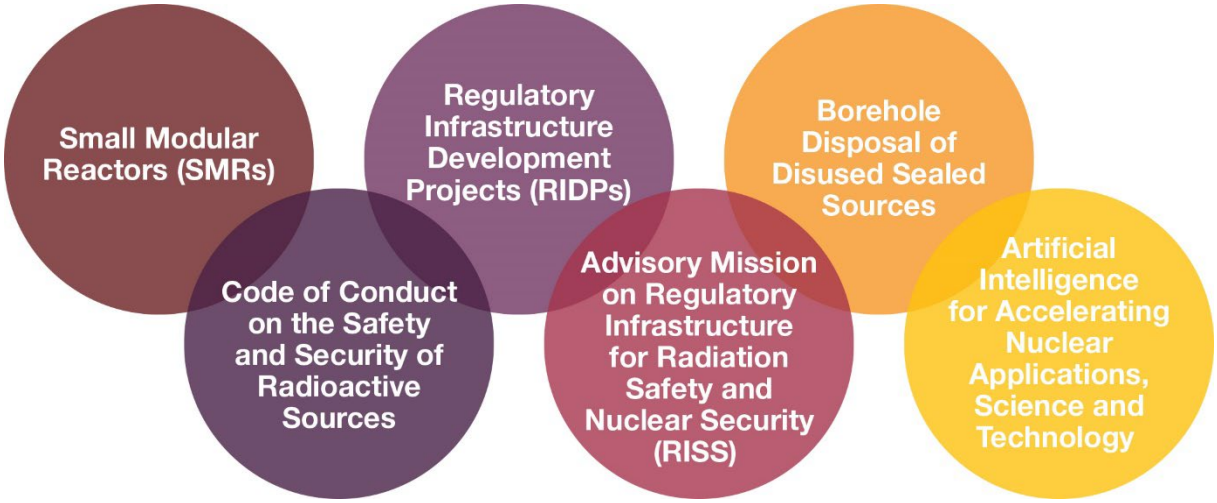

Figure 14: Areas of high effort in the security and safety interface.

Related Activities

96. ***The Agency will continue ensuring that the safety standards and nuclear security guidance take into account the implications for both nuclear safety and nuclear security, whenever appropriate, recognizing the distinction between nuclear safety and nuclear security. The Agency is planning to undertake the following related activities:***

- Continue to address, in close cooperation with Member States, the interfaces between nuclear safety and nuclear security, while recognizing their distinctions, and to develop safety and security publications and foster culture accordingly;
- Continue to support Member States in managing the interface between nuclear safety and nuclear security for nuclear installations, radioactive sources and transport by developing new guidance, revising relevant safety standards and holding training activities;
- Continue to create synergies between nuclear safety and nuclear security for nuclear installations by facilitating the use of safety approaches for security purposes;
- Develop practical steps to implement recommendations provided by the joint AdSec and INSAG publication on the safety–security interface;
- Continue to support Member States in integrating safety–security–safeguards by design for nuclear installations (in particular for SMRs) by developing technical publications and organizing educational and training activities; and
- Continue to promote collaboration and synergies within the Agency towards further enhancing the safe, secure and peaceful application of nuclear technology in States and facilitating the achievement of tangible results.

E. Nuclear Security Fund

Trends

97. In 2022, the Agency received contributions and pledges to the Nuclear Security Fund (NSF) from the following Member States: Canada, China, Estonia, Finland, France, Germany, Japan, the Netherlands, New Zealand, the Republic of Korea, the Russian Federation, Spain, Switzerland, the United Kingdom and the United States of America. The total revenue in 2022 was €29 million. In 2018, 2019, 2020 and 2021, the revenue was €33 million, €38 million, €45 million and €34 million, respectively. At the end of 2022, the balance of reserve NSF funds was €60 million. These funds are being used to implement the nuclear security programme in 2023.[5]

98. Overall, 48 Member States, the European Union, and governmental and non-governmental organizations have contributed to the NSF since its establishment. Specifically, 25 of those donors have contributed to the NSF in the past 5 years (2018–2022), with 10 donors contributing once, 6 donors contributing 2 to 4 times, and 9 donors contributing 5 or more times. Contributions from donors contributing 5 or more times accounted for 80% of the total amount received in the past 5 years.

99. In implementing activities in 2022, the Agency utilized funds from contributions received in 2022, as well as from previous contributions, including those received in 2021 from Canada, China, the Czech Republic, Denmark, Finland, France, Japan, the Republic of Korea, New Zealand, Norway, the Russian Federation, Spain, Switzerland, the United Kingdom and the United States of America. The Agency also used funds received in earlier years, including those contributed by the European Union.[6]

100. The COVID-19 pandemic had an inverse effect on NSF revenue and expenditures in previous years. In 2020, NSF expenditure reduced to €16 million, as many events were conducted in virtual or hybrid format and some were postponed. In the same year, NSF revenue increased to €45 million, compared to €38 million in 2019 and €33 million in 2018. This resulted in an increase of more than €28 million in NSF reserve funds in 2020.

101. The Agency maintains efficiency in technical and financial implementation (expenditure) of NSF revenue. The Agency's rate of annual expenditure set against revenue of NSF funds increased significantly in 2022 (to 121%), despite significant savings from the conduct of some events in a virtual or hybrid format. In comparison, the annual rate of NSF expenditure set against revenue was 43% in 2021 and 36% in 2020, when the Agency could only implement a reduced number of in-person events due to the COVID-19 pandemic. The 2022 rate was also higher than the pre-pandemic rates of 63% in 2019 and 84% in 2018 (see Figure 15).

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[5] See footnote 1.

[6] The year in which a contribution is received as revenue is determined by the date when a binding agreement is made.

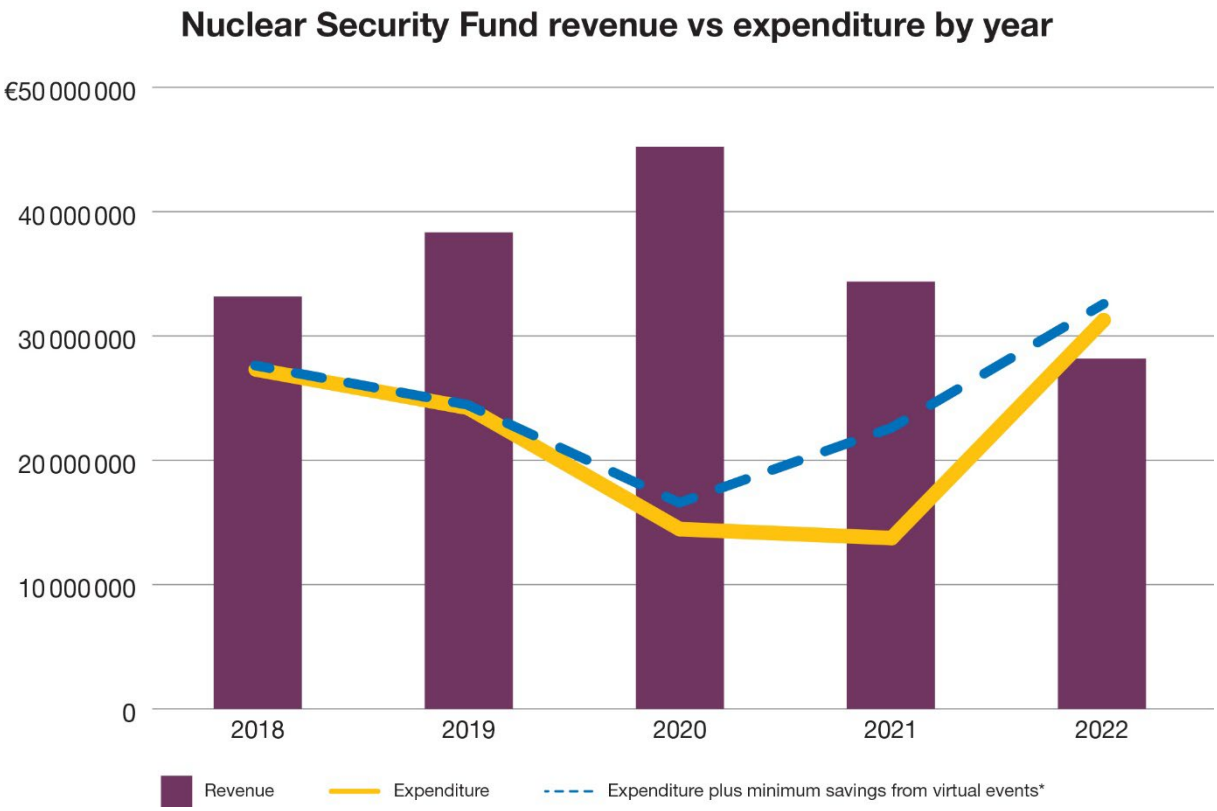

Figure 15: Revenue versus Expenditure, 2018-2022.

* 'Minimum savings from virtual events' consists of the savings made by holding national/regional/international training courses and national/regional/international workshops as virtual events. It does not include savings from other categories of virtual events or from any hybrid events.

102. The Agency implemented 419 nuclear security-related events in 2022, of which 78 were held in a virtual format and 43 were hybrid. Between 2020 and 2022, a total of 469 events were held virtually, leading to savings of over €11 million. Had all of these events been held in person, as in previous years, expenditure in 2021 and 2022 (€23 million and €21 million, respectively) would have been significantly higher.

103. The proportion of annual expenditure from the NSF related to official travel was reduced. Since 2018, the Agency has reduced the amount spent per year from the NSF on official travel — 2.99% of annual expenditure (€1 million) in 2022 compared to 4.85% (€1.4 million) in 2018.

104. The Agency still requires a significant amount of funding in order to implement a number of activities that have been identified as Member State priorities. The following graph presents a snapshot of currently unfunded activities, all of which have been presented to donors and are awaiting funding. The Agency is unable to fund any of these activities with existing contributions due to the conditions placed by donors on the large majority of funds contributed to the NSF.

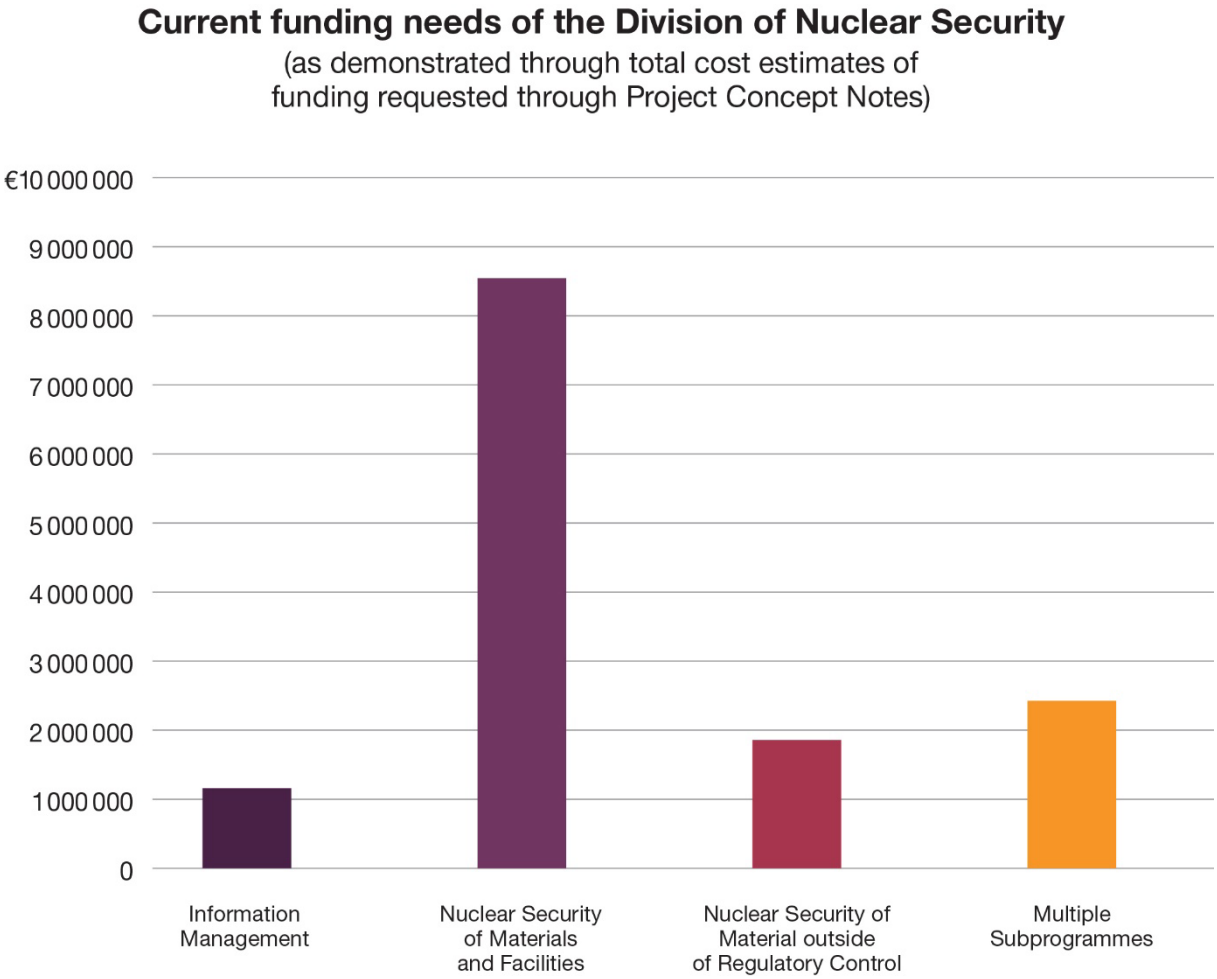

Figure 16: This graph presents a snapshot of the Agency's funding needs in nuclear security as of January 2023. Not all requests for funding are expressed in Project Concept Notes.

105. In 2022, NSF expenditures increased by more than 50% compared to 2021 in the following technical areas: security of nuclear materials, security of radioactive sources, response to nuclear security events, transport security, promotion and universalization of the CPPNM and A/CPPNM, and education and training. NSF expenditures in the areas of nuclear security detection and nuclear forensics increased by more than 25% compared to 2021. The increase in the number of activities (and corresponding expenditures) in those areas in 2022 reflects the Agency's greater attention to the top areas of needs identified by States within the framework of the INSSP (as referred to in section A.3 of this report).

106. The majority of contributions include certain restrictions — thematic, geographic or time constraints — on how they can be utilized. Overall, the programming and reporting requirements tied to contributions have increased in complexity and frequency in recent years, which has had an effect on the Agency's ability to plan, implement and resource the full range of nuclear security activities as efficiently as possible and in line with the principles of results based management. The Agency continues to consult with donor countries, with the goal of better aligning contributions to activities requiring funding.

Related Activities

107. ***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 unearmarked funding for longer-term results;
- Continue to prioritize funding of projects and programmes based on expressed needs; and
- Continue to engage with Member States to demonstrate results and share information.

F. Technical Support and Assistance to Ukraine

Trends

108. On 24 February 2022, the Agency, through its Incident and Emergency Centre, was notified of the imposition of martial law on the territory of Ukraine and of an alert at Chornobyl nuclear power plant (NPP). From that date, the Agency closely monitored the situation at Ukraine's nuclear facilities as well as activities involving radioactive sources, focusing on the implications for nuclear safety and security, and issued regular reports and public statements. The Agency issued two Summary Reports on Nuclear Safety, Security and Safeguards in Ukraine[7] and provided two detailed reports to the Agency's Board of Governors on the situation in Ukraine (GOV/2022/52 and GOV/2022/66).

109. The situation at the Zaporizhzhya nuclear power plant (ZNPP) continues to be dangerous, precarious and challenging with the seven indispensable pillars for ensuring nuclear safety and security during an armed conflict ('Seven Pillars') being compromised at the site at all times. This situation underscores the need to agree on arrangements to ensure that the plant is protected.

110. Discussions aimed at agreeing on arrangements to ensure that the ZNPP is protected, with the ultimate aim of preventing a nuclear accident, were intensified; within the reporting period, efforts still needed to be made with regard to reaching an agreement and commitment by the concerned parties as soon as possible.

111. The continued presence of Agency nuclear safety and security experts at the ZNPP has enabled progress in terms of gradually improving and deepening the understanding of the situation and related nuclear safety and security issues at the site. Ever since its establishment, the Agency team present at the site has been able to share observations and report on the nuclear safety and security situation in an impartial and independent manner, which proved essential during the reporting period.

112. The operating staff at the ZNPP continued to show endurance and resilience in keeping the facility safe and secure amid the armed conflict. The difficulties for personnel at the ZNPP significantly intensified during the reporting period, with their crucial work having to be carried out under increasingly difficult conditions, with potentially severe consequences for nuclear safety and security

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[7] Available at: https://www.iaea.org/sites/default/files/22/04/ukraine-report.pdf and https://www.iaea.org/sites/default/files/22/09/ukraine-2ndsummaryreport_sept2022.pdf

and for their own well-being. The Director General repeatedly called for the concerned parties to put an end to the enormous pressure being placed on the Ukrainian operating staff.

113. The Agency continued to provide technical support and assistance to Ukraine in nuclear safety and security. The Agency conducted nine in-person missions to Ukraine to help stabilize the situation, closely assess nuclear safety and security and assess corresponding needs. Seven deliveries of donated and procured equipment to various organizations were carried out during the reporting period. The Agency agreed with Ukrainian officials that a continuous Agency presence would also be established at Khmelnytskyy, Rivne, South Ukraine and Chornobyl NPPs.

114. The continued commitment of Member States and close cooperation with the Agency are essential to ensure nuclear safety and security in Ukraine under all circumstances and to provide assistance efficiently.

115. The Agency has begun an internal review of challenges in the application of Agency safety standards and nuclear security guidance in armed conflict situations. The review will cover nuclear safety and security considerations for all nuclear and radiation facilities and activities. It will analyse the issues and challenges faced at nuclear facilities in terms of the practical application of Agency safety standards and nuclear security guidance during armed conflicts, using the knowledge and experience gathered in Ukraine since February 2022, and how these issues and challenges might be addressed.

Related Activities

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

- Continue close collaboration and technical exchanges and dialogue with Ukrainian counterparts with the aim of better understanding the nuclear safety and security situation and the needs in the area;
- Continue sharing information with Member States, international organizations and the public on the nuclear safety and security situation in Ukraine;
- Continue delivery of technical support and assistance to Ukraine including, but not limited to, delivery of nuclear safety and security-related equipment and conduct of expert missions;
- Continue working closely with Member States and international organizations to ensure effective coordination in the provision of assistance and to secure necessary funding;
- Pursue efforts to help stabilize the situation at the ZNPP, e.g. through the continued presence of Agency staff, and to agree on arrangements to ensure that the plant is protected; and
- Complete the analysis of Agency safety standards and nuclear security guidance and arrive at findings regarding challenges in their application in an armed conflict.

Appendix A
Agency Activities in 2022

A. General Nuclear Security Areas

A.1. Promoting Further Adherence to International Legal Instruments

1. The Agency continued to assist Parties, upon their request, in meeting their obligations under the Convention on the Physical Protection of Nuclear Material (CPPNM) and the Amendment to the CPPNM (A/CPPNM) and further increased its efforts to promote universal adherence to the A/CPPNM. These efforts included outreach targeted to States that are party to the CPPNM but not yet to the Amendment, as well as to States that have not yet acceded to the CPPNM.

2. A Conference of the Parties to the Amendment to the Convention on the Physical Protection of Nuclear Material, pursuant to Article 16.1 of the Convention as amended, was convened by the Director General, as depositary, in Vienna in March–April 2022. The Conference reviewed the implementation of the Convention as amended and its adequacy as concerns the preamble, the whole of the operative part and the annexes in the light of the then prevailing situation. Representatives of 106 Parties to the A/CPPNM participated in the event, and representatives of 17 States party to the CPPNM but not to the Amendment participated in the conference as observers. In addition, representatives of seven States not party to the CPPNM, 6 intergovernmental organizations and 11 non-governmental organizations attended the conference as observers.

Figure A-1: The First Conference of the Parties to the Amendment to the Convention on the Physical Protection of Nuclear Materials was held in Vienna from 28 March to 01 April 2022. (Photo: IAEA)

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

3. One new publication in the Nuclear Security Series (NSS) was issued in 2022, bringing the total number of publications in the NSS to 43. In addition, 16 others, including 4 revisions were at various stages of development.

4. To address the identified challenge of the lack of NSS publications available in other languages, 31 NSS publications were made available in Arabic, French, Russian and Spanish in 2022, increasing the number of NSS publications available in languages other than English to 32. This includes all NSS publications at the Implementing Guide, Recommendations and Fundamentals levels.

5. A new poster showing all NSS publications was developed to address the identified need to further increase awareness of the NSS.

6. The Agency hosted a webinar to raise awareness of the NSS in November 2022. The webinar was conducted in English, with simultaneous interpretation into Arabic, Chinese, French, Russian and Spanish. The webinar was attended by more than 230 participants from 78 States.

7. The Nuclear Security Guidance Committee (NSGC) met in June and November 2022, including a joint session with the Nuclear Safety Standards Committee. The NSGC approved four document preparation profiles for draft publications in the NSS, and two drafts for Member State review.

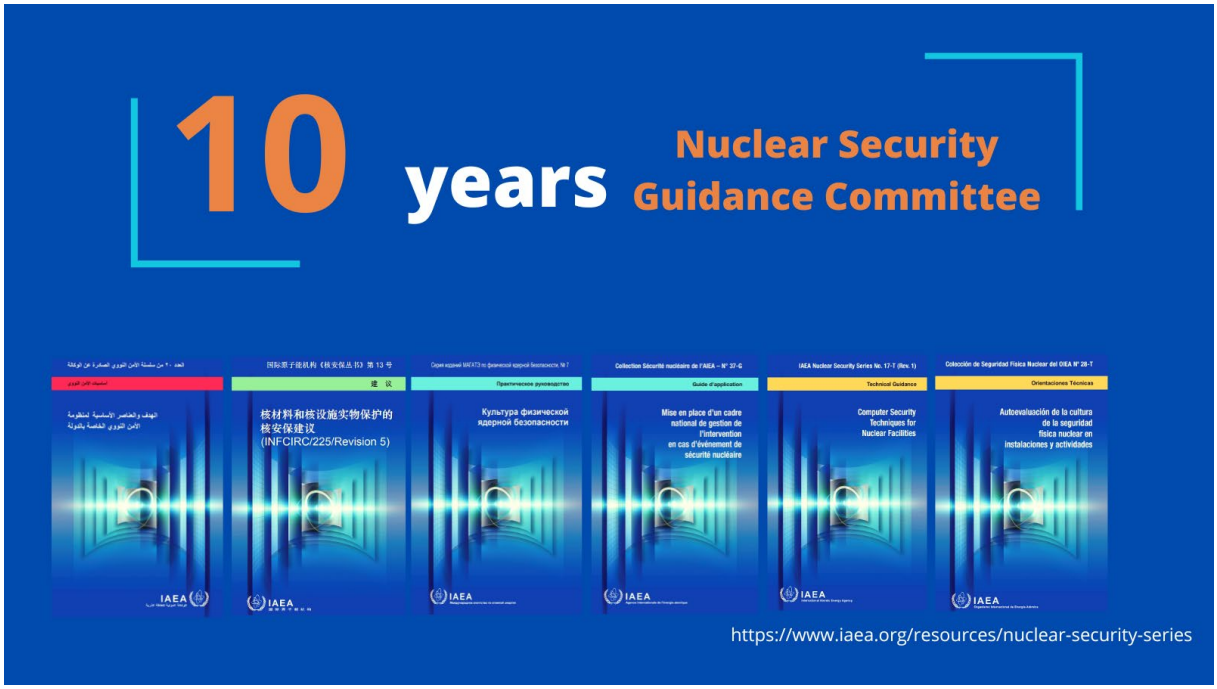


Figure A-2: The 21st meeting of the Nuclear Security Guidance Committee (NSGC) was held in June in Vienna, marking the 10th Anniversary of the committee.

8. The Agency conducted one in-person International Physical Protection Advisory Service mission in 2022, in Finland, preceded by one national workshop.

A.3. Assessing Nuclear Security Needs and Priorities

Figure A-3: During a mission to Uganda in August 2022 national stakeholders sharing roles and responsibilities for nuclear security discussed with the IAEA experts the country's needs and identified priority actions to update the Integrated Nuclear Security Support Plan. (Photo: Atomic Energy Council of Uganda)

9. The Agency conducted 18 in-person Integrated Nuclear Security Support Plan (INSSP) missions, to Armenia, Benin, Botswana, Cambodia, Egypt, Guinea, Hungary, Kenya, Lebanon, Mongolia, Peru, the Philippines, Somalia, South Africa, Sudan, Uganda, Uzbekistan and Zambia; and 3 INSSP finalization missions, to the Plurinational State of Bolivia, Guyana and Singapore. The Agency also undertook eight awareness-raising missions targeting decision makers in Armenia, Benin, Cambodia, Guinea, Guinea-Bissau, Libya, Mongolia and Zambia. In addition, Brunei Darussalam benefited from an INSSP preparatory mission in September 2022.

10. In October 2022, the Agency held a regional workshop on the INSSP in Panama. The workshop aimed to raise awareness of the importance of nuclear security and the INSSP mechanism in Central American Integration System States. The workshop was attended by 14 participants from 6 States and 1 United Nations entity (the 1540 Committee).

11. As part of the activities towards the realignment of the Nuclear Security Information Management System (NUSIMS) self-assessment tool with the INSSP structure, the Agency undertook a full revision of the functional areas of the INSSP template to better anchor the assessment of nuclear security needs in the recommendations contained in the Nuclear Security Fundamentals and three recommendations documents (Nuclear Security Series Nos 13, 14 and 15).

A.4. Capacity Building in Nuclear Security

12. The Agency updated and revised training materials for 34 courses and workshops in the Nuclear Security Training Catalogue and developed training materials for 9 new courses or workshops.

13. An internal training material repository was redeveloped to house all nuclear security training course packages and workshop materials. The repository will simplify Agency staff access to, and sharing and referencing of, materials. It will also streamline the review process and help to eliminate duplication of content.

14. The Agency developed model training management procedures related to the application of a systematic approach to training (SAT) and guidelines, and revised the self-assessment tools to analyse and strengthen the management of Agency training programmes and to continue to ensure their quality and relevance in meeting States' needs.

15. Gender parity and equality in the nuclear sector were promoted by the Agency through the Women in Nuclear Security Initiative (WINSI), which was launched in March 2021. To increase the sustainability of WINSI's efforts, throughout 2022, WINSI partnered with four universities to organize four webinars on the role of education as a key to developing and promoting more women in the field of nuclear security.

16. In 2022, 24 fellows of the Agency's Marie Skłodowska-Curie Fellowship Programme (MSCFP), continued their enrolment in master's programmes related to nuclear security. The MSCFP aims to help increase the number of women in the nuclear field.

17. The Agency established the Leadership Academy for Nuclear Security, and conducted a pilot training course aimed at helping middle and senior managers from organizations with nuclear security functions to further develop their leadership behaviours with regard to nuclear security.

18. The Agency continued developing an e-learning course on SAT, to be used as a prerequisite for participation in workshops on the topic, to assist States in better identifying their human resource development needs, establish human resource development plans for nuclear security and promote SAT.

19. A new training course for Division of Nuclear Security staff was piloted in 2022 and will be made available to Member States in 2023. The course, entitled "Transferring Classroom-based Training to Virtual/Hybrid", is focused on how to convert existing in-person training content for use in online environments and how to use engagement techniques for creating dynamic virtual training experiences.

20. Two e-learning modules were translated and made available in Arabic, Chinese, English, French, Russian and Spanish during the reporting period, and two new modules entitled "Introduction to Nuclear Security Culture" and "Nuclear Security Detection Architecture Awareness" were developed, bringing the total number of e-learning modules to 21, 19 of which are available in the languages mentioned above.

Figure A-4: New nuclear security e-learning modules have been added in 2022 the IAEA's learning management system.

21. In March 2022, the Agency held the 2022 International Nuclear Security Education Network (INSEN) Leadership Meeting virtually. The INSEN secretariat also conducted an education impact assessment survey during the reporting period. The INSEN annual meeting was held in person in July 2022, gathering nearly 80 participants from 40 States, at which nuclear security education activities, the revision of the INSEN action plan, and a report on new and ongoing activities of INSEN members were discussed.

22. The Agency supported graduate education programmes in nuclear security by providing fellowships to seven students from seven Member States in the 2022–2023 academic year to attend the master's degree programme in nuclear security at the University of National and World Economy in Bulgaria. The number of fellowships increased, taking into consideration geographical distribution and gender parity.

23. Two international, one national and one regional School on Nuclear Security were held virtually, in person or in a hybrid format, in 2022. Schools were held in Italy in April 2022 (with 52 participants from 30 Member States), Brazil in June 2022 (with 33 participants) and South Africa in November 2022 (with 30 participants from 14 English-speaking African countries). One School was held for MSCFP fellows in Vienna in August 2022, with 68 participants from 46 Member States. Notably, the national School in Brazil was the first conducted in Portuguese. It was implemented in cooperation with the Government of Brazil through the Nuclear and Energy Research Institute.

Figure A-5: IAEA Marie Skłodowska-Curie Fellowship Programme students attended the International School on Nuclear Security in Vienna in August 2022. (Photo: IAEA)

24. In May–June 2022, the Agency conducted a regional workshop on establishing and operating a Nuclear Security Support Centre (NSSC). This pilot workshop, held in Egypt, engaged 25 participants

from 15 African countries in interactive scenario-based discussions that emphasized the importance of and process for identifying potential NSSC stakeholders, assessing available resources and nuclear security needs, and developing a strategy implementation plan.

25. The 2022 Annual Meeting of the International Network for Nuclear Security Training and Support Centres (NSSC Network) was held in Vienna in July 2022. It was attended by 54 participants from 37 States and 4 observer organizations, to celebrate the 10th anniversary of the NSSC Network and to identify priority activities for the upcoming year.

26. The Agency conducted a consultancy meeting of the NSSC Network leadership in December 2022 to discuss overall NSSC Network priorities and receive updates on progress in implementing individual working group action plans.

Figure A-6: Practical training on planning, establishing and operating a national Nuclear Security Support Centre (NSSC) was offered to 25 participants from 16 African countries during an NSSC Network regional workshop held in Egypt in May-June 2022. (Photo: Egyptian Nuclear and Radiological Regulatory Authority)

27. Development of the Nuclear Security Training and Demonstration Centre at the Agency's Seibersdorf laboratories continued, with an emphasis on applying the key concepts set out in *Establishing and Operating a National Nuclear Security Support Centre* (IAEA-TDL-010) to help ensure that equipment, staffing and other resources are developed sustainably and used efficiently.

28. The Agency conducted one international workshop on human resource development in nuclear security to assist Member States in implementing best practices in human resource development in the field of nuclear security. The international workshop was conducted in Moldova in November–December 2022, 12 participants from 7 States took part in the workshop.

A.5. Information and Computer Security

29. To meet the demand for support for developing computer security regulations, the Agency initiated the development of a publication that will assist States in developing computer regulations. A new computer security inspection training course was also developed.

30. The Agency assisted in the completion of a project report on computer security regulatory inspection guides, which was authorized by the Romanian National Commission for Nuclear Activities Control for public use to provide benefit to other Member States.

31. The Agency held a Technical Meeting on Computer Security Regulations in Nuclear Security, two expert missions to Member States on computer security regulations and one national training course on computer security inspections for nuclear facilities.

32. Development of a non-serial publication on computer security regulations for nuclear security was started.

33. The Agency held ten training courses on information and computer security: three on computer security fundamentals for nuclear security, two on computer security for industrial control systems, two on conducting computer security assessments, one on protecting computer-based systems in nuclear security regimes, one on computer security incident response for nuclear facilities and one on computer security inspection for nuclear facilities.

34. Virtual training opportunities are broadening the Agency's reach regarding training offerings related to computer security. The Agency established a highly effective experiential computer security training and demonstration capability using real-world equipment. Additionally, a virtualized training platform is at advanced stages of development and will support the delivery of highly effective virtual training to Member States with online access to training exercises and simulations. The Agency's leverage of the 'Cyber Range' capabilities of the Austrian Institute of Technology — an Agency Collaborating Centre — will enable increased training and capacity building for Member States through a virtual training environment built on a common infrastructure platform.

35. The Agency conducted two national exercises on cyber security incidents and their impact and recovery in conjunction with Brazil's "Cyber Guardian Exercise 4.0" and Slovenia's "KIVA2022" exercise.

Figure A-7: The importance of computer security regulations was discussed in a technical meeting held in Berlin, Germany in June 2022. (Photo: Federal Office for Radiation Protection, BfS)

36. The Agency conducted four Technical Meetings: three related to the 2023 International Conference on Computer Security in the Nuclear World: Security for Safety — one of which was a consultancy meeting to discuss more than 200 technical papers on computer security received for the conference — and one on instrumentation and control and computer security for small and medium sized or modular reactors (SMRs) and microreactors.

37. The Agency supported four international outreach activities led by international standards organizations: the Nuclear Threat Initiative's Cyber Nuclear Forum, the International Electrotechnical Commission's SC 45A working group meeting, the Nuclear Energy Institute's Cyber Security Implementation Workshop, and the Canada–United States of America blended physical attack–cyberattack experiment.

38. The Agency began working on a coordinated research project (CRP) on enhancing computer security for radiation detection systems. The CRP was approved in late 2021.

A.6. Information Exchange and Sharing

39. Content of the Nuclear Security Information Portal was updated during the reporting period. Key members of the NSSC Network participated in a consultancy meeting to improve the NSSC Network's Library of Lessons Learned and Case Studies, and the resulting upgrades to this database provide the NSSC User Group with an improved interface and options for sharing best practices.

40. The Agency provided quarterly Incident and Trafficking Database (ITDB) analytical summary reports, an annual factsheet summarizing ITDB incidents for public information and, in response to requests from Member States, additional information services in support of three major public events (MPE**s**).

Figure A-8: The Triennial Technical Meeting of States' Points of Contact for the Incident and Trafficking Database was held in Vienna in April 2022. (Photo: IAEA)

A.7. Nuclear Security Research and Emerging Technologies

41. In April 2022, the Agency initiated a new CRP entitled "Facilitation of Safe and Secure Trade Using Nuclear Detection Technology — Detection of RN and Other Contraband". This CRP will support projects enhancing the safety–security interface, as well as those supporting trade/customs applications, by developing and demonstrating methods using nuclear detection technologies to detect commercial fraud and public safety hazards, such as explosives, illicit drugs and contaminated goods. The CRP has 22 ongoing subprojects (from 20 Member States).

42. The Agency continued implementation of multiple CRPs, including "Advancing Radiation Detection Equipment for Detecting Nuclear and Other Radioactive Material Out of Regulatory Control" and "Advancing Maintenance, Repair, and Calibration of Radiation Detection Equipment". The Agency conducted the third and final Research Coordination Meeting (RCM) for the CRP "Advancing Radiation Detection Equipment for Detecting Nuclear and Other Radioactive Material Out of Regulatory Control" in Thailand in May 2022, as well as the first RCM on the CRP "Advancing Maintenance, Repair, and Calibration of Radiation Detection Equipment" in Greece in May 2022. A final report on the CRP "Advancing Radiation Detection Equipment for Detecting Nuclear and Other Radioactive Material Out of Regulatory Control" is expected in 2023.

43. A new CRP is being developed to identify lessons learned, best practices and strategies for the prevention and mitigation of counterfeit, fraudulent and suspect items (CFSIs) that could impair nuclear security systems. A webinar held on this topic in 2022 was attended by over 140 participants from 50 countries, and concluded with 13 countries and 3 international organization expressing interest in conducting further research on the topic. The research undertaken as part of the CRP will assist in the

development of a non-serial publication that will detail the nuclear security implications of CFSIs, as well as lessons learned, best practices and measures for addressing this issue.

44. In March 2022 the Agency held the first consultancy meeting on the Mobile-Integrated Nuclear Security Network (M-INSN), where participants were able to test and provide feedback on the initial release and accompanying documentation. Further development and testing of the M-INSN continued in 2022 based on the needs identified during the meeting, including experimental activities for enhancing understanding and application of the global navigation satellite system used for the M-INSN, and the development of M-INSN kits for short-term loan. M-INSN related needs were also identified during a regional consultancy meeting for the CRP "Advancing Radiation Detection Equipment for Detecting Nuclear and Other Radioactive Material Out of Regulatory Control", such as the continued development of a Bluetooth adapter to modernize radiation detection equipment for compatibility with the M-INSN.

45. In July 2022, the Agency held its first national training course on M-INSN and on equipment operation, testing and maintenance in preparation for major public events (MPEs) in Vienna; and loaned the first set of M-INSN kits (containing mobile phones, personal radiation detectors, and a central command computer and server) in preparation for the 2022 FIFA U-20 Women's World Cup in Costa Rica. In October–November 2022, participants in the National Workshop on Responding to Criminal or Intentional Unauthorized Acts Involving Nuclear and Other Radioactive Material at Main Venues and Other Strategic Locations of Major Public Events, held in Egypt, were trained on the M-INSN, and asked to provide feedback on its capabilities and use, particularly gaps and development needs for M-INSN use during MPEs. Work continues to develop M-INSN to address a variety of nuclear security use cases and needs, including integrating additional radiation detectors, non-radiation sensors and analysis tools.

46. Based on demand from Member States with regard to investigating and improving the assessment of radiation portal monitor (RPM) occupancies (both alarming and non-alarming) for containerized cargoes, the desktop version of the Tool for Radiation Alarm and Commodity Evaluation (TRACE) alarm assessment was developed. It was released in October 2022.

47. Member States continue to express the need for additional tools and guidance in the areas of maintenance, repair and calibration, and modernization of radiation detection equipment, including maintaining the capacity of experts for conducting repair and calibration. This is addressed through the CRP "Advancing Maintenance, Repair, and Calibration of Radiation Detection Equipment" and an associated project to develop RPM kits that can be used for in-field diagnostics as well as training of experts. The first such kits will be available in 2023.

48. Member States continue to express the need for 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. This will be addressed through a CRP that will support projects enhancing the safety–security interface, as well as those supporting trade and customs applications, by developing and demonstrating methods using nuclear detection technologies to detect commercial fraud and public safety hazards, such as explosives, illicit drugs and contaminated goods.

49. The available tools for nuclear security (TRACE, M-INSN and the Minimum Detectable Quantity and Alarm Threshold Evaluation Tool) were presented and demonstrated at the 2022 NSSC Network Annual Meeting and the Third Annual Meeting of the Network of Front Line Officers. The Agency conducted a webinar entitled "Enhancing Nuclear Security through Science & Technology" in November 2022, which provided information to Member States on how science and technology is, and can be, used to address major issues and needs in nuclear security, and enabled the sharing of experiences among Member States currently deploying the Agency-developed tools.

Figure A-9: The use of uncrewed aerial systems for radiation detection and surveillance was discussed in a technical meeting organized in Brno, Czech Republic, in September 2022. (Photo: IAEA)

50. The Agency conducted a Technical Meeting addressing the need for improved research, development, training, testing and guidance related to uncrewed aerial systems (UASs) in radiation detection and surveillance operations for nuclear security and for environmental remediation and monitoring. Over 120 participants from 51 Member States participated in this Technical Meeting. The need for further investigation of UAS technology was identified at the Second Technical Meeting on Radiation Detection Instruments for Nuclear Security: Trends, Challenges and Opportunities, held in April 2018. At the meeting, capabilities and lessons learned for using UASs for surveillance and mapping, among other topics, were discussed. Gaps in legal and regulatory requirements were a key issue identified.

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

51. The Agency assisted two Member States with physical protection upgrades at nuclear facilities. The Agency also assisted one Member State with a transportation security upgrade. These upgrades were complemented by specialized technical training to support the operation, maintenance and sustainability of physical protection equipment, systems and measures for detection, delay and response.

52. The Agency held the Webinar on Threat Assessment, Design Basis Threats and Representative Threat Statements in February 2022, with a total of 227 participants. Three national workshops on the topic were held during the year — in Armenia in February 2022, attended by 19 participants; in Iraq in May 2022, attended by 46 participants; and in Jamaica in October 2022, attended by 13 participants.

53. In April 2022, the Agency implemented an expert mission on the nuclear security requirements for the future research reactor in the Plurinational State of Bolivia. This meeting provided the Agency with information about the existing nuclear security infrastructure and the development status of the research reactor. The next steps will involve implementing physical protection system upgrades once funding is secured.

54. The Agency held a consultancy meeting to finalize the IAEA Technical Document (TECDOC) provisionally entitled *Management of Regulatory Oversight for the Operation of a First Nuclear Power Plant* in May 2022. Experts from Finland, Hungary and Pakistan participated in reviewing the final comments on the draft publication.

55. Forty-five participants from 28 countries attended the International Training Course on Developing Regulations and Associated Administrative Measures for Nuclear Security in Vienna in May 2022. Agency staff members delivered the course, without the support of external experts.

56. In June 2022, the Agency held a Regional Workshop on the Physical Protection of Nuclear Material and Nuclear Facilities in the Netherlands. 16 participants from 7 countries attended the workshop.

57. The Agency implemented a coordination meeting on physical protection upgrade projects for Egypt in July 2022. The progress of the ongoing physical protection upgrade projects was reviewed to ensure the work conducted is as outlined in the statement of work.

58. Fourteen participants from seven countries attended a pilot International Training Course on Regulatory Functions for the Security of Nuclear Material, Nuclear Facilities and Associated Activities in Pakistan in September 2022. Lecturers from Bulgaria, Pakistan and the Russian Federation delivered presentations.

59. The Agency delivered a Regional Training Course on Physical Protection Inspections at Nuclear Facilities in Japan in September 2022, attended by 16 participants from 9 countries.

60. The Agency held an International Training Course on Physical Protection Inspections at Nuclear Facilities in the Russian Federation in October 2022, attended by 13 participants from 9 countries.

61. In October 2022, 26 participants from Pakistan were trained to become future lecturers of courses pertaining to the physical protection of nuclear material and nuclear facilities during a National Train the Trainers Course on the Physical Protection of Nuclear Material and Nuclear Facilities in Pakistan. Lecturers from Egypt, the United States of America and the Secretariat also participated in the training course.

62. The Agency delivered three national workshops on nuclear security culture in practice, in the Democratic Republic of the Congo in May 2022, in Rwanda in October 2022 and in Burkina Faso in November 2022. The Agency also held an international workshop on the topic in India in September 2022, and a regional workshop for English- and French-speaking African countries in Zambia in October 2022. The Agency continued its efforts to enhance understanding of nuclear security culture self-assessment through three national workshops, held in Ghana in August 2022, in Pakistan in August 2022 and in Senegal in November 2022. To support Member States' efforts in the area of nuclear security culture self-assessment and enhancement, the Agency conducted two expert missions, to Armenia in February 2022 and to Malaysia in June 2022. In support of Member States' efforts towards raising senior

managers' awareness of nuclear security culture, the Agency organized a pilot seminar on the topic in Indonesia in June 2022. The Agency also organized a virtual consultancy meeting to review existing workshop materials on nuclear security culture in practice in September 2022.

63. A consultancy meeting on the Training Course on the Physical Protection of Nuclear Material and Nuclear Facilities was held in Vienna in December 2022.

64. The Agency held a consultancy meeting on the Hypothetical Atomic Research Institute facility in Vienna in December 2022. The meeting involved input from three experts from the United States of America.

65. The Agency conducted a consultancy meeting on the review and finalization of the training material and qualification questionnaire for Romanian regulatory inspectors in Vienna in December 2022, attended by 9 participants from 5 countries.

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

Figure A-10: Experts discussed computer security and digital instrumentation and control of small modular reactors and microreactors during a technical meeting held in Vienna in February 2022. (Photo: IAEA)

66. The Agency is currently working on the development of a TECDOC on the nuclear security of SMRs, with reference to their specific features, such as compact design, underground construction, new types of nuclear fuels and smaller footprint. In this regard, the Agency conducted one virtual consultancy meeting for SMR experts in January 2022 on the potential contents of the TECDOC. The meeting was attended by 24 SMR experts from 12 Member States.

67. Four hundred fifty individuals from 50 Member States participated in an Agency hosted Webinar on Safety, Security and Safeguards Interfaces and Challenges for Novel Advanced Reactors in February 2022.

68. The Agency participated in a webinar on the security of advanced reactors in May 2022, arranged by King's College London, United Kingdom, by delivering a presentation on the security of SMRs.

69. The Agency conducted a virtual consultancy meeting related to the development of technical report on safety–security–safeguards by design for SMRs in May 2022. The meeting was attended by four experts from four Member States, alongside nine staff members from different Agency Departments.

70. The Agency conducted a Technical Meeting on Safety, Security and Safeguards by Design for Small Modular Reactors in June 2022. The meeting was attended by 102 participants (20 in person and 82 virtually) from 29 Member States and 2 international organizations.

71. The Agency conducted a virtual consultancy meeting in July 2022 to review the tentative draft of the TECDOC on the security of SMRs. The meeting was attended by 23 SMR experts from 13 Member States.

72. The Agency participated in the International Small Modular Reactor Conference for the Creation of New Growth Motivity and Vitalization of Nuclear Industry, held in the Republic of Korea in September 2022, by delivering a presentation on the security of SMRs.

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

73. The Agency held three National Training Courses on Nuclear Material Accounting and Control for Nuclear Security Purposes at Facilities over the course of 2022. The first was in Egypt in January 2022. In total, 14 participants took part in the week-long course, which involved instructors from Egypt, France, the Philippines and the United States of America. The second was in South Africa in August 2022. The course was attended by 27 participants, with lecturers from France, the Philippines and the Secretariat. The third was for Bangladesh and was held in the Russian Federation in November 2022, attended by 15 participants from Bangladesh.

74. In February–March 2022, the Agency held an International Training Course on Nuclear Material Accounting and Control for Practitioners in the United States of America. The training course was held in person and involved 28 participants from 23 countries. The two-week training course was well received by the participants, which offered them practical, hands-on experience with nuclear material accounting and control measures for nuclear security purposes.

75. The Agency held the first consultancy meeting for the development of a non-serial publication provisionally entitled *Content of a Facility Nuclear Material Accounting and Control Plan* in March 2022. Five experts — from Japan, Kazakhstan, Malaysia, the Russian Federation and the United States of America — participated. An expert from Finland provided comments on the draft publication, but was not able to attend.

76. In April 2022, the Agency held the first consultancy meeting on developing the draft Technical Guidance publication provisionally entitled *Establishment and Implementation of a Trustworthiness Programme in Nuclear Security*. Experts from Belgium, Japan, the Russian Federation, the United Kingdom and the United States of America provided comments on the first draft. Comments from Finland were received, but the experts were not able to attend the meeting.

77. The Agency held the first consultancy meeting on the activities under the CRP "Preventive and Protective Measures Against Insider Threats at Nuclear Facilities" in May 2022. The event involved participants from each project team (Egypt, Ghana, Greece, Indonesia, the Russian Federation, Sweden (two teams) and Tunisia). The meeting focused on specific activities within the CRP that are aimed at enhancing collaboration among the teams.

78. The second consultancy meeting on developing the draft Technical Guidance publication provisionally entitled *Establishment and Implementation of a Trustworthiness Programme in Nuclear Security* was held in July 2022. Experts from Belgium, Japan, the Russian Federation, the United Kingdom and the United States of America took part in the discussions. Comments were provided by Finland, but the experts were not able to attend. A final consultancy meeting, prior to the finalization of the publication, will be held in 2023.

79. In September 2022, the Agency held the Advanced, Practitioner-Level Training Course on Preventive and Protective Measures against Insider Threats in Belgium. In total, 49 participants from 24 countries participated in the training course, and lectures were delivered by experts from 11 countries (Belgium, Canada, Finland, Indonesia, Jordan, Kazakhstan, the Netherlands, the Republic of Korea, Tunisia, the United Kingdom and the United States of America), as well as by the International Criminal Police Organization.

80. The Agency held an International Training Course on Control of Nuclear Material in Use, Movement and Storage in the Russian Federation in October 2022. The course was attended by over 30 participants from primarily Russian-speaking countries.

81. The Agency held the Second Research Coordination Meeting on Preventive and Protective Measures against Insider Threats at Nuclear Facilities for the furtherance of the related CRP in November 2022. Participants from each of the eight teams attended the week-long meeting. The participants presented their current progress, worked collaboratively in groups on the project activities and provided comments on the existing outline of the TECDOC that will be published upon conclusion of the project.

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

82. Two international training courses on the security of non-nuclear radioactive material in transport were held in Malaysia in September 2022 and in Japan in December 2022. An interregional workshop on transport security planning was held in Tunisia in October 2022.

83. The Agency organized virtual meetings with six Member States to support the drafting of transport security regulations and to establish the timeframes for the development of regulations. The meetings were held with the United Republic of Tanzania in March 2022, Djibouti in April 2022, the Central African Republic in May 2022, the Niger in May 2022, Sierra Leone in June 2022 and Togo in August 2022.

84. The Agency organized expert missions to consolidate the transport security regulations of four Member States, to Côte d'Ivoire in March 2022, the United Republic of Tanzania in September 2022, Kenya in October 2022 and the Niger in November 2022.

85. Evaluations of removal plans for two disused sealed radioactive source (DSRS) projects in Bosnia and Herzegovina and in Chile were completed to ensure that the plans comply with the transport security requirements stipulated in the corresponding statements of work.

86. The Agency drafted a Technical Guidance publication provisionally entitled *Security of Nuclear and Other Radioactive Material in Transport* and solicited comments from Member States.

87. Albania received Agency assistance related to physical protection upgrades to enhance the security of radioactive material in transport.

88. The Agency supported Côte d'Ivoire in developing technical guidance on transport security plan development in compliance with the national transport security regulations.

B.2. Security of Radioactive Material 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

89. *Security Management of Radioactive Material in Use and Storage and of Associated Facilities* (IAEA Nuclear Security Series No. 43-T) was published in March 2022.

90. The Agency addressed six requests to strengthen physical protection at facilities with high activity radioactive sources in use and storage. The Agency assisted in the removal of 21 high activity disused radioactive sources from 4 States, continued to support the ongoing removal of 35 high activity disused radioactive sources in 6 States and initiated the preparatory work for removal of an additional 32 sources from 3 States.

91. Benin and the Central African Republic received assistance in the review of draft laws for the security of radioactive material in use and storage and of associated facilities and activities.

92. The Agency assisted in the review or drafting of regulations on the security of radioactive material in use and storage through training on drafting regulations for radiation safety and nuclear security of radioactive material in August, October and November 2022 for States in Africa and in Latin America and the Caribbean, with 105 participants from 40 countries.

93. Four regional training courses were held on authorization and inspection for radiation safety and nuclear security in March, June, September and November 2022. Three of the courses were focused on medical practices and the other on industrial practices, with a total of 23 participants from 12 countries in Africa and in Latin America and the Caribbean.

94. The Agency held two regional workshops on strategic directions for establishing integrated management systems for regulatory bodies in May–June 2022 and October–November 2022 for States in Africa, with 23 participants from 12 countries.

95. Two in-field physical protection assessment missions were completed in 2022 – to Zimbabwe in May 2022 and Cuba in August 2022. Evaluations of eight facilities with high activity radioactive sources. The Agency also conducted two virtual workshops on basic concepts of physical protection systems for radioactive material in August and September 2022, for Malta and Papua New Guinea, and thereafter initiated remote physical protection assessments of one facility in Malta and one in Papua New Guinea.

96. In May 2022, the Agency held a virtual National Training Course on Regulatory Control of Safety and Security for Radiotherapy Practice for Costa Rica with 19 participants.

97. The Agency held an International Seminar on Radioactive Material Security Inspections for Countries Embarking on Nuclear Power Programmes in October 2022, with 26 participants from 15 States.

98. The Agency held one international training course in Austria in April 2022, and two regional training courses, in Benin in May 2022 and Nigeria in November 2022, on the security of radioactive material in use and storage, with 58 participants from 41 countries.

99. An expert mission, to Nigeria, was initiated upon request, to assist with the review and update of draft national policy and strategy for DSRSs.

100. The Agency conducted three expert missions to Albania, Nigeria and Sudan, upon request, to support completion of national inventories of radioactive sources.

101. An expert mission to Costa Rica was conducted, upon request, to support the establishment of a centralized storage facility for radioactive waste and DSRSs.

102. The Agency conducted one virtual expert mission, to Benin, to initiate work on draft national policy and strategy for radiation safety and security of radioactive materials.

103. The Agency conducted six Advisory Missions on Regulatory Infrastructure for Radiation Safety and Nuclear Security, to the Democratic Republic of the Congo in March–April 2022; to Seychelles in May 2022; to Gabon, Uruguay and Djibouti in September 2022; and to the Plurinational State of Bolivia in November 2022.

104. The Regional School on Leadership in Radiation Safety and Security of Radioactive Material for Latin America and the Caribbean was held, in Austria in August 2022, with 17 participants from 9 countries.

105. The Agency held three Regional Workshops on the Development of Regulatory Infrastructure for Radiation Safety and Security of Radioactive Material. The first, which served as a kick-off meeting for new projects in Caribbean countries, was conducted in a hybrid format in April 2022, with a total of 17 participants from 11 States. The other two workshops, for Africa and for Latin America and the Caribbean, were conducted in a hybrid format in April and June 2022, with 71 participants from 40 States.

106. A trilateral contract, involving the Agency, the awarded contractor, and the end-user representing the beneficiary State, on the conditioning of four disused radioisotope thermoelectric generators, was finalized by the involved parties and circulated for signature. The conditioning will serve as a preventative measure to maintain radioactive source containment and ensure that the devices are suitable for safe and secure long term storage, as part of a project to assist Member States in strengthening the safety and security of disused radioisotope thermoelectric generators.

107. The Agency held the Third Research Coordination Meeting on Improving the Security of Radioactive Material throughout its Lifecycle, Associated Facilities, and Associated Activities virtually in September 2022, with 11 participants from 5 Member States.

Figure A-11: International Conference on the Safety and Security of Radioactive Sources: Accomplishments and Future Endeavours, Vienna June 2022. (Photo: IAEA)

108. The International Conference on the Safety and Security of Radioactive Sources: Accomplishments and Future Endeavours, held in Vienna in June 2022, had more than 600 registered participants from 116 States and 9 organizations. The participants exchanged experiences and anticipated future developments related to the safety and security of radioactive material.

109. The Agency organized the Tenth Meeting of the Working Group on Radioactive Material Security virtually in October 2022, with 90 participants from 60 States, to share information about Agency activities on the security of radioactive material and to explore technical topics related to regulatory challenges and lessons learned.

110. Both the conference and working group meeting reinforced that Member States have an increased desire for the Agency to continue to provide support that promotes the consistent application of international instruments, with an emphasis on the Code of Conduct on the Safety and Security of Radioactive Sources and its supplementary Guidance, and their universalization; enhances regulatory infrastructure for safety and security, including through developing national policies and strategies for the safety and security of radioactive sources in a harmonized and holistic manner; and reduces risks associated with high activity radioactive sources, such as through physical protection enhancements and life cycle management.

111. The Agency held two Regional Training Courses on Authorization and Inspection for the Security of Radioactive Material and Associated Facilities, in Malaysia in October–November 2022, with 16 participants from 7 States and in Albania in November 2022, with 15 participants from 9 States.

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

Figure 17: Discussions about the Code of Conduct on Safety and Security of Radioactive Sources and its Supplementary Guidance took place in the IAEA awareness-raising meeting hosted in Vienna in August 2022 to increase support to this important non-legally binding instrument. (Photo: IAEA)

112. The Agency held two Technical Meetings to Create Awareness of the Need for Political Commitment to the Code of Conduct on the Safety and Security of Radioactive Sources and its Supplementary Guidance, in Vienna in May and August–September 2022, with 51 participants from 24 countries.

C. Nuclear Security of Materials Out of Regulatory Control

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

113. The Agency held three Regional Workshops on Developing a National Framework for Managing the Response to Criminal or Intentional Unauthorized Acts involving Material Out of Regulatory Control: for Arabic-speaking Member States, in Morocco in March–April 2022; for English-speaking African States, in Ghana in June 2022; and for Central Asian States, in Kazakhstan in September 2022. In total, more than 70 participants from 17 Member States were trained, in person, based on *Developing a National Framework for Managing the Response to Nuclear Security Events* (IAEA Nuclear Security Series No. 37-G).

114. Three national workshops on Managing the Response to Criminal or Intentional Unauthorized Acts involving Material Out of Regulatory Control were held in person, in Nigeria in February 2022, in Cambodia in July 2022 and in the Philippines in September 2022. Road maps of nuclear security response capability development for the three countries were developed and will be implemented through their respective INSSPs.

Figure A-13: In Nigeria the IAEA offered its assistance to enable the country establish its nuclear security infrastructure and specifically the framework required for about the response to malicious acts involving radioactive material out of regulatory control. (Photo: Nigerian Nuclear Regulatory Authority, NNRA)

115. The Agency conducted an in-person expert mission to support Thailand in developing its response plan for criminal or intentional unauthorized acts involving nuclear or other radioactive material out of regulatory control in April 2022, as part of the country's road map for nuclear security response capability development.

116. The Agency conducted two expert missions to support Egypt in the development and implementation of three national exercises on response to criminal acts involving nuclear or other radioactive material out of regulatory control, as part of the country's road map for nuclear security response capability development. The expert mission to finalize the exercises was held in September 2022 and the mission to support the conduct of the three exercises was held in November 2022.

C.2. Nuclear Security Detection Architecture

117. A National Training Course on the Operation, Calibration and Maintenance of Radiation Detection Equipment was held for Thailand in Vienna in July 2022. Five experts were trained on the radiation detection equipment provided by the Agency in 2021.

118. The Agency held a Regional Workshop on Nuclear Security Detection Architecture and Response Frameworks for the Africa Region in South Africa in October 2022.

Figure A-14: Participants of the Regional Workshop on Nuclear Security Detection Architecture and Response Frameworks for the Africa Region held in Cape Town, South Africa in October 2022 working in groups during the practical sessions of the workshop. (Photo: South Africa Department of Mineral Resources and Energy)

C.3. Major Public Events

119. In 2022, the Agency supported the implementation of 9 MPEs.

120. More than 900 pieces of radiation detection equipment were loaned in support of the following MPEs: 2022 Africa Cup of Nations in Cameroon, Winter Olympic Games in China, 2022 FIFA U-20 Women's World Cup and 2022 Central American Games in Costa Rica, 2022 South American Games in Paraguay, Commonwealth Heads of Government meeting in Rwanda, 2022 FIFA Men's World Cup in Qatar, and 18th Francophone Summit in Tunisia.

121. In collaboration with China, the Agency held a webinar on nuclear security measures for MPEs, focused on considerations and lessons learned from global MPEs, in January 2022; and one virtual National Workshop on Developing and Implementing Nuclear Security Measures for Major Public Events in December 2022.

122. The Agency conducted a National Workshop on Responding to Nuclear Security Events and Emergencies Triggered by Nuclear Security Events at Main Venues and other Strategic Locations at Major Public Events in Rwanda in March 2022.

123. The Agency held a virtual coordination meeting on the implementation of nuclear security measures for the 2023 Africa Cup of Nations for Côte D'Ivoire in March 2022. The Agency conducted the first consultancy meeting on the development of an Agency publication provisionally entitled *Report on Nuclear Security Arrangements and Lessons Learned in Preparation and Conduct of the Africa Cup of Nations 2021* in Vienna in April 2022.

Figure A-15: The IAEA provided assistance to Costa Rica to protect the Women's U-20 football World Cup from any criminal or terrorist activities involving radioactive material. (Photo: IAEA)

124. In preparation for the 2022 FIFA U-20 Women's World Cup, the Agency held a virtual coordination meeting in March 2022 and conducted an expert mission in May–June 2022 for Costa Rica. More broadly, the Agency also conducted for Costa Rica national workshops on developing and implementing nuclear security systems and measures for MPEs, in June 2022; on medical response and decontamination for first responders, in July 2022; on response to criminal or intentional unauthorized acts involving nuclear and other radioactive material at main venues and other strategic locations of MPEs, in July 2022; and on the use of radiation detection instruments for MPEs, in July 2022.

125. The Agency held a National Workshop on Responding to Nuclear Security Events and Emergencies Triggered by Nuclear Security Events at Main Venues and other Strategic Locations at Major Public Events in Rwanda in May 2022.

126. The Agency held a National Workshop on Developing and Implementing Nuclear Security Systems and Measures for Major Public Events in May 2022 and a National Workshop on Responding to Nuclear Security Events and Emergencies Triggered by Nuclear Security Events at Main Venues and other Strategic Locations at Major Public Events in June 2022, both in Qatar.

127. The Agency held an International Workshop on Nuclear Security Measures and Emergency Response Arrangements for Major Public Events in the United States of America in August 2022.

128. In collaboration with Egypt, the Agency held a virtual coordination meeting on the implementation of nuclear security measures for the 27th session of the Conference of the Parties of the United Nations Framework Convention on Climate Change in August 2022, and a National Workshop on Responding to Criminal or Intentional Unauthorized Acts involving Nuclear and other Radioactive Material at Main Venues and other Strategic Locations of Major Public Events in October–November 2022 in Egypt.

129. A virtual coordination meeting was held with Benin in September 2022 on the implementation of nuclear security measures for the 2022 Pétanque World Championships.

130. The Agency held a national training course on the use of radiation detection instruments for MPEs in Paraguay in September–October 2022.

131. In November 2022, the Agency held a National Workshop on Responding to Criminal or Intentional Unauthorized Acts involving Nuclear and other Radioactive Material at Main Venues and other Strategic Locations of Major Public Events in Tunisia.

132. The Agency held an Interregional Workshop on Developing and Implementing Nuclear Security Systems and Measures for Major Public Events in the United Arab Emirates in November 2022.

C.4. Radiological Crime Scene Management and Nuclear Forensics Science

133. The Agency continued to draft the TECDOC provisionally entitled *Implementing a Nuclear Forensics Capability: Application of Analytical Techniques,* and the publication was approved for issuance.

134. The Agency encouraged international collaboration in nuclear forensics research by providing funding for the residential assignment of a Moldovan scientist at the Laboratory for Microparticle Analysis in Moscow.

135. Practical Arrangements were extended with the Stockholm International Peace Research Institute in Sweden and Thailand's Office of Atoms for Peace for nuclear forensics activities.

136. The Agency held a Technical Meeting on Nuclear Forensics: From National Foundations to Global Impact in April 2022.

Figure A-16: Demonstration of nuclear security response during a technical meeting on nuclear forensics held in Vienna in April 2022. (Photo: IAEA)

137. A regional exercise on forensic examination of evidence and trace amounts of nuclear material from radiological crime scenes was implemented in Moscow in June 2022.

138. The Agency implemented a virtual National Train-the-Trainer Course on Radiological Crime Scene Management (Session 1) in Thailand in September 2022, a National Foundation Workshop on Radiological Crime Scene Management in Egypt in October 2022, a virtual and in-person Regional Train-the-Trainer Course on Radiological Crime Scene Management (Session 1 and Session 2) in Colombia in March and in December 2022 and an International Train-the-Trainer Course on Radiological Crime Scene Management for Subject Matter Experts in November 2022 in Austria.

139. The Agency held an introductory workshop on nuclear forensics for Association of Southeast Asian Nations countries in October 2022, and a training course providing a practical introduction to nuclear forensics in Australia in November 2022.

140. A new CRP entitled "Nuclear Forensics Science to Bridge the Radiological Crime Scene to the Nuclear Forensics Laboratory" was launched. It focuses on how nuclear forensics and radiological crime scene management directly enhance nuclear security, helping to ensure that nuclear energy can be used for energy generation, industrial and medical applications, and other peaceful applications.

D. Nuclear Security Interfaces

141. The Agency held the first consultancy meeting on a draft publication provisionally entitled *Management of the Interfaces Between Nuclear and Radiation Safety and Nuclear Security* in March 2022. Experts from Canada, France, Morocco, Pakistan, the Russian Federation and the United States of America participated by providing presentations on national experiences, comments on the table of contents and input for the revision of the document preparation profile for resubmission to the NSGC.

142. The second consultancy meeting on the same draft publication was held in August–September 2022. Experts from Canada, France, Morocco, Pakistan, the Russian Federation and the United States of America participated in the meeting. The document preparation profile was approved prior to the meeting, and the drafted chapters were reviewed. The next consultancy meeting will take place in 2023.

143. Seventeen individuals from 10 countries attended a Regional Workshop on the Interface Between Nuclear Safety and Security in Jordan in October 2022.

144. The Agency held an international Workshop on Managing the Interface Between Nuclear Safety and Security for Nuclear Fuel Cycle Facilities in Vienna in October 2022. The workshop was attended by 18 participants from 13 countries. The sharing of knowledge, experience and practical information related to the management of the interface between safety and security for nuclear fuel cycle facilities will assist in the further development of the draft publication provisionally entitled *Management of the Interfaces Between Nuclear and Radiation Safety and Nuclear Security*.

145. The Agency supported the implementation of a first-of-a-kind borehole disposal system in Ghana and Malaysia, a disposal solution that combines financial affordability and technological feasibility, where DSRSs can be safely, securely and permanently stored.

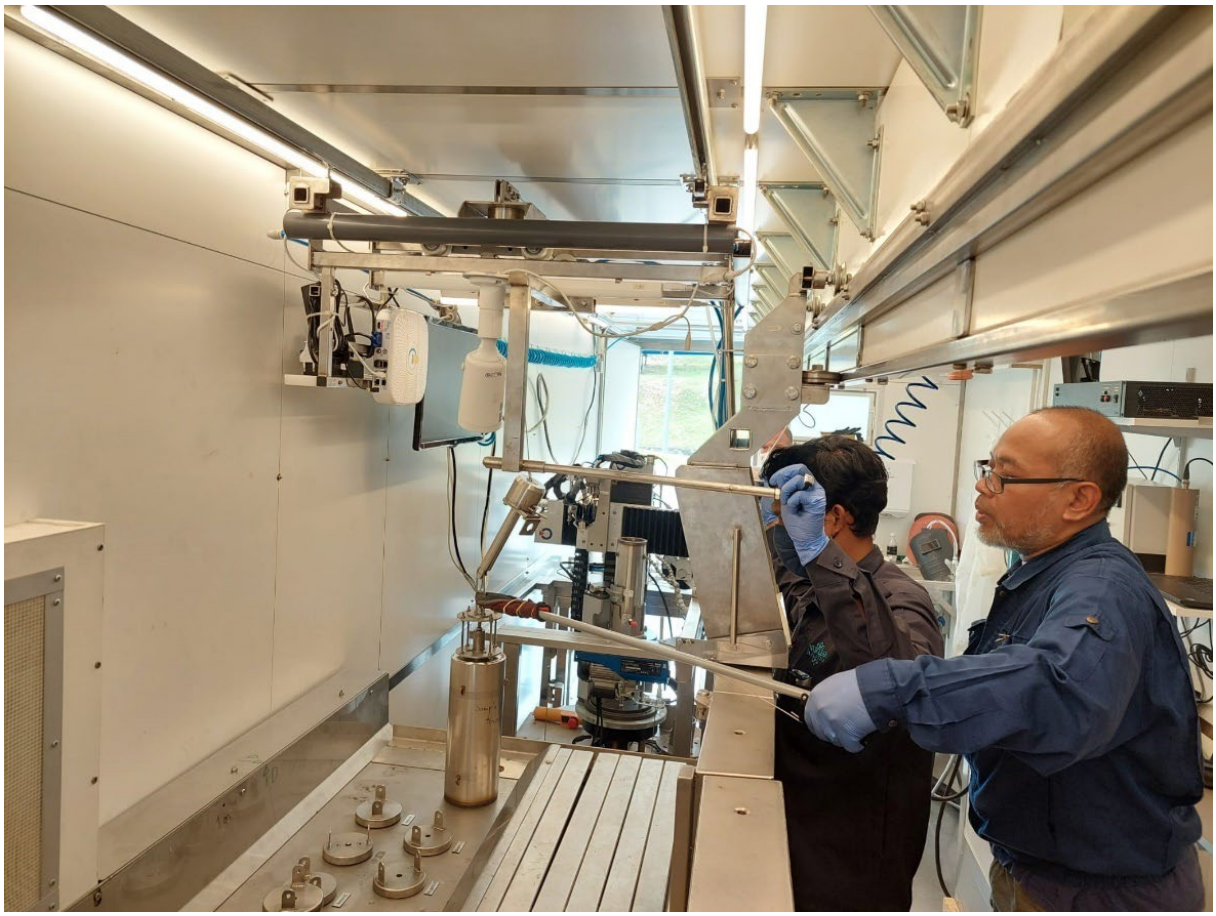


Figure A-17: A team of international experts in disused sealed radioactive sources management has been engaged to provide support to the Malaysia Nuclear Agency during the implementation of the project. (Photo: IAEA)

146. The Agency is enhancing inter-Departmental cooperation in the area of active interrogation technologies. The enhanced cooperation will provide additional opportunities for Member States to understand the application of active interrogation technologies for nuclear security and safety applications, in addition to conducting research at the Seibersdorf laboratories to enhance capacity building and develop additional guidance and reference materials relating to the use of such technologies.

147. The Agency developed a new smartphone application, the Personnel Alarm Assessment Tool (PAAT), which will be used to assist front line officers in their assessment of radiation alarms caused by individuals. Testing of the first version of PAAT began in December 2022, with its expected release to Member States in early 2023. Cross-cutting Agency cooperation increases the accuracy of the library of medical isotopes used for nuclear medicine treatments and diagnostics, and the calculational methodology to assure that the radiation levels detected and causing radiation alarms are compatible with medical treatments and timelines.

E. Nuclear Security Fund

Figure A-18: The IAEA held in 2022 two informal technical briefings in Vienna about the Multipurpose Building Project with the aim to inform the Member States on the construction and development progress. (Photo: IAEA)

148. In 2022, the Agency held two multilateral donor coordination meetings. The Agency also held bilateral donor coordination meetings with 16 donors: Australia, Belgium, Canada, China, Denmark, Finland, France, Japan, the Netherlands, the Republic of Korea, the Russian Federation, Saudi Arabia, Switzerland, the United Kingdom and the United States of America, as well as the European Union.

149. The Agency developed 196 individual reports and sent them to donors in accordance with donor requirements.

Appendix B
The Agency's Nuclear Security Series Activities in 2022

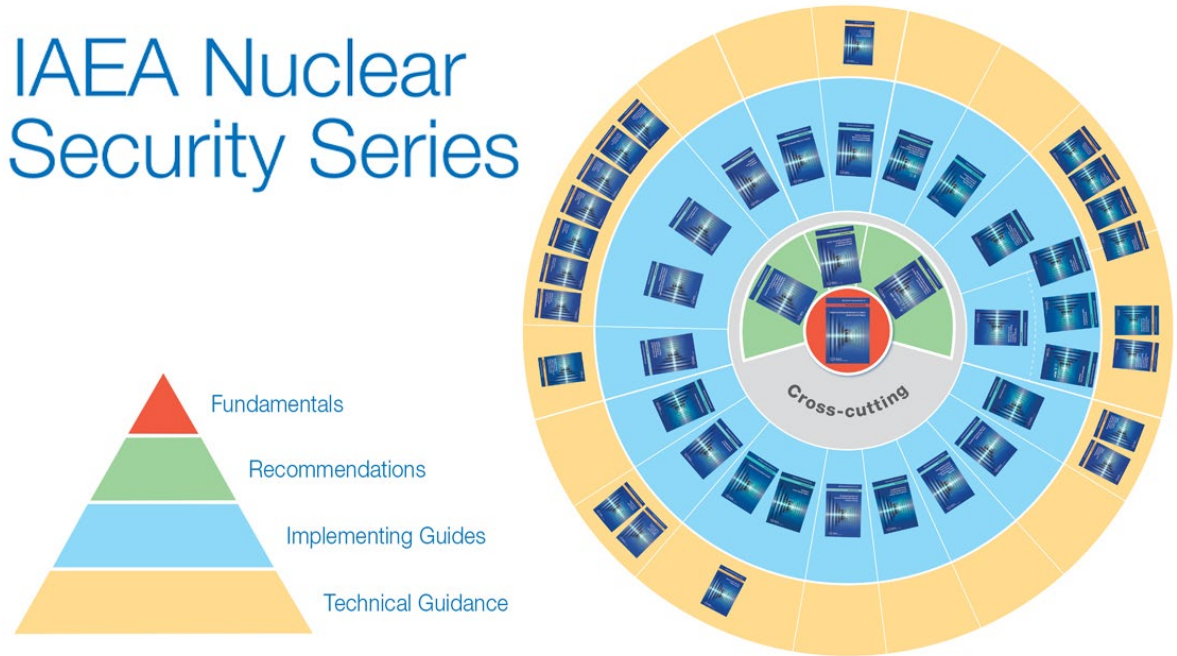
1. The Agency issued one Nuclear Security Series publication after endorsement by the Nuclear Security Guidance Committee (NSGC):

- Security Management of Radioactive Material in Use and Storage and of Associated Facilities (IAEA Nuclear Security Series No. 43-T).

2. The Agency continues to review the top tier of the Nuclear Security Series — the Nuclear Security Fundamentals and three Recommendations-level publications — to determine whether any revisions are needed in the near term, taking into account NSGC recommendations in this regard.

3. All Safety Standards Series and Nuclear Security Series publications are available online via the Nuclear Safety and Security Online User Interface (NSS-OUI) platform. The platform allows users to search a uniform knowledge base and contains information on the relationships between publications, allowing users to navigate from one publication to other relevant guidance and recommendations from other publications.

4. The NSS-OUI platform also enables the collection, storage and retrieval of feedback on the use of the current publications in both Series. The functionality assists in justifying the need for revisions by using the above-mentioned feedback, therefore also ensuring stability of the parts of the standards that remain valid.



Appendix C
The Agency's Collaborating Centres for Nuclear Security

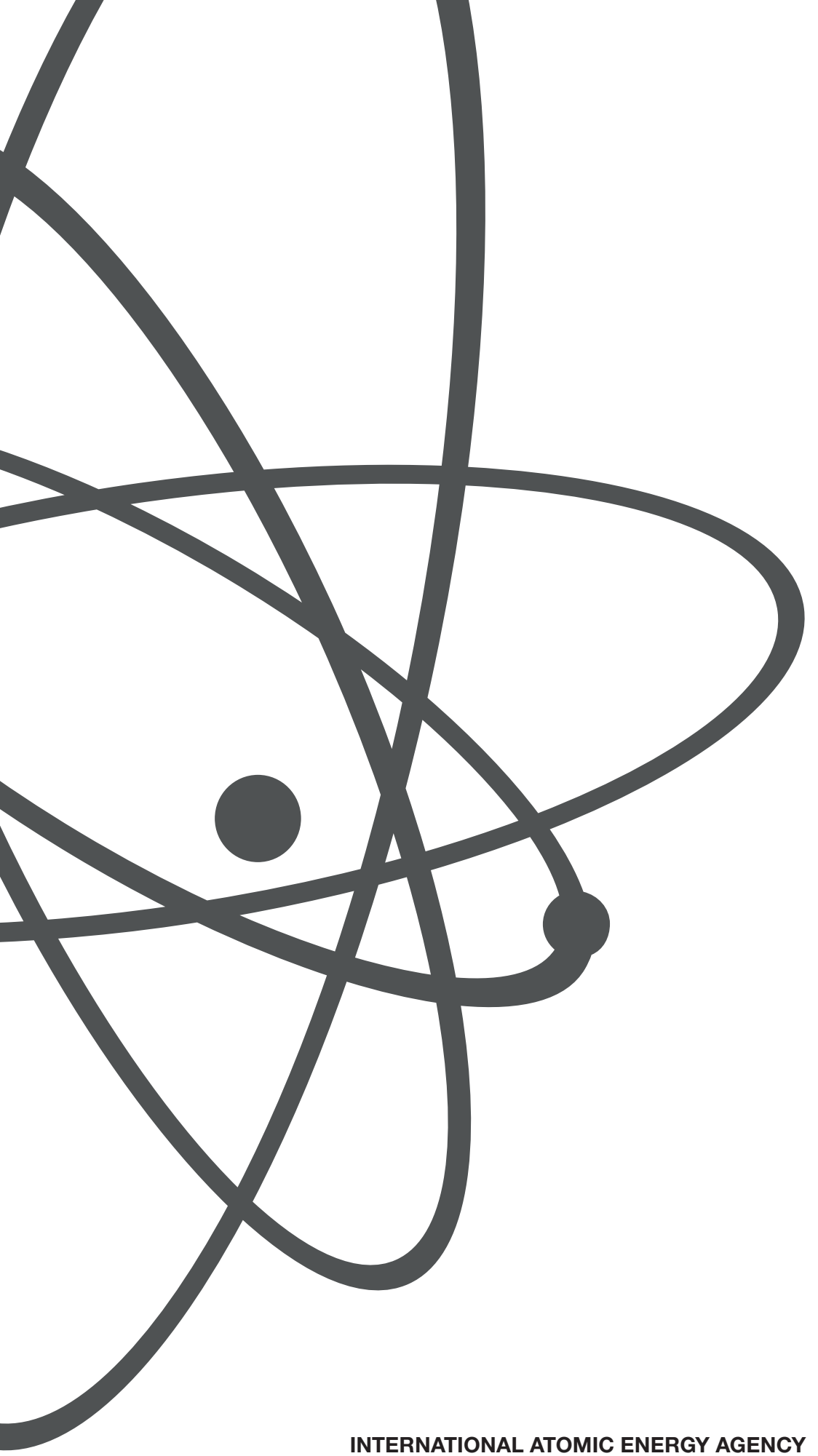
1. The Collaborating Centre scheme assists the Agency in achieving its objective to promote the peaceful uses of nuclear technology worldwide, and helps Member States strive towards achieving the targets identified in the United Nations Sustainable Development Goals.

2. An Agency Collaborating Centre is a Member State institution, department or laboratory that focuses on research, development and training and that has been designated by the Agency to support the Agency's programmatic activities by implementing an agreed work plan.

3. Such Centres are designated through a Collaborating Centre Agreement. This Agreement is a legally binding document signed by both parties, and contains the undertakings of the parties and the duration of designation as well as the objectives, activities and expected results and outcomes.

4. There are currently ten Collaborating Centres for nuclear security:

Institution name	Location	Programmatic focus
Austrian Institute of Technology	Austria	Information and computer security for nuclear security
China Atomic Energy Authority	China	Research, development, testing and training on nuclear security detection and physical protection technologies
Radiation Detection Training Centre of the General Administration of Customs of the People's Republic of China	China	Capacity building for nuclear security front line officers, and facilitation of safe and secure trade using nuclear detection technologies
National Institute for Nuclear Science and Technology	France	Education and training in nuclear sciences and applications, nuclear energy and nuclear safety and security
Centre for Energy Research of the Hungarian Academy of Sciences	Hungary	Nuclear forensics
Japan Atomic Energy Agency	Japan	Radiological characterization for decommissioning and nuclear security
Moroccan Nuclear and Radiation Safety and Security Agency	Morocco	Nuclear security capacity building
National Institute of Safety and Security	Pakistan	Nuclear security education, training and technical support
Rosatom Technical Academy	Russian Federation	Knowledge management and human resource development for nuclear energy and nuclear security
Explosive Ordinance Disposal and Chemical, Biological, Radiological and Nuclear Defence Training Centre	Spain	Various nuclear security activities



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