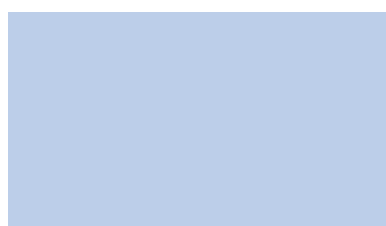
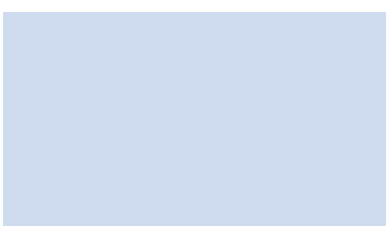
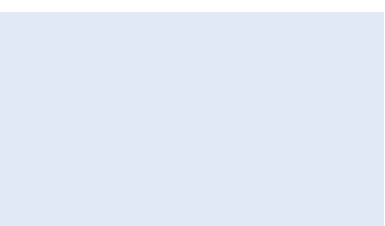
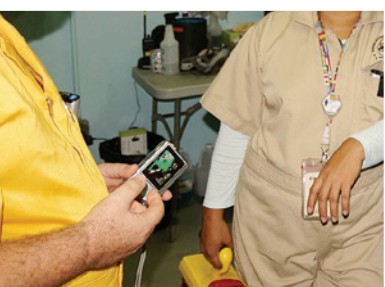


Nuclear Safety Review 2019



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Nuclear Safety Review 2019

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Foreword

The *Nuclear Safety Review 2019* includes the global trends and the Agency's activities undertaken in 2018 and thereby demonstrates the progress made regarding the priorities for 2018. It also presents priorities for 2019 and beyond, as identified by the Agency, for strengthening nuclear, radiation, transport and waste safety. 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 Safety Review 2019* was submitted to the March 2019 session of the Board of Governors in document GOV/2019/3. The final version of the *Nuclear Safety Review 2019* was prepared in light of the discussions held during the Board of Governors and also of the comments received from the Member States.

Table of Contents

Executive Overview	1
Analytical Overview.....	9
A. General Safety Areas.....	9
A.1. Agency Safety Standards and Peer Review and Advisory Services.....	9
A.2. International Safety Conventions	13
A.3. Regulatory Effectiveness in Nuclear, Radiation, Transport and Waste Safety, and in Emergency Preparedness and Response.....	14
A.4. Leadership and Management for Safety, Safety Culture and Communication on Safety	17
A.5. Capacity Building in Nuclear, Radiation, Transport and Waste Safety, and in Emergency Preparedness and Response.....	19
A.6. Research and Development for Safety	24
B. Strengthening Radiation, Transport and Waste Safety.....	25
B.1. Radiation Protection of Patients, Workers and the Public.....	25
B.2. Control of Radiation Sources.....	27
B.3. Safe Transport of Radioactive Material.....	29
B.4. Decommissioning, Spent Fuel Management and Waste Management.....	30
B.5. Radiation Protection of the Environment and Remediation	33
C. Strengthening Safety in Nuclear Installations	34
C.1. Nuclear Power Plant Safety	34
C.1.1. Operational Safety: Operating Experience and Long Term Operation.....	34
C.1.2. Site and Design Safety.....	37
C.1.3. Severe Accident Prevention and Mitigation	39
C.2. Safety of Small and Medium Sized or Modular Reactors	40
C.3. Research Reactor Safety	42
C.4. Fuel Cycle Facility Safety	44
C.5. Safety Infrastructure for Embarking Countries	45
C.5.1. Nuclear Power Programmes	45
C.5.2. Research Reactors Programme	48
D. Strengthening Emergency Preparedness and Response	49
D.1. Arrangements for Information Exchange, Communication and Assistance.....	49
D.2. Harmonization of Arrangements for Preparedness and Response	51
D.3. Testing Readiness for Response	53
E. Improving Management of the Safety and Security Interface.....	55
F. Strengthening Civil Liability for Nuclear Damage	56
Appendix	1
Summary of the Agency's Safety Standards Activities during 2018	1

Nuclear Safety Review 2019

Report by the Acting Director General

Executive Overview

1. The *Nuclear Safety Review 2019* includes the global trends and the Agency's activities undertaken in 2018 and thereby demonstrates the progress made regarding the priorities for 2018. It also presents priorities for 2019 and beyond, as identified by the Agency, for strengthening nuclear, radiation, transport and waste safety. 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.
2. The Executive Overview summarizes the trends, activities and priorities covered in this report. They include those related to general safety areas; radiation, transport and waste safety, safety in nuclear installations; emergency preparedness and response (EPR); management of the safety and security interface; and strengthening civil liability for nuclear damage.
3. The Appendix provides details on the activities of the Commission on Safety Standards and activities relevant to the Agency's safety standards.

General Safety Areas

Trends

4. The work on the Agency's safety standards continued to focus on the revision of existing standards rather than the establishment of new ones.
5. Member State requests for the Agency's peer review and advisory services continued to increase.
6. Information provided by Member States in the Agency's Radiation Safety Information Management System (RASIMS)¹ indicates that the majority of Member States are making good or substantial progress in strengthening their radiation safety regulatory infrastructure.
7. An increasing number of Member States are requesting assistance in developing programmes on leadership and management for safety, as well as on conducting safety culture self-assessment for regulatory bodies.
8. Member States continue to express a need for Agency support in the development and strengthening of national provisions for education, training, qualification and competence of personnel.

¹ The Agency's Radiation Safety Information Management System can be found at <https://rasims.iaea.org/>.

Activities

9. The Agency issued the Safety Requirements publication *Regulations for the Safe Transport of Radioactive Material: 2018 Edition* (IAEA Safety Standards Series No. SSR-6 (Rev. 1)). The Agency also issued seven General Safety Guides and five Specific Safety Guides.

10. The Agency conducted 66 peer review and advisory services across all safety areas.

11. The Agency hosted the Sixth Review Meeting of the Contracting Parties to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention). The Agency held the Officers' Experience Feedback on the Peer Review of the Vienna Declaration on Nuclear Safety Meeting to consider and identify possible actions for the Eighth Review Meeting of the Contracting Parties to the Convention on Nuclear Safety (CNS). The Agency also held the Organizational Meeting for the Eighth Review Meeting of CNS.

12. The Agency held two editions of the International School of Nuclear and Radiological Leadership for Safety, in India and in Mexico.

13. The Agency held the International Conference on the Challenges Faced by Technical and Scientific Support Organizations in Enhancing Nuclear Safety and Security: Ensuring Effective and Sustainable Expertise.

Priorities for strengthening general safety areas

14. The Agency will:

- continue strengthening its safety standards using lessons arising from the Fukushima Daiichi accident and other relevant sources; and assist with the application of its safety standards by, inter alia, strengthening its peer review and advisory services and related self-assessment tools;
- promote universal adherence to the CNS and the Joint Convention and support their effective implementation, inter alia, through the organization of workshops at the regional level and through bilateral activities with the Member States;
- assist Member States in strengthening their regulatory effectiveness by identifying lessons from international conferences, peer reviews, advisory missions, knowledge networks and relevant meetings and workshops;
- assist Member States in strengthening leadership and management for the safety of nuclear facilities and activities; assist Member States in their efforts to foster and sustain a strong safety culture; and assist Member States in strengthening their processes for communicating radiation risks to the public in planned and existing exposure situations and during an emergency;
- assist Member States in their capacity building programmes, including education and training in nuclear, radiation, transport and waste safety as well as EPR; and assist Member States in developing their expertise in the relevant technical areas; and
- assist Member States' efforts in the field of research and development for safety where the need for further work has been identified and facilitate the exchange of the results.

Strengthening Radiation, Transport and Waste Safety

Trends

15. The Agency has received a number of requests for Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) reviews to be carried out in 2019 and beyond.
16. The increased use of sealed radioactive sources has resulted in a growing need for appropriate arrangements for their management when they become disused, including the building of national disposal facilities. Member State support for the Code of Conduct on the Safety and Security of Radioactive Sources continues to grow.
17. The increased use of radioactive material in Member States is creating a growing need for regulatory oversight, including for domestic and international transport.
18. Significant growth in the number of decommissioning projects worldwide has increased the need for related education and training programmes.
19. Member States are increasingly requesting Agency support to develop and implement plans for near surface disposal of very low and low level radioactive waste. Several Member States are showing increased interest in geological disposal of high level radioactive waste and spent fuel when considered as waste.
20. The increasing use of nuclear techniques and applications has resulted in a growing need for analysing and evaluating the radiological implications of releases to the environment.
21. With the increased number of diagnostic imaging procedures utilizing ionizing radiation over the past years and better access to this medical technology, the Agency continues raising awareness for justification of using these techniques and for optimization of associated exposures.

Activities

22. The Agency conducted six ARTEMIS missions in 2018, including the first ever combined Integrated Regulatory Review Service (IRRS)–ARTEMIS mission.
23. The Agency held a Technical Meeting on Experiences with the Implementation of the Bonn Call for Action regarding radiation protection in medicine and a Technical Meeting on Preventing Unintended and Accidental Exposures in Nuclear Medicine.
24. The Agency held an Open-ended Meeting of Legal and Technical Experts on Implementation of the Guidance on the Import and Export of Radioactive Sources.
25. The Agency published the *Strategic Master Plan for Environmental Remediation of Uranium Legacy Sites in Central Asia*.² The document was presented at side events of the Sixth Review Meeting of Contracting Parties to the Joint Convention, the 62nd regular session of the General Conference and the 73rd session of the United Nations General Assembly.

Priorities for strengthening radiation, transport and waste safety

26. The Agency will:
 - assist Member States in the application of the Agency's safety standards, in particular, the International Basic Safety Standards (GSR Part 3), in radiation protection of people and the

² See: <https://nucleus.iaea.org/sites/connect/CGULSpublic/Pages/default.aspx>.

environment for applications such as energy production, research, and medical and industrial uses of radionuclides;

- assist Member States in the management of radioactive sources from cradle to grave through guidance documents, peer reviews, advisory services, training courses and workshops; and promote the effective application of the Code of Conduct on the Safety and Security of Radioactive Sources and the supplementary Guidance on the Import and Export of Radioactive Sources and Guidance on the Management of Disused Radioactive Sources, and facilitate the sharing of experience;
- assist Member States in building capacity for the safe transport of radioactive material;
- assist Member States in developing and implementing national policies and strategies for the safe management of radioactive waste, including disposal of waste, sealed radioactive sources, geological disposal of high level waste and spent fuel when considered as waste, and the development of decommissioning strategies and plans; and
- promote and facilitate the sharing of experience gained in dealing with the remediation of contaminated areas, including from post-accident situations and uranium legacy sites.

Strengthening Safety in Nuclear Installations

Trends

27. Lessons identified from Operational Safety Review Team (OSART) missions and analysis of data from the International Reporting System for Operating Experience (IRS) continue to indicate a need to learn from events, or to strengthen aspects, related to leadership and management for safety, the conduct of operations and maintenance, control of plant modifications, and programmes for effective use of operating experience.

28. An increasing number of nuclear power reactors around the world have programmes to address long term operation (LTO) and ageing management. Member States are paying increasing attention to establishing systematic ageing management programmes and processes for periodic safety reviews for fuel cycle facilities. Agency missions, conducted upon Member State requests, continue to identify areas for improvement in these areas.

29. An increasing number of Member States have expressed interest in small and medium sized or modular reactors (SMRs). More than 50 SMR designs are in various stages of development.

30. Around 30 Member States continue to consider or plan a new nuclear power programme. Many Member States continue to plan or implement projects to establish their first or a new research reactor.

Activities

31. The Agency held a Technical Meeting to Share Experience on Implementing Safety Improvements at Existing Nuclear Power Plants.

32. The Agency, in cooperation with the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA), issued a publication entitled *Nuclear Power Plant Operating Experience*.

33. The Agency prepared an OSART mission highlight report that summarizes the most significant observations made during missions and follow-up visits undertaken from 2013 to 2015.

34. The Agency finalized a study on how the Specific Safety Requirements *Safety of Nuclear Power Plants: Design* (IAEA Safety Standards Series No. SSR-2/1 (Rev. 1)) are applicable to SMRs intended

for near term deployment. The study led to the launch of the development of Agency publications that use and expand on the results of the study.

35. The Small Modular Reactor Regulators' Forum initiated its second phase by establishing three working groups on licensing; design and safety analysis; and manufacturing, commissioning and operations.

Priorities for strengthening safety in nuclear installations

36. The Agency will:

- assist Member States in implementing and improving programmes for ageing management and the safe LTO of nuclear installations; facilitate the exchange of operating experience of NPPs; and provide assistance to Member States to support their preparation for implementation of safety upgrades in existing NPPs;
- assist Member States in the application of the Agency's safety standards relating to the evaluation of safety of nuclear installations, such as siting, design, commissioning and operating requirements, including long term operation;
- provide forums for Member States to share knowledge and experience in their efforts to strengthen severe accident management guidelines; and further develop technical documentation in this area;
- assist Member State activities related to SMRs, particularly their efforts to develop safety requirements, build capacity for design safety and safety assessment, and share good practices;
- provide assistance to Member States to support their preparation for implementation of safety upgrades resulting from safety assessments of research reactors, managing ageing of research facilities, enhancing regulatory supervision, and strengthening application of the Code of Conduct on the Safety of Research Reactors through application of the relevant Agency safety requirements; and continue to facilitate the exchange of operating experience;
- provide assistance to Member States to support their preparation for implementation of safety upgrades identified by safety reassessments of nuclear fuel cycle facilities; and continue to support Member States to enhance regulatory supervision;
- assist Member States in the development of safety infrastructures for new nuclear power programmes; and
- assist Member States in developing safety infrastructure for new research reactor programmes.

Strengthening Emergency Preparedness and Response

Trends

37. Effective information exchange and emergency communication remain a priority for Member States.

38. Member States are increasingly requesting technical assistance and advice in strengthening national and regional EPR arrangements. Member States are showing increased interest in harmonizing their EPR arrangements based on the requirements in IAEA Safety Standards Series No. GSR Part 7.

39. The use of the Emergency Preparedness and Response Information Management System (EPRIMS) is increasing.

Activities

40. The Agency released an updated version of its Unified System for Information Exchange in Incidents and Emergencies (USIE) website, which allows information about an event to be easily revised. The updated site also allows the transfer and storage of encrypted confidential information.

41. The Agency launched a new version of EPRIMS, which provided improved usability and information sharing features.

42. The Agency held an International Symposium on Communicating Nuclear and Radiological Emergencies to the Public.

43. The Agency held the Ninth Meeting of the Representatives of Competent Authorities Identified under the Early Notification Convention and the Assistance Convention. The Agency further encouraged those Member States which had no contact points established for emergency communication to establish them.

Priorities for strengthening emergency preparedness and response

44. The Agency will:

- further develop operational arrangements for notification, reporting and assistance in a nuclear or radiological incident or emergency;
- assist Member States in the implementation of IAEA Safety Standards Series No. GSR Part 7 and develop associated Safety Guides, as a main reference for harmonization of EPR arrangements at the international level; and
- continue to implement an active exercise programme to test EPR at the international level and support national EPR exercise programmes.

Improving Management of the Safety and Security Interface

Trends

45. Member States continue to encourage the Secretariat to facilitate a coordination process to address safety and security interfaces.

Activities

46. The Agency held a Technical Meeting on the Safety and Security Interface — Approaches and National Experiences.

Priorities for improving management of the safety and security interface

47. The Agency will ensure that safety standards and nuclear security guidance take into account the implications for both safety and security whenever appropriate, recognizing that the activities that address nuclear safety and security are different.

Strengthening Civil Liability for Nuclear Damage

Trends

48. Member States continue to attach importance to having effective and coherent nuclear liability mechanisms in place at the national and global level to ensure prompt, adequate and non-discriminatory compensation for damage caused by a nuclear accident or incident.

Activities

49. The Agency's International Expert Group on Nuclear Liability (INLEX) held its 18th regular meeting in Vienna, Austria. The meeting was preceded by a Workshop on Civil Liability for Nuclear Damage. A National Workshop on Civil Liability for Nuclear Damage was also held in Khartoum, Sudan.

Priorities for strengthening civil liability for nuclear damage

50. The Agency will continue to facilitate the establishment of a global nuclear liability regime and assist Member States in their efforts to adhere to and implement the international nuclear liability instruments, taking into account the recommendations adopted by INLEX in 2012.

Analytical Overview

A. General Safety Areas

A.1. Agency Safety Standards and Peer Review and Advisory Services

Trends

1. The work on the Agency's safety standards continued to focus on the revision of existing standards rather than the establishment of new ones. The revision of Safety Requirements publications to include lessons from the Fukushima Daiichi accident has been completed and the focus continues to be on revising Safety Guides.

2. Member State requests for the Agency's peer review and advisory services continued to increase and a large number of missions were conducted across all safety areas. The Agency received the following requests for peer review missions to be conducted over the next two years: 18 for Integrated Regulatory Review Service (IRRS) missions; 5 for Integrated Nuclear Infrastructure Review (INIR³) missions; 2 for Emergency Preparedness Review (EPREV) missions; 6 for Site and External Events Design (SEED) review missions; 3 for Technical Safety Review (TSR) services; 9 for Operational Safety Review Team (OSART) missions; 4 for Occupational Radiation Protection Appraisal Service (ORPAS) missions; 12 for Safety Aspects of Long Term Operation (SALTO) missions; 1 for Integrated Safety Assessment of Research Reactors (INSARR) missions; 1 for Independent Safety Culture Assessment (ISCA) missions; 2 for Education and Training Appraisal (EduTA) missions; and 7 for Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS) missions.

Activities

3. The Agency issued the Safety Requirements publication *Regulations for the Safe Transport of Radioactive Material: 2018 Edition* (IAEA Safety Standards Series No. SSR-6 (Rev. 1)). This revision of the Agency's Transport Regulations includes a new category of surface contaminated objects (SCO-III) and establishes additional requirements to assess the effects of storage time on package design.

4. The Agency issued the following seven General Safety Guides:

- *Occupational Radiation Protection* (IAEA Safety Standards Series No. GSG-7);
- *Radiation Protection of the Public and the Environment* (IAEA Safety Standards Series No. GSG-8);
- *Regulatory Control of Radioactive Discharges to the Environment* (IAEA Safety Standards Series No. GSG-9);

³ INIR is a service provided by the IAEA Department of Nuclear Energy. It is reported here due to the coordinated delivery of the INIR service with many safety related peer review and advisory services.

- *Prospective Radiological Environmental Impact Assessment for Facilities and Activities* (IAEA Safety Standards Series No. GSG-10);
 - *Arrangements for the Termination of a Nuclear or Radiological Emergency* (IAEA Safety Standards Series No. GSG-11);
 - *Organization, Management and Staffing of the Regulatory Body for Safety* (IAEA Safety Standards Series No. GSG-12); and
 - *Functions and Processes of the Regulatory Body for Safety* (IAEA Safety Standards Series No. GSG-13).
5. In addition, the Agency issued the following five Specific Safety Guides:
- *Establishing the Infrastructure for Radiation Safety* (IAEA Safety Standards Series No. SSG-44);
 - *Radiation Protection and Safety in Medical Uses of Ionizing Radiation* (IAEA Safety Standards Series No. SSG-46);
 - *Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities* (IAEA Safety Standards Series No. SSG-47);
 - *Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants* (IAEA Safety Standards Series No. SSG-48); and
 - *Operating Experience Feedback for Nuclear Installations* (IAEA Safety Standards Series No. SSG-50).
6. The Commission on Safety Standards (CSS) endorsed for submission to the Board of Governors the draft Safety Requirements publication *Site Evaluation for Nuclear Installations* (DS484) (IAEA Safety Standards Series No. SSR-1).
7. The CSS also endorsed for submission for publication the following draft Safety Guides:
- *Organization, Management and Staffing of the Regulatory Body for Safety* (IAEA Safety Standards Series No. GSG-12);
 - *Functions and Processes of the Regulatory Body for Safety* (IAEA Safety Standards Series No. GSG-13);
 - *Operating Experience Feedback for Nuclear Installations* (IAEA Safety Standards Series No. SSG-50);
 - *Decommissioning of Medical, Industrial and Research Facilities* (DS403), which is a revision of WS-G-2.2;
 - *Radiation Safety of X-ray Generators and other Radiation Sources Used for Inspection Purposes and for Non-Medical Human Imaging* (DS471);
 - *Design of the Reactor Coolant System and Associated Systems in Nuclear Power Plants* (DS481), which is a revision of NS-G-1.9;
 - *Design of Reactor Containment and Associated Systems for Nuclear Power Plants* (DS482), which is a revision of NS-G-1.10;
 - *Accident Management Programmes for Nuclear Power Plants* (DS483), which is a revision of IAEA Safety Standards Series No. NS-G-2.15 taking into account lessons from the Fukushima Daiichi accident;

- *Establishing the Safety Infrastructure for a Nuclear Power Programme* (DS486), which is a revision of SSG-16;
- *Design of the Reactor Core for Nuclear Power Plants* (DS488), which is a revision of NS-G-1.12;
- *Deterministic Safety Analysis for Nuclear Power Plants* (DS491), which is a revision of SSG-2; and
- *Human Factors Engineering in the Design of Nuclear Power Plants* (DS492).

8. The Agency included all new safety standards and nuclear security guidance publications in the Nuclear Safety and Security Online User Interface (NSS-OUI) platform and tagged defined terms used in safety standards with definitions from the IAEA Safety Glossary. The NSS-OUI platform was used to develop a strategic plan for the revision of Safety Guides on the safety of nuclear fuel cycle facilities.

9. The Agency held a consultancy meeting in Vienna, Austria, in February 2018 to analyse the Safety Fundamentals to determine whether there is a need to refine parts of the text with respect to retrospective attribution of radiation health effects to past radiation exposure, prospective inference of health risks from radiation exposure, and prediction of notional health effects for comparative purposes (e.g. use of collective dose), taking account of the Annex on *Attributing Health Effects to Ionizing Radiation Exposure and Inferring Risks* in the 2012 report of the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR). Taking into account the results of the discussion at this consultancy meeting, the Safety Standards Committees have subsequently concluded that there is no need for revision of the Safety Fundamentals.

10. The Agency conducted seven IRRS missions — six to Member States without nuclear power plants (NPPs) and one to a Member State with operating NPPs — and two follow-up IRRS missions in Member States with operating NPPs. The Agency conducted three INIR⁴ Phase 1 missions, one INIR Phase 2 mission and one INIR Phase 3 mission. The Agency conducted two EPREV missions. The Agency conducted two SEED review missions. The Agency conducted three TSR services: one TSR on Periodic Safety Review (TSR-PSR), one TSR on Design Safety (TSR-DS) and one TSR on Safety Requirements (TSR-SR). The Agency conducted six OSART missions, one at an NPP in the pre-operational phase prior to initial fuel load, and two follow-up OSART missions. The Agency conducted one Peer Review of Operational Safety Performance Experience (PROSPER) mission. The Agency conducted two ISCA missions. The Agency conducted one EduTA mission. The Agency conducted four ORPAS missions and one follow-up ORPAS mission. The Agency conducted ten Advisory Missions on Regulatory Infrastructure for Radiation Safety (AMRAS) and three follow-up AMRAS missions. The Agency conducted six SALTO missions. The Agency conducted two INSARR missions and one follow-up INSARR mission. The Agency conducted six ARTEMIS missions including the first ever combined IRRS–ARTEMIS mission.

11. The Agency incorporated Member States' feedback into the TSR services guidelines. The guidelines provide a basic structure and common approach across the technical areas covered the TSR.

12. The Agency finalized performance indicators for IRRS missions and the IRRS programme, and implemented them in seven IRRS missions from June 2018 onwards. The Agency included performance indicators for EPREV missions in the recent revision of the EPREV guidelines and applied these in recent missions.

⁴ INIR is a service provided by the IAEA Department of Nuclear Energy. It is reported here due to the coordinated delivery of the INIR service with many safety related peer review and advisory services.

13. The first draft of the ARTEMIS guidelines was released. In interactions with Member States, the Agency underlined the need to enlarge the pool of experts. The Agency continues its work to ensure adequate peer expertise for each mission.

14. The Agency held a workshop in Luxembourg in November 2018 to exchange information, experience and lessons learned from the IRRS missions conducted since 2014, as well as to discuss recent developments and expectations for the IRRS programme and to explore further improvements in the planning and implementation of IRRS missions in the longer term. The Agency held a regional workshop also in Luxembourg in November 2018 to discuss specific aspects related to the IRRS missions that have been conducted so far in Member States from the European Union and to assist these countries in fulfilling their obligations under the EU legislation for nuclear safety.

Priorities and Related Activities

15. ***The Agency will continue strengthening its safety standards using lessons arising from the Fukushima Daiichi accident and other relevant sources. The Agency will assist with the application of its safety standards by, inter alia, strengthening its peer review and advisory services and related self-assessment tools. The Agency will undertake the following activities in relation to these priorities:***

- The Agency will continue to review and revise Safety Guides to incorporate lessons from the Fukushima Daiichi accident and other sources. When developing new standards, the Agency will continue to focus on post-emergency recovery; procedures and criteria for food, drinking water and non-food commodities in existing exposure situations; and the methodology for the development of such criteria; as well as state of the art safety functions for nuclear facilities and activities;
- The Agency will continue the work to revise closely interrelated Safety Guides on operational safety for nuclear power plants (DS497), and will complete the revision of the Safety Guide on preparedness and response for an emergency during the transport of radioactive material (DS469);
- The Agency will further enhance the NSS-OUI platform by adding up-to-date safety standards and nuclear security guidance and defining a process for collection and analysis of Members States' feedback. Terms defined in published standards will be tagged to link to Safety Glossary definitions and information notes. The NSS-OUI platform will continue to be used to support the drafting, review and approval process for safety standards;
- The Agency will continue to provide peer review and advisory services upon request;
- The Agency will continue to strengthen its peer review and advisory services and self-assessment tools by incorporating lessons learned from their implementation and to share, as appropriate, the relevant information with Member States. The lessons from recent ARTEMIS missions, including the first combined IRRS–ARTEMIS mission, will be reviewed and the draft guidelines for ARTEMIS revised as appropriate;
- The Agency will facilitate TSR peer reviews by enhancing the Global Safety Assessment Network (GSAN) through provision of the information about TSR services; and
- The Agency will hold a Technical Meeting on the occasion of the 20th anniversary of the EPREV service to discuss ways to further improve its effectiveness and efficiency.

A.2. International Safety Conventions

Trends

16. The Convention on Nuclear Safety⁵ (CNS) was adopted on 17 June 1994 and entered into force on 24 October 1996. As of December 2018, there were 85 Contracting Parties to the CNS, an increase of 2 compared to the end of 2017.

17. The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention)⁶ was adopted on 5 September 1997 and entered into force on 18 June 2001. As of December 2018, there were 80 Contracting Parties to the Joint Convention, an increase of 4 compared to the end of 2017.

Activities

18. The Agency hosted and provided Secretariat support to the Sixth Review Meeting of the Contracting Parties to the Joint Convention in Vienna, Austria, in May–June 2018, attended by more than 850 delegates from 69 Contracting Parties and 4 observers (Lebanon and the Philippines as Signatory States of the Joint Convention, as well as the Islamic Republic of Iran and the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA)). The Contracting Parties reviewed national reports in country groups and identified that good progress was being made in many areas related to the safety of spent fuel and radioactive waste management. At the plenary the Contracting Parties adopted a number of proposals to improve the effectiveness of the review process, addressing the submission and the content of the national reports, the submission of proposals to be considered at review meetings. The summary report was made available on the Agency's website.

19. The Contracting Parties decided by consensus to hold an Extraordinary Meeting prior to the Organizational Meeting of the Seventh Review Meeting, with the view to discuss possible ways to improve procedural mechanisms of the Joint Convention.

20. The Agency held a meeting in Vienna in late January and early February at which the Officers of the Seventh Review Meeting of the Contracting Parties to the Convention on Nuclear Safety provided feedback on their experience in reporting on the principles of the Vienna Declaration on Nuclear Safety. The group of Officers prepared a report that was considered at the Organizational Meeting for the Eighth Review Meeting, which was held in Vienna in October 2019. At the meeting, the Convention on Nuclear Safety Contracting Parties also established Country Groups and elected the President, Vice-Presidents and the Country Group Officers of the Eighth Review Meeting.

21. The Agency held a Regional Workshop to Promote the Joint Convention for Member States from the Asia and the Pacific region in Jakarta, Indonesia, in October 2018 and a Workshop to Promote the CNS and the Joint Convention in Vienna, Austria, in December 2018, to give Member States a broader understanding of the CNS and the Joint Convention, and to further encourage adherence to them and active participation in the peer review processes.

⁵ The text of the CNS is available in document INFCIRC/449: <https://www.iaea.org/sites/default/files/infcirc449.pdf>.

⁶ The text of the Joint Convention is available in document INFCIRC/546: <https://www.iaea.org/sites/default/files/infcirc546.pdf>.

Priorities and Related Activities

22. *The Agency will promote universal adherence to the CNS and the Joint Convention and support their effective implementation, inter alia, through the organization of workshops at the regional level and through bilateral activities with the Member States. The Agency will undertake the following activities in relation to this priority:*

- The Agency will continue to undertake preparatory activities for the next CNS and Joint Convention review meetings;
- The Agency will continue to organize workshops at the regional level and bilateral activities, including for Member States embarking on nuclear power programmes and States with radioactive waste not originating from the nuclear fuel cycle, such as disused sealed radioactive sources, to raise awareness and promote adherence to the Joint Convention and to the CNS; and
- The Agency will continue organizing CNS educational workshops, and developing materials and tools to support implementation of these workshops.

A.3. Regulatory Effectiveness in Nuclear, Radiation, Transport and Waste Safety, and in Emergency Preparedness and Response

Trends

23. Information provided by Member States in the Agency's Radiation Safety Information Management System (RASIMS)⁷, indicates that 76% of Member States are making good or substantial progress in strengthening their radiation safety regulatory infrastructure. The 13 Advisory Missions on Regulatory Infrastructure for Radiation Safety (AMRAS) undertaken in 2018 showed that there is a need in some Member States for continuous technical support for establishing and developing a sustainable regulatory framework for radiation safety.

24. The two IRRS follow-up missions undertaken in 2018 illustrate some Member States' continued commitment to strengthening national legal and governmental infrastructure by completing the IRRS cycle.

25. The Agency noted interest by many Member States in updating national emergency preparedness and response (EPR) frameworks, including EPR regulations, and harmonizing arrangements in line with Safety Requirements No. GSR Part 7.

26. Review meetings, technical and steering committee meetings, as well as the recent report of the International Nuclear Safety Group (INSAG) entitled *Ensuring Robust National Nuclear Safety Systems — Institutional Strength in Depth* (INSAG Series No. 27), highlighted a need to further connect the different nuclear organizations, facilitate adherence to legal instruments and promote the Agency's safety standards and services through communication, and through information and knowledge sharing mechanisms.

27. The number of ORPAS missions has increased in the past five years. The missions highlighted the fact that Member States' rapid increase in the use of radiation technology has led to a need for guidance, training and technical services to strengthen occupational radiation protection.

⁷ The Agency's Radiation Safety Information Management System can be found at <https://rasims.iaea.org/>.

Activities

28. The Agency continued to support the activities of the Regulatory Cooperation Forum (RCF). RCF senior leaders were joined by Agency staff for meetings in Rabat, Morocco in January 2018 and Minsk, Belarus in June 2018 to avoid duplication of support activity plans.

29. The Agency held a workshop for the Indonesian National Nuclear Energy Agency in Jakarta, Indonesia, on competence development for a nuclear power programme, and a workshop for the Pakistan Nuclear Regulatory Authority in Islamabad, Pakistan, in July 2018 on review and assessment in the context of periodic safety review.

30. The Agency supported Member States in establishing and further strengthening their national regulatory infrastructure for radiation safety through five workshops focused on the establishment of a management system for the regulatory body, authorization and inspection for facilities, as well as activities using cyclotrons and other technologies.

31. The Agency continued to support the strengthening of radiation safety infrastructure in Member States to establish or enhance their cancer control capacity, through integrated missions of the Programme of Action for Cancer Therapy (imPACT) reviews. The Agency conducted seven such missions: in Indonesia in January; in Afghanistan and Ukraine in May; in Mexico in August; in North Macedonia in September; and in Guyana and Mauritius in December.

32. The Agency hosted the Arab Network of Nuclear Regulators (ANNuR) Plenary Meeting during the 62nd regular session of the General Conference. The participants stated that many of their States consider that nuclear energy can contribute to the mitigation of climate change. The participants also discussed the publication of a training programme for the regulatory supervision of research reactors and the development of a sample manual for the planning, management and conduct of regulatory review and assessment of safety for NPPs.

33. The Agency updated and launched a revised version of the Control of Sources Network (CSN) portal. New features include a platform for Member States to discuss and share regulatory information and documentation for strengthening their radiation safety infrastructure.

34. The Agency continued operating RASIMS as a tool for assisting Member States that receive technical support from the Agency, so that they can evaluate their progress in applying the Agency's radiation safety standards. The Agency held two consultancy meetings in 2018, with RASIMS national coordinators from all regions, on testing and evaluating a new version of RASIMS that was under development. Eighteen RASIMS national coordinators attended an interregional workshop held in Vienna, Austria, in October to learn how to use the new version of RASIMS.

35. The Agency restructured the International Regulatory Network (RegNet) portal in line with Member State feedback that was endorsed by the Steering Committee of the Global Nuclear Safety and Security Network (GNSSN) in December 2017. The Agency is adding content to the new structure.

36. The Agency published a Technical Document (TECDOC) entitled *Regulatory Oversight of Human and Organizational Factors for Safety of Nuclear Installations* (IAEA-TECDOC-1846), which describes ways to regulate human and organizational factors including through an integrated safety assessment approach. The Agency continued to develop TECDOCs on integrated safety assessment by the regulatory body; on collecting, analysing and sharing regulatory experience; and on managing regulatory oversight for the first nuclear power plant, to support application of the Safety Requirements

Governmental, Legal and Regulatory Framework for Safety (IAEA Safety Standards Series No. GSR Part 1 (Rev.1))⁸.

37. The Agency developed a draft Safety Report entitled *Managing Nuclear Safety Knowledge: National Approaches and Experience* to assist Member States in developing a national level strategy or a coordination mechanism for nuclear safety knowledge management, in line with the Agency's safety standards and good practices. The Agency held two workshops, in Tunis, Tunisia, in June 2018 and in Berlin, Germany, in December 2018, based on the draft Safety Report.

38. The Agency, in cooperation with the European Commission, held a workshop in Luxembourg, Luxembourg, in December 2018 to discuss EPR requirements in GSR Part 7 and in relevant European Union legislation, along with national experiences of their implementation.

39. The Agency held 51 workshops and training events to assist Member States in implementing GSR Part 7 and associated guidance, including 32 at interregional or regional level and 19 at national level. The Agency, in cooperation with the Food and Agriculture Organization of the United Nations (FAO), conducted a webinar in October 2018 to raise awareness of the requirements in GSR Part 7, specifically those in relation to food safety in a nuclear or radiological emergency. The webinar was attended by about 200 experts worldwide. In addition to two EPREV missions, 32 advisory services on EPR were provided upon request from Member States.

40. The Agency supported the members of the Forum of Nuclear Regulatory Bodies in Africa (FNRBA) in the revision of its Charter to improve the governance of the Forum and interaction with African stakeholders. The revised Charter was made available in Arabic, English and French and sent to all FNRBA countries. In September 2018, the FNRBA plenary meeting approved a roadmap of project priorities with the support of FNRBA partners based on an online survey developed by the Agency. The Agency also developed a collaborative platform to collect FNRBA members' needs.

Priorities and Related Activities

41. ***The Agency will assist Member States in strengthening their regulatory effectiveness by identifying lessons from international conferences, peer reviews, advisory missions, knowledge networks and relevant meetings and workshops. The Agency will undertake the following activities in relation to this priority:***

- The Agency will continue to support the establishment, development, implementation and strengthening of regulatory infrastructure for nuclear and radiation safety in line with GSR Part 1 (Rev.1);
- The Agency will hold the fifth International Conference on Effective Nuclear Regulatory Systems;
- The Agency will continue to support the activities of the RCF;
- The Agency will regularly update the CSN portal to enhance regulatory cooperation and sharing of experience on establishing, implementing and strengthening a national regulatory infrastructure for radiation safety;
- The Agency will publish a TECDOC provisionally entitled *Methodology for the Systematic Assessment of the Regulatory Competence Needs (SARCoN) for Regulatory Bodies of Radiation Facilities and Activities* and support Member States in its application to ensure regulatory competence in respect of radiation facilities and activities;

⁸ INTERNATIONAL ATOMIC ENERGY AGENCY, *Governmental, Legal and Regulatory Framework for Safety*, IAEA Safety Standards Series No. GSR Part 1 (Rev. 1), IAEA, Vienna (2016).

- The Agency will continue supporting Member States' implementation of the General Safety Guides *Organization, Management and Staffing of the Regulatory Body for Safety* (IAEA Safety Standards Series No. GSG-12) and *Functions and Processes of the Regulatory Body for Safety* (IAEA Safety Standards Series No. GSG-13);
- The Agency will assist RASIMS Coordinators in the transition to the new version of RASIMS, which will enable participating Member States to collect and evaluate information about their national radiation safety infrastructure in a more efficient and effective manner;
- The Agency will test the collaborative platform developed in 2018 to capture the needs of FNRBA members and will continue to support ANNuR activities to strengthen and harmonize nuclear safety infrastructure in Arab countries;
- The Agency will continue to support the implementation of the EPR requirements established in GSR Part 7; and
- The Agency will conduct Schools on Drafting Regulations and develop related training materials.

A.4. Leadership and Management for Safety, Safety Culture and Communication on Safety

Trends

42. Agency peer review missions continue to provide recommendations relating to leadership and management for safety and safety culture.
43. An increasing number of Member States are requesting assistance in developing their programmes on leadership and management for safety, as well as on conducting safety culture self-assessment for regulatory bodies.
44. Thematic working groups and Technical Meetings have highlighted the need for the Secretariat to further support Member States in developing communication strategies and plans, as well as establishing a global community of practice to discuss and share experiences.

Activities

45. The Agency held the annual IAEA Workshop for Senior Managers on Leadership and Culture for Safety in Vienna, Austria, in September 2018. The workshop reinforced senior managers' understanding of their role in influencing culture and leadership for safety across all levels of their organization. The Agency held a Training Workshop on a Systemic Approach to Safety — Pragmatic Solutions in Vienna, Austria, in October 2018 to assist in training managers of facilities, regulators and technical support organizations in assessing and identifying improvements to their systems and practices in support of leadership, management and culture for safety.
46. The Agency supported operating organizations in enhancing their safety culture capabilities by organizing a workshop on the Safety Culture Continuous Improvement Process (SCCIP) implementation support programme for the Rosenergoatom Concern and Kalinin nuclear power plant in Moscow, Russian Federation, in September 2018; a workshop on safety culture assessment support in Kola, Russian Federation, in April 2018; an SCCIP follow up support mission in Veracruz, Mexico, in August 2018; an expert mission on safety culture and safety culture self-assessment methodologies of NPPs senior management in Islamabad, Pakistan, in December 2018; a mission on human factors, leadership for safety and safety culture in Accra, Ghana, in October 2018; and a safety culture self-assessment mission in Fennovoima, Helsinki, Finland, in November 2018.

47. The Agency held two regional workshops on establishing a management system in the regulatory body, for Member States in the Asia and the Pacific region in Shanghai, China, in April 2018 and for ANNuR and FNRBA members in Hurghada, Egypt, in September 2018.

48. The Agency conducted a mission to review the management system of the Indonesian Nuclear Energy Regulatory Agency (BAPETEN) against the General Safety Requirements *Leadership and Management for Safety* (IAEA Safety Standards Series No. GSR Part 2)⁹ in Jakarta, Indonesia, in March 2018. The mission also provided BAPETEN with recommendations for addressing gaps in meeting the requirements of GSR Part 1 (Rev.1).

49. The Agency held a Regional Workshop for Instructor Training on Safety Leadership for seven member countries of the Asian Nuclear Safety Network (ANSN) in Fukui Prefecture, Japan, in April 2018.

50. The Agency conducted an expert mission in Warsaw, Poland, in May 2018 to review the National Atomic Energy Agency's provisions to implement the requirements of Safety Requirements No. GSR Part 2, including its management system. Significant progress was observed in developing a comprehensive management system. Several suggestions to continue improving the well-designed management system were offered.

51. The Agency evaluated the Pilot International School of Nuclear and Radiological Leadership for Safety and, as a result, enhanced role play exercises and expanded the training materials to support extending the School from a one-week to a two-week programme. Two editions of the School were held: a one-week school in India, and a two-week school in Mexico, in November 2018.

52. The Agency held three national workshops in the area of leadership and management for safety, in Accra, Ghana, in April 2018, in Teheran, Islamic Republic of Iran, in August 2018 and in Warsaw, Poland, in May 2018.

53. The Agency held two national workshops on regulatory oversight of safety culture in Ljubljana, Slovenia, in January 2018 and in Islamabad, Pakistan, in November 2018. The Agency also held one regional workshop on self-assessment of safety culture for nuclear regulatory bodies in Hanoi, Viet Nam, in October 2018.

54. The Agency continued to develop the Nuclear Communicator's Toolbox. The toolbox will serve as an Agency web-platform for communicators with comprehensive information as well as basic principles and practical guidance related to nuclear communication, including advice on safety and security communication. It will also offer easy access to information on relevant topics on the Agency's website.

Priorities and Related Activities

55. The Agency will assist Member States in strengthening leadership and management for the safety of nuclear facilities and activities. The Agency will assist Member States in their efforts to foster and sustain a strong safety culture. The Agency will also assist Member States in strengthening their processes for communicating radiation risks to the public in planned and existing exposure situations and during an emergency. The Agency will undertake the following activities in relation to these priorities:

- The Agency will continue to make available workshops and training in leadership, management and culture for safety for Member States and will continue with the programme

⁹ INTERNATIONAL ATOMIC ENERGY AGENCY, *Leadership and Management for Safety*, IAEA Safety Standards Series No. GSR Part 2, IAEA, Vienna (2016).

of work on continuously improving safety culture and self-assessment of safety culture for regulatory bodies and for operators of nuclear facilities and activities;

- The Agency will develop a Safety Guide on leadership and management for safety to provide guidance on meeting the requirements in GSR Part 2;
- The Agency will develop additional case studies and will organize a train-the-trainers workshop for the International School of Nuclear and Radiological Leadership for Safety, and conduct regional editions of the School;
- The Agency will finalize the development of a toolkit for safety and security communicators, and will also organize workshops to support Member States in sharing good practices in communication; and
- The Agency will finalize a Safety Guide provisionally entitled *Arrangements for Public Communications in Preparedness and Response for a Nuclear or Radiological Emergency* (DS475) and develop associated training materials to support Member States with its implementation.

A.5. Capacity Building in Nuclear, Radiation, Transport and Waste Safety, and in Emergency Preparedness and Response

Trends

56. Member States continue to express a need for Agency support in the development and strengthening of national provisions for education, training, qualification and competence of personnel with responsibilities in radiation protection and safety, i.e. radiation protection officers (RPOs) and qualified experts (QEs). An analysis of the results from 20 EduTA missions conducted since 2005¹⁰ showed that national provisions for RPOs and QEs need to be further strengthened in line with the Agency's safety standards. In particular, there is a need to clarify the respective roles and functions of the RPO and QE, and to establish qualification requirements (education and training (E&T), work experience and competence) for them and criteria for their designation and formal recognition (see Figure 1).

57. The Postgraduate Educational Course (PGEC) in Radiation Protection and the Safety of Radiation Sources continued to be in high demand, with courses attracting more than twice as many applicants as available places.

58. The number of train-the-trainers events for RPOs and the number of participants have increased in comparison with previous years: 114 participants attended six workshops in 2018, compared to 98 participants at five workshops in 2017 and 60 participants at three workshops in 2016.

59. There is increasing interest in the use of online and web-based training, particularly in the area of protection of patients from exposure to ionizing radiation.

¹⁰ See: <https://www.iaea.org/services/review-missions/education-and-training-appraisal-eduta>.

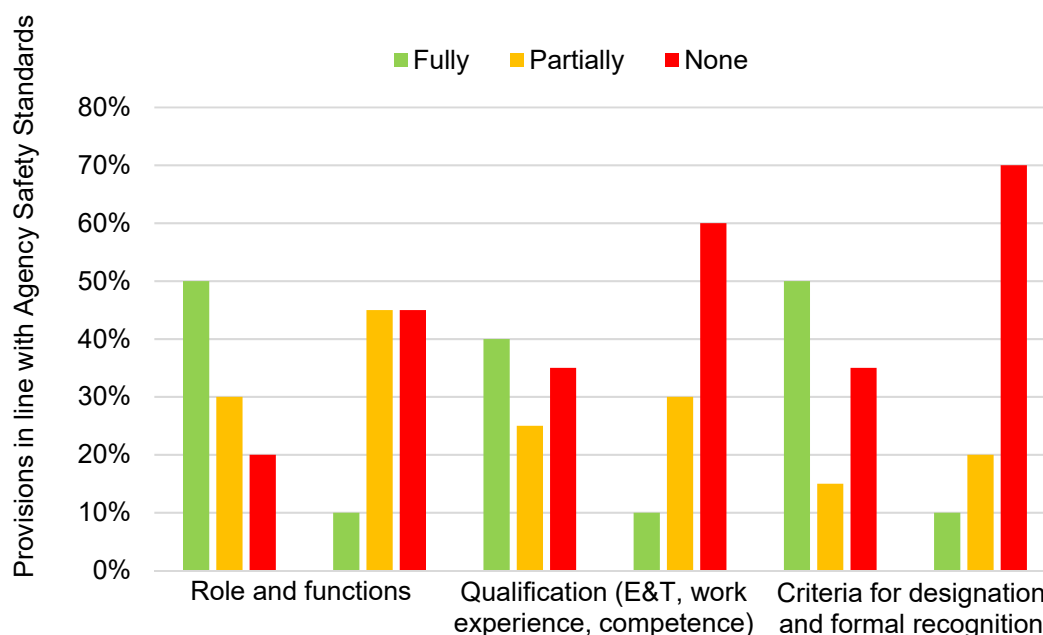


FIG. 1. Results from EduTA missions conducted since 2005 of national provisions for RPO and QE in line with Agency safety standards.

60. Member States with existing nuclear installations and those considering embarking on nuclear power programmes expressed increasing demand for Agency support for education and training activities related to site evaluation and operational safety of nuclear installations, design safety, protection against external events, design extension conditions, severe accident management, long term operation and safety culture. Member States embarking on new nuclear power programmes have requested increased support for practical training on, for example, safety assessment computational tools, probabilistic safety assessment, severe accident management guidelines, drafting regulations, inspector training and senior managers leadership and culture for safety.

61. Many Member States considering embarking on a nuclear power programme, or on a first research reactor project, are facing difficulties in allocating resources for regulatory capacity building. In many of these Member States, the programme or project schedules allow only limited time for the regulatory body to establish its resources and competence to perform its regulatory functions effectively.

62. Some Member States encounter difficulties in recruiting competent staff, which may be attributed to the absence of appropriate national infrastructure and/or a lack of coordination of national education and training resources.

63. Capacity Building Centres for EPR (CBCs-EPR) have contributed to an increase in regional EPR capacity building activities.

64. Member States continue to express a need for support in developing or strengthening their national and organizational knowledge management programmes for nuclear safety, in developing or strengthening national capacity building programmes, and in developing or strengthening technical and scientific capacity including technical and scientific support organizations (TSOs).

Activities

65. The Agency published a Safety Report entitled *A Methodology for Establishing a National Strategy for Education and Training in Radiation, Transport and Waste Safety*¹¹. This provides guidance on how to assess education and training needs in order to design the national education and training programme in these areas, and how to optimize the use of national resources to complement external assistance.

66. The Agency conducted five PGECs, in English, French and Spanish as appropriate, at the Agency-affiliated regional training centres in Accra, Ghana, and Rabat, Morocco for Africa, Kajang, Malaysia, for Asia, Aghia Paraskevi, Greece, for Europe, and Buenos Aires, Argentina, for Latin America and the Caribbean.

67. The Agency held regional training courses on justification of medical radiation exposure and use of Agency referral guidelines in Warsaw, Poland, in September 2018, and on appropriate and safe use of imaging in Tbilisi, Georgia, in June 2018, and a workshop on responsibilities for radiation protection in medicine in Vienna, Austria, in April 2018. The Agency held a joint course with the International Centre for Theoretical Physics (ICTP) on quality assurance and dose management in hybrid imaging in Trieste, Italy, in September 2018. The Agency also held regional training courses for the Africa region on strengthening safety in radiotherapy in Port Louis, Mauritius, in April 2018, and for the Latin America and the Caribbean region on justification in radiodiagnosis for healthcare authorities in order to create awareness of how to use the Agency's referral guidelines to avoid unnecessary exposure to patients in San Salvador, El Salvador, in July 2018.

68. The Agency held a regional training course for the Latin America and the Caribbean region on technical options for predisposal management of radioactive waste in Montevideo, Uruguay, in June 2018.

69. The Agency expanded its e-learning activities in support of safety related training. The Agency improved the interface of the online version of the PGEC, and included an instructional video and training resources to enhance the online train-the-trainers course for RPOs. The Agency developed an e-learning course on radiation protection in medicine when performing C-arm fluoroscopy.

70. In response to increasing demand for guidance on strengthening regulatory requirements for education, training, qualification and competence of RPOs and QEs, the Agency held three regional workshops: for Europe in Sliema, Malta, in October 2018; for the Asia and the Pacific region in Amman, Jordan, in November 2018; and for Latin America and the Caribbean in Panama City, Panama, in December 2018.

71. The Agency held six train-the-trainers workshops for RPOs, in Montevideo, Uruguay, in March 2018; in Hanoi, Vietnam, in May 2018; in Tirana, Albania, and in Dushanbe, Tajikistan, in June 2018; and in Rabat, Morocco, in November (two workshops, one in French and one in English).

72. The Agency conducted, upon request, an EduTA mission in Tajikistan in April 2018. The Agency also conducted five advisory missions on education and training in radiation, transport and waste safety: to Panama in March 2018; to Mexico in September 2018; to Chile and to Kyrgyzstan in October 2018; and to Brazil in November 2018.

73. The Agency conducted 14 expert missions and capacity building workshops in the framework of the SEED service.

¹¹ INTERNATIONAL ATOMIC ENERGY AGENCY, *A Methodology for Establishing a National Strategy for Education and Training in Radiation, Transport and Waste Safety*, IAEA Safety Reports Series No. 93, IAEA, Vienna (2018).

74. The Agency finalized a draft Safety Report on knowledge management for regulatory bodies. Based on the draft Safety Report, the Agency held a regional workshop in Vienna, Austria, in June 2018 to further improve the standardized training material for strengthening skills and competences of regulatory staff responsible for managing knowledge management programmes for nuclear safety.

75. The Agency designated two new CBCs-EPR, in China (operated by the Institute of Radiation Protection and General Hospital of Nuclear Industry) and in the Russian Federation (operated by the Rosatom Technical Academy and Rosatom Emergency Response Centre of St Petersburg).

76. The Agency held a Workshop of the Capacity Building Centres for Emergency Preparedness and Response: Exchanging Experience and Looking for Synergies in Vienna, Austria, in July 2018. The Workshop was attended by 33 participants from 19 Member States and was the first step towards creating a network of such Centres.

77. The Agency published a TECDOC entitled *Technical and Scientific Support Organizations Providing Support to Regulatory Functions* (IAEA-TECDOC-1835). Based on the TECDOC and with contributions from TSO Forum experts, the Agency developed the TSO Initiative to support Member States in developing and strengthening technical and scientific capacity. This Initiative comprises a set of tools: a self-assessment questionnaire; six cases studies; the terms of reference for a national workshop; and a roadmap on developing competences and research and development topic priorities, according to the milestones approach for nuclear programmes.

78. The Agency held the first International Workshop on Building Technical and Scientific Capabilities in Embarking Countries in Vienna, Austria, in April 2018, attended by representatives from TSOs and regulatory bodies of 13 Member States. Participants exchanged experience and feedback on aspects of technical and scientific capacity in embarking countries and evaluated the tools of the TSO Initiative. In May 2018, the Agency held a national workshop on support of a TSO for regulatory bodies, in Ankara, Turkey.

79. The Agency held the International Conference on the Challenges Faced by Technical and Scientific Support Organizations in Enhancing Nuclear Safety and Security: Ensuring Effective and Sustainable Expertise in Brussels, Belgium, in October 2018, attended by more than 250 participants from 61 Member States and five international organizations. The Conference highlighted initiatives to develop and strengthen scientific and technical capabilities supporting regulatory decision-making for enhanced nuclear and radiation safety and security.

80. The Agency supported the third meeting of the Steering Committee for the European and Central Asian Safety Network (EuCAS) in Prague, Czech Republic, in August 2018. The Steering Committee established a new Working Group on Education and Training. The Agency is continuing to develop a survey to identify needs and existing cooperation among EuCAS members.

81. The Agency continued to support the implementation of the programme on nuclear and radiological safety of the Ibero-American Forum of Radiological and Nuclear Regulatory Agencies (FORO). At its annual meeting in Brasilia, Brazil, in July 2018, the FORO's plenary approved three new projects: periodic verification and maintenance of reusable packaging for the transport of radioactive material not subject to design approval; licensing criteria and inspection requirements for centralized radiopharmacies; and regulatory practices in the licensing of nuclear reactor operators.

82. The Agency held two Steering Committee meetings of the ANSN in May and November 2018. The Steering Committee approved the revised terms of reference of ANSN organizations. The 3rd ANSN plenary, held during the 62nd regular session of the General Conference, endorsed the new ANSN vision, terms of reference of ANSN organizations and the establishment of new Topical Groups of the ANSN.

Priorities and Related Activities

83. *The Agency will assist Member States in their capacity building programmes, including education and training in nuclear, radiation, transport and waste safety as well as EPR, and will assist Member States in developing their expertise in the relevant technical areas. The Agency will undertake the following activities in relation to this priority:*

- The Agency will continue enhancing education and training programmes and implementing capacity building activities in the areas of design safety and safety assessment;
- The Agency will continue implementing the Strategic Approach to Education and Training in Nuclear Safety 2013–2020, and will develop a methodology for assessing the status of implementation of the Approach;
- The Agency will assist Member States in the self-assessment of their capacity building measures and will continue supporting the establishment of national strategies and programmes for capacity building in nuclear safety;
- The Agency will continue to enhance, within the framework of coordination between funding and supporting mechanisms, the provision of assistance to Member States for strengthening national infrastructure in nuclear, radiation, transport and waste safety, as well as in emergency preparedness and response through the development of national integrated support plans for safety;
- The Agency will continue supporting the use of the SARCoN methodology and tool by establishing standardized SARCoN training material;
- The Agency will continue to offer the PGEC in collaboration with the regional training centres affiliated to the Agency, and organize train-the-trainers for RPOs and specialized training events in the field of regulatory activities, occupational radiation protection, radiation protection of patients, transport safety and waste and environmental safety. The Agency will expand its e-learning activities in these areas, including those available on the Radiation Protection of Patients (RPOP) website¹²;
- The Agency will support Member States in the development of national strategies for education and training in radiation, transport and waste safety through regional workshops, advisory missions and services such as EduTA. The Agency will also provide Member States with guidance and support to strengthen regulatory requirements for education, training, qualification and competence of RPOs and QEs;
- The Agency will continue to deliver webinars on specialized topics in radiation protection in medicine in several languages;
- The Agency will continue to support regional networks, such as ANSN and EuCAS, and associations, such as FORO, in the development and implementation of the joint programmes of work;
- The Agency will provide guidance material and support accredited universities in the development of pilot programmes to implement the curriculum for a masters degree programme in nuclear safety and security;

¹² See the training section of the RPOP website:

<https://rpop.iaea.org/RPOP/RPoP/Content/AdditionalResources/Training/index.htm>.

- The Agency will finalize a Safety Report to assist Member States in the establishment of a national strategy or coordination mechanism for capacity building and knowledge management for nuclear safety;
- The Agency will adapt the regulatory control training course and the Basic Professional Training Course on Nuclear Safety to an interactive e-learning format to enable individual study and support capacity building in Member States with enhanced flexibility and cost effectiveness; and
- The Agency will organize a workshop to discuss the establishment of a network of CBCs-EPR.

A.6. Research and Development for Safety

Trends

84. Much recent research and development work undertaken in Member States has focused on gaining an increased understanding of severe accident phenomena and novel design features to provide a demonstration of the safety of nuclear installations.

85. At the Technical Meeting on Next Generation Reactors and Emergency Preparedness and Response, held in Vienna, Austria, in February 2017, Member States expressed interest in additional research activities in the EPR area.

Activities

86. The CSS endorsed the development of a Safety Guide entitled *Assessment of the Application of General Requirements for Design of Nuclear Power Plants (DS508)*, in support of the practical implementation of Safety Requirements No. SSR-2/1 (Rev. 1) and other updated safety standards. The Agency initiated the development of more detailed technical documents on advanced NPP designs (e.g. related to analysis of design extension conditions, and equipment qualification for severe accident conditions). One aim in the development of these documents is to identify research and development needs.

87. The Agency drafted the terms of reference of a joint EC–IAEA group for coordination in nuclear safety research and development in February 2018.

88. The Agency conducted the 7th Joint IAEA–Generation IV International Forum (GIF) Technical Meeting/Workshop on the Safety of Liquid Metal Cooled Fast Reactors in Vienna in March 2018 with 24 participants from ten Member States and three international organizations. The workshop was focused on review of the GIF Report entitled *Safety Design Guidelines on Safety Approach and Design Conditions for Generation IV Sodium-cooled Fast Reactor Systems*.

Priorities and Related Activities

89. ***The Agency will assist Member States' efforts in the field of research and development for safety where the need for further work has been identified and will facilitate the exchange of the results. The Agency will undertake the following activities in relation to this priority:***

- The Agency will continue to organize meetings and conduct activities to encourage research and development based on needs identified, particularly regarding advanced approaches in safety assessment, analysis of design extension conditions, new design features, and equipment qualification in severe accident conditions;
- The Agency will hold a Technical Meeting on Next Generation Reactors and EPR, as a follow-up to the one held in 2017;

- The Agency will continue to carry out research and development activities in support of the safety of advanced/innovative reactors, complemented with specific education and training initiatives in order to promote and support capacity building and human resource development; and
- The Agency will organize the 8th Joint IAEA–GIF Technical Meeting/Workshop on the Safety of Liquid Metal Cooled Fast Reactors.

B. Strengthening Radiation, Transport and Waste Safety

B.1. Radiation Protection of Patients, Workers and the Public

Trends

90. There is an increasing awareness among Member States of the need for the protection of workers in industries involving naturally occurring radioactive material (NORM) and for a graded approach to the use of regulators' and operators' resources for management of worker protection as required by the International Basic Safety Standards (IAEA Safety Standards Series No. GSR Part 3).

91. There is also increasing awareness of exposure due to radon in homes and workplaces and radiation doses received following the consumption of food and drinking water in non-emergency situations.

92. New and complex cancer control applications, including radiotherapy technology and procedures, are increasingly used for treatment of cancer in countries and regions where they have previously had limited application.

93. The increasing use of diagnostic imaging procedures utilizing ionizing radiation and better access to this medical technology is creating a need for greater awareness of the importance of justification and the optimization of associated exposures in order to protect patients from risks related to ionizing radiation.

Activities

94. The Agency held a Technical Meeting on Experiences with the Implementation of the Bonn Call for Action regarding radiation protection in medicine in Vienna, Austria, in March 2018, attended by 41 participants from 21 Member States and nine international organizations. Participants exchanged information on the finalization of an online implementation toolkit for the Bonn Call for Action.

95. The Agency held a Technical Meeting on Preventing Unintended and Accidental Exposures in Nuclear Medicine in Vienna, Austria, in May 2018, attended by 45 participants from 30 Member States and nine international organizations. The purpose of the meeting was to share experience, learn from past incidents and prepare guidelines on how to avoid accidents in the future.

96. The Agency promoted the Information System on Occupational Exposure in Medicine, Industry and Research module on industrial radiography (ISEMIR-IR) through regional workshops in Ankara, Turkey, in April 2018, in Melbourne, Australia, in May 2018, in Gaborone, Botswana, in August 2018 and in Tunis, Tunisia, in November 2018. It was also promoted at national workshops on industrial radiography in Nottingham, United Kingdom, and Koszalin, Poland, in October 2018. The Agency conducted related promotional activities in China and the Republic of Korea in October 2018. Through this promotion, more stakeholders became familiar with the system.

97. The Agency developed a training package on occupational radiation protection in industries involving NORM and the corresponding e-learning material is under development.

98. In cooperation with the Conference of Radiation Control Program Directors, the European Radon Association and the World Health Organization (WHO), the Agency initiated a programme of webinars to provide information on radon-related topics. Six webinars were held in 2018, attended by 750 participants from 58 Member States.

99. The Agency released six online modules of radon-related training material for self-study by Member States, co-sponsored by the WHO.¹³

100. The Agency, in cooperation with FAO, UNSCEAR and the WHO, completed a literature review of measurements of natural radionuclides in food published during the period 1998–2017. Twenty-four Member States provided measurement data from ongoing environmental monitoring programmes and research projects over the same period. These data will be used to assess the range of radiation doses associated with different ‘cluster diets’ defined by the WHO in its Global Environmental Monitoring System Food Programme (GEMS/Food) database.

101. The Agency held a Steering Group meeting of a project on developing guidance on radioactivity in food and drinking water in non-emergency situations in Vienna, Austria, in December 2018. The group reviewed the work carried out since its previous meeting in November 2017 and prioritized the future activities.

Priorities and Related Activities

102. *The Agency will assist Member States in the application of the Agency’s safety standards, in particular, the International Basic Safety Standards (GSR Part 3), in radiation protection of the people and the environment for applications such as energy production, research, and medical and industrial uses of radionuclides. The Agency will undertake the following activities in relation to this priority:*

- The Agency will produce guidance material, and hold webinars and, upon request, national and regional workshops to continue to highlight the importance of Member States identifying situations involving exposure to high radon concentrations in homes and workplaces and of taking appropriate action to reduce exposures;
- The Agency will continue to support Member States’ exchange of radiation protection experience and will continue to aim to reach consensus on methodologies to assess the radiological impact to the public and the environment for planned and existing situations related to the production of nuclear energy and uses of radionuclides in research, medical and industrial applications;
- The Agency will continue to develop the Safety in Radiation Oncology (SAFRON) incident learning system for voluntary sharing of safety related events in medical uses of radiation; and
- The Agency will consult with Member States on the development of guidance on the management of radionuclides in food and drinking water in non-emergency situations, focusing specifically on dietary exposure assessment, and identification of those combinations of food and radionuclide that make the largest contribution to dose.

¹³ See: <https://www.iaea.org/topics/radiation-protection/radon/training-material>.

B.2. Control of Radiation Sources

Trends

103. The increased use of sealed radioactive sources in medicine, industry, agriculture and research has resulted in a growing need for appropriate arrangements for the management of disused sealed radioactive sources, including the building of national disposal facilities.¹⁴

104. Member State support for the Code of Conduct on the Safety and Security of Radioactive Sources continues to grow. In 2018, one further Member State made a political commitment to implementing the Code, bringing the total number to 137. Three 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, bringing the total number that have done so to 114. One Member State nominated points of contact for facilitating the export and import of radioactive sources, bringing the total that have done so to 143, and nine Member States made a political commitment to implementing the supplementary Guidance on the Management of Disused Radioactive Sources.

Activities

105. The Agency organized two training events for Member States with low progress in developing regulatory infrastructure in the Africa and the Asia and the Pacific regions. The events focused on how to establish a national register of radiation sources and how to maintain it with the support of the Regulatory Authority Information System (RAIS) 3.4 web system. The Agency conducted seven expert missions to train regulatory staff on using RAIS 3.4 web and to assist in customizing the system. Five RAIS servers were provided to Member States to assist regulatory bodies in managing safety related records.

106. To support Member States' efforts to strengthen national regulatory frameworks and the safe management of disused sealed radioactive sources, the Agency implemented regional and international projects, including several meetings and workshops on the cradle to grave control of radioactive sources with emphasis on the management of radioactive sources after the end of their useful life. This included the Regional Workshop: School on Drafting Regulations — Radiation Safety Stream for 21 experts from 14 European Member States in Vienna, Austria, in August 2018.

107. The Agency held a Regional Workshop on the Management of Radioactive Sources in Scrap Metal Recycling and Semi-Finished Products for the Africa region in Abuja, Nigeria, June 2018. The objective of the workshop was to assist African Member States in establishing national programmes for the management of radioactive sources that could be found in scrap metal.

108. The Agency held an Open-ended Meeting of Legal and Technical Experts on Implementation of the Guidance on the Import and Export of Radioactive Sources in Vienna, Austria, in June 2018, attended by 155 experts from 86 Member States. Participants exchanged information and identified what is needed to promote the safe and secure management of radioactive sources during import and export worldwide. The meeting concluded that there is currently no need to revise the Guidance and efforts should be focused on the full and systematic implementation of its existing provisions.

109. The Agency held an Interregional Open-ended Meeting of Legal and Technical Experts on Implementation of the Code and its Guidance for small island developing States from the Caribbean and the Pacific areas in Vienna, Austria, in August 2018. Thirty-four experts from 17 Member States shared experiences on the application of the Code of Conduct. The Agency encouraged Member States to

¹⁴ Radioactive sources are defined as 'disused' when they are no longer used for the practice for which they were authorized.

express political commitment to the Code and to promote the Guidance on the Management of Disused Radioactive Sources.

110. The Agency held three Open-ended Meetings of Legal and Technical Experts on Implementation of 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: for the Europe region in Bucharest, Romania, in May 2018, attended by 23 participants from 18 Member States; for the Africa region in Kampala, Uganda, in September 2018, attended by 32 participants from 28 Member States; and for the Latin America and the Caribbean region in Montevideo, Uruguay, in October 2018, attended by 19 participants from 12 Member States.

111. The Agency held five regional workshops on practical activities of regulatory oversight such as import/export controls, inspections and training guidelines in Austria, Vienna, in February 2018, in Egypt, Cairo, in April 2018, in Lusaka, Zambia, in July 2018, in Mexico City, Mexico, in July 2018, and in Dakar, Senegal, in November 2018.

Priorities and Related Activities

112. *The Agency will assist Member States in the management of radioactive sources from cradle to grave through guidance documents, peer reviews, advisory services, training courses and workshops. The Agency will also promote the effective application of the Code of Conduct on the Safety and Security of Radioactive Sources and the supplementary Guidance on the Import and Export of Radioactive Sources and Guidance on the Management of Disused Radioactive Sources, and facilitate the sharing of experience. The Agency will undertake the following activities in relation to these priorities:*

- The Agency will continue encouraging States to express political commitment to the Code of Conduct on the Safety and Security of Radioactive Sources and the supplementary Guidance on the Import and Export of Radioactive Sources and Guidance on the Management of Disused Radioactive Sources;
- The Agency will assist Member States in establishing and implementing cradle to grave control of radioactive sources, including through national registers and inventories of radiation sources;
- The Agency will promote the Code of Conduct and supplementary Guidance and continue to assist Member States in their efforts to build capacity to implement their provisions;
- The Agency will continue the development of RAIS to address Member States' needs. The enhanced, highly secure and easily customizable tool will enable users to manage regulatory processes. The Agency will continue providing support and training for the use of RAIS 3.4 web;
- The Agency will organize an Open-ended Meeting of Legal and Technical Experts on Implementation of the Code of Conduct on the Safety and Security of Radioactive Sources and supplementary Guidance on the Import and Export of Radioactive Sources and Guidance on the Management of Disused Radioactive Sources in May 2019; and
- The Agency will continue to support Member States, upon request, in developing comprehensive national strategies for managing disused and orphan radioactive sources, including in the metal recycling industry.

B.3. Safe Transport of Radioactive Material

Trends

113. The increased use of radioactive material in Member States is creating a growing need for regulatory oversight, including for domestic and international transport.

114. Some Member States are increasingly interested in the construction and deployment of transportable nuclear power plants (TNPPs). One vessel for such reactors is at an advanced state of manufacture and one Member State has declared its intent to manufacture a similar vessel in the near future.

Activities

115. The Agency published a revision of the *Regulations for the Safe Transport of Radioactive Material* as the 2018 Edition (IAEA Safety Standards Series No. SSR-6 (Rev. 1)).¹⁵ The Agency prepared a final draft of the *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material* (DS496), which is a revision of IAEA Safety Standards Series No. SSG-26.¹⁶ The Agency produced a final draft of a new Specific Safety Guide entitled *Format and Content of the Package Design Safety Report for the Transport of Radioactive Material* (DS493). A final revised draft of the *Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2018 Edition)* (DS506) was posted online for Member State comments by 30 November 2018.

116. The Agency completed the development of and piloted the e-learning platform for the Regulations for the Safe Transport of Radioactive Material, 2012 Edition (IAEA Safety Standards Series No. SSR-6).

Priorities and Related Activities

117. ***The Agency will assist Member States in building capacity for the safe transport of radioactive material. The Agency will undertake the following activities in relation to this priority:***

- The Agency will publish the revised *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material* (IAEA Safety Standards Series No. SSG 26 (Rev. 1)). It will continue revising the *Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material* (IAEA Safety Standards Series No. SSG-33). It will finalize the Specific Safety Guide entitled *Format and Content of the Package Design Safety Report for the Transport of Radioactive Material*;
- The Agency will launch an e-learning platform on regulatory requirements for transport safety and create e-learning modules on other topics for operators and regulatory bodies; and
- The Agency will continue to discuss a strategic approach regarding the development and deployment of TNPPs. In this regard, the Agency will support, as appropriate, the outcomes of the International Maritime Organization's review and possible revision of its transport regulations.

¹⁵ INTERNATIONAL ATOMIC ENERGY AGENCY, *IAEA Regulations for the Safe Transport of Radioactive Material*, IAEA Safety Standards Series No. SSR-6 (Rev.1), IAEA, Vienna (2018).

¹⁶ INTERNATIONAL ATOMIC ENERGY AGENCY, *Advisory Material for the IAEA Regulations for the Safe Transport of Radioactive Material (2012 Edition)*, IAEA Safety Standards Series No. SSG-26, IAEA, Vienna (2014).

B.4. Decommissioning, Spent Fuel Management and Waste Management

Trends

118. The Agency has received a number of requests for ARTEMIS reviews to be carried out in 2019 and beyond.

119. Significant growth in the number of nuclear decommissioning projects worldwide has increased the need for related education and training programmes. Member States have requested, inter alia, that the Agency develop specific training materials on regulatory inspection of decommissioning.

120. Member States continue to seek the Agency's assistance in developing and implementing safe long term management solutions for radioactive waste, such as the siting of radioactive waste management facilities.

121. Member States are increasingly requesting Agency support to develop and implement plans for near surface disposal of very low and low level radioactive waste.

122. Several Member States are showing increased interest in geological disposal of high level radioactive waste and spent fuel when considered as waste. Licencing activities for geological disposal facilities are progressing in some Member States.

123. The Agency made progress in the development of a borehole disposal system for disused sealed radioactive sources. Several Member States worked to develop borehole disposal techniques, regulatory and infrastructure support systems, hardware and equipment, and processes and procedures. Many other Member States are interested in exploring the concept.

124. Member States with little relevant experience in regulating the management of large concentrations of NORM, in residues generated in industries such as rare earth processing, oil, gas and titanium processing, and water treatment, have expressed a need for Agency support in establishing regulatory and safety infrastructure for NORM residues management.

125. During the Sixth Review Meeting of the Contracting Parties to the Joint Convention, an increasing number of Member States reported ongoing measures to retain and acquire the appropriate human resources within their regulatory bodies as current staff retire and leave the industry. There was also an increase in reporting of actions to preserve institutional knowledge and to attract new talent into the industry.

Activities

126. The Agency conducted six ARTEMIS missions in 2018, including the first ever combined IRRS-ARTEMIS mission.

127. The Agency held two consultancy meetings in Vienna, Austria, in February and June 2018 to develop a new Safety Guide provisionally entitled *Application of the Concept of Clearance (DS500)* as a follow-up to the outcomes of the International Conference on Advancing the Global Implementation of Decommissioning and Environmental Remediation Programmes. The new Safety Guide will expand the scope of the Safety Guide *Application of the Concepts of Exclusion, Exemption and Clearance* (IAEA Safety Standards Series No. RS-G-1.7).

128. The Agency held Technical Meetings in Vienna, Austria, in July 2018, on Current Status of the Predisposal Management of Institutional Radioactive Waste, attended by more than 30 participants from 25 Member States, and on Methodologies and Approaches to Address Challenges in Managing Radioactive Waste from Past Activities, attended by 26 participants from 14 Member States.

129. The Agency held a Technical Meeting to launch the International Project on Decommissioning of Small Facilities in Vienna, Austria, in June 2018, attended by 41 participants from 33 Member States. The project will focus on national infrastructures for planning and decommissioning of small medical, industrial and research facilities, and the application of relevant safety standards.

130. The Agency held a Technical Meeting to launch the International Project on Completion of Decommissioning in Vienna, Austria, in September 2018, attended by 40 participants from 29 Member States. The project will provide a systematic overview of practical experience worldwide in defining decommissioning end states, in demonstrating compliance with end state criteria and in defining and implementing any needed measures and controls after the end of decommissioning. It will also contribute to the revision of the Safety Guide *Release of Sites from Regulatory Control on Termination of Practices* (IAEA Safety Standards Series No. WS-G-5.1).

131. The Agency held a Technical Meeting to launch a new International Forum on Safety Infrastructure for Uranium Production and Management of NORM Residues in Vienna, Austria, in June 2018, attended by 36 participants from 27 Member States. This project provides a forum to promote strong regulatory capacity to ensure safe and sustainable uranium production, including management of NORM residues. It also sets the strategic direction of future work on the safety of uranium production and NORM residues management. The project aims to assist Member States, including those commencing uranium production for the first time, with the regulatory aspects of the management of NORM residues.

132. The Agency continued developing two Safety Reports aimed at preventing legacy site situations from arising in the future. These reports focus on the safety aspects of uranium production and on the development and management of uranium production by in situ leaching and take into account the provisions of the draft Safety Guide entitled *Management of Radioactive Residues from Mining, Mineral Processing, and other NORM related Activities* (DS459).

133. The Agency continued to update the Nuclear Communicators' Toolbox, which provides a range of resources to assist in the communication of nuclear matters. The Agency also held a Technical Meeting on Learning from the Experience of Local Communities on Stakeholder Involvement in Radioactive Waste Management Programmes in Vienna, Austria, in November 2018, attended by 95 participants from 25 Member States and one international organization. The participants shared information on experiences and lessons learned on topics related to local stakeholder involvement in radioactive waste management and provided input to a new document on this topic.

134. The Agency held the Third Annual Technical Meeting of the project on Data Analysis and Collection for Costing of Research Reactor Decommissioning — Phase II (DACCORD) in Vienna, Austria, in October 2018, attended by 29 participants from 26 Member States. The project aims to deepen collaboration on research reactor decommissioning costing developed during Phase I. It will focus on determining the cost implications of different strategies and techniques, and on understanding the sources and levels of uncertainty of the cost estimates.

135. The Agency continued implementing the International Project on Managing the Decommissioning and Remediation of Damaged Nuclear Facilities (DAROD). Two consultancy meetings in February and June 2018 finalized the draft project report, which addresses regulatory, technical and institutional recommendations from the final Technical Meeting held in the United Kingdom in 2017. The meeting also reviewed the case study on decommissioning of destroyed facilities at the Al Tuwaitha Nuclear Research Centre in Iraq.

136. The Agency has continued to develop the concept of qualified technical centres (QTCs) through several consultancy meetings. A draft designation process with technical criteria was confirmed at the consultancy meeting in December 2018. Interested Member State facilities will be invited to submit requests to be designated a QTC.

137. The Agency began developing a Safety Guide on policy and strategy for the safety of radioactive waste and spent fuel management, decommissioning, and environmental remediation.

138. The Agency, in cooperation with the European Commission and the OECD/NEA, held a joint meeting on the status and trends in spent fuel and radioactive waste management in Luxembourg in July 2018. The meeting was attended by 30 participants from 14 Member States. The first project report was published in January 2018.

139. The Agency continued to implement the International Project on Demonstration of the Operational and Long-Term Safety of Geological Disposal Facilities for Radioactive Waste (GEOSAF-III), and initiated several other projects related to the safety of geological disposal. These include working groups on decision-making following monitoring of geological disposal facilities and on interaction between regulators and operators during the licensing of geological disposal facilities.

140. The Agency held a first meeting of the Forum on the Safety of Near Surface Disposal in Vienna, Austria, in October 2018, attracting 32 participants from 19 Member States.

141. A Topical Session on Recent Developments and Challenges in the Safe Management of Disused Sealed Radioactive Sources was held in Vienna, Austria, in May 2018 at the Sixth Review Meeting of the Contracting Parties to the Joint Convention.

142. A side event on Innovative Solutions for the Effective Management of Disused Sealed Radioactive Sources was held in Vienna, Austria, in September 2018 during the 62nd regular session of the General Conference. The Agency held three consultancy meetings on the application of the graded approach to post-closure safety assessment for the disposal of disused sealed radioactive sources in boreholes in Vienna, Austria, in January, April and December 2018.

143. The Agency assisted the regulatory body of Malaysia in identifying experts for an independent peer review of a licence application for the disposal of disused sealed radioactive sources in a borehole. This peer review took place in Dengkil, Malaysia, in May 2018. A meeting was held in Athens, Greece, in October 2018 to train regulatory bodies participating in the Sustaining Cradle-to-Grave Control of Radioactive Sources project focusing on the review of safety cases for radioactive waste disposal.

Priorities and Related Activities

144. *The Agency will assist Member States in developing and implementing national policies and strategies for the safe management of radioactive waste, including disposal of waste, sealed radioactive sources, geological disposal of high level waste and spent fuel when considered as waste, and the development of decommissioning strategies and plans. The Agency will undertake the following activities in relation to this priority:*

- The Agency will revise the training material on safety decommissioning of nuclear facilities;
- The Agency will develop specialized training modules on regulatory supervision, planning and implementation of decommissioning;
- The Agency will assist Member States by providing access to its spent fuel and radioactive waste inventory database. The database is being upgraded in cooperation with the European Commission and the OECD/NEA. This will provide a reporting tool Member States could use to meet their national and international (European and Joint Convention) reporting requirements;
- The Agency will assist Member States in selecting safe solutions for the management of radioactive waste, including by providing technical guidance and robust approaches for waste processing and storage, and guidance on fundamental aspects to support planning for radioactive waste management. Based on Member States' experiences, the Agency will also

develop documents establishing good practices in disposal and will provide comprehensive information on options and approaches to develop and implement different disposal solutions; and

- The Agency will continue to provide a platform for professional networks in decommissioning, radioactive waste management, management of disused radioactive sources and environmental remediation.

B.5. Radiation Protection of the Environment and Remediation

Trends

145. The increasing use of a wide range of nuclear techniques and applications worldwide has resulted in a growing need for analysing and evaluating the radiological implications of radionuclides being released to the environment.

146. There is growing interest in methodologies for the prospective and retrospective assessment of doses to members of the public and non-human biota in relation to the authorization and establishment of discharge limits for facilities and activities and the assessment of past unregulated practices and accidents and the control of their impact. Source and environmental radiological monitoring programmes are used by Member States to complement such assessments and to demonstrate compliance with the protection criteria.

147. There is an ongoing demand by Member States for Agency assistance in remediation activities, particularly the remediation of legacy sites from past uranium production and other nuclear-related activities.

Activities

148. The Agency held a Technical Meeting on the Draft Safety Guide provisionally entitled *Remediation Process for Areas Affected by Past Activities and Accidents* in Vienna, Austria, in July 2018, attended by six participants from five international organizations. The meeting collected input from international organizations on the draft Safety Guide to ensure that it is consistent with other relevant international guidance.

149. The Agency published the *Strategic Master Plan for Environmental Remediation of Uranium Legacy Sites in Central Asia* in English in May 2018 and in Russian in September 2018.¹⁷ The document was presented at the side event Uranium Legacy Sites — The Environmental Remediation Programme in Central Asia hosted by the European Union in the framework of the Sixth Review Meeting of Contracting Parties to the Joint Convention, and at side events to the 62nd regular session of the General Conference and the 73rd session of the United Nations General Assembly in September 2018.

150. In the framework of the Coordination Group for Uranium Legacy Sites (CGULS), the Agency held the first Regional Workshop on Public Awareness for Remediation in Central Asia in Dushanbe, Tajikistan, in November 2018, attended by 29 participants from 5 Member States and 3 international organizations. The workshop served as a platform for Central Asian participants to share their experience and lessons learned in developing localized public awareness programmes. The participants emphasized a need for further capacity building and guidance on how to work with the public before, during and after the remediation.

151. The Agency continued supporting the International Working Forum on Regulatory Supervision of Legacy Sites (RSLs), assisting Member States and fostering exchange of information on effective

¹⁷ See: <https://nucleus.iaea.org/sites/connect/CGULSpublic/Pages/default.aspx>.

and efficient regulatory supervision for the management of legacy sites. The Agency held a Technical Meeting of the RSLs in Vienna, Austria, in November 2018, attended by more than 30 participants from 19 Member States. The participants shared experiences and lessons learned related to the role of regulators in the overall remediation process and discussed the draft revision of the Safety Guide *Remediation Process for Areas Affected by Past Activities and Accidents* (IAEA Safety Standards Series No. WS-G-3.1.).¹⁸

152. The Agency held the third Technical Meeting of the second phase of the Modelling and Data for Radiological Impact Assessments (MODARIA II) programme in Vienna, Austria, in October 2018, attended by approximately 150 participants from 47 Member States. The programme builds experience and transfers knowledge in the assessment of radiation doses from radionuclides that are being released to or are already present in the environment.

153. The Agency held a Technical Meeting to discuss the development of the draft Safety Guide on *Source Monitoring, Environmental Monitoring and Individual Monitoring for Protection of the Public and the Environment* (DS505) in Vienna, Austria, in December 2018, attended by 51 participants from 31 Member States and 3 international organizations. The participants discussed, inter alia, the design and establishment of robust, fit-for-purpose monitoring programmes to ensure and demonstrate protection of the public and the environment for planned, emergency and existing exposure situations over the entire lifetime of facilities and activities.

Priorities and Related Activities

154. ***The Agency will promote and facilitate the sharing of experience gained in dealing with the remediation of contaminated areas, including post-accident situations and uranium legacy sites. The Agency will undertake the following activities in relation to this priority:***

- The Agency will publish reports on situation-specific remediation strategies for contaminated urban and rural areas for a wide range of environmental conditions, and on the remediation and decommissioning of an area or a site affected by a nuclear or radiological emergency; and
- The Agency's CGULS will, upon request, undertake peer reviews of environmental impact assessments and feasibility studies for remediation, and review progress of remediation activities. It will also hold its annual Technical Meeting.

C. Strengthening Safety in Nuclear Installations

C.1. Nuclear Power Plant Safety

C.1.1. Operational Safety: Operating Experience and Long Term Operation

Trends

155. OSART missions continue to identify the need to strengthen the conduct of operations, enhance continuous improvement, optimize maintenance activities and improve assessment of major plant safety modifications. These missions also continue to highlight a need to further strengthen accident management and on-site EPR.

¹⁸ INTERNATIONAL ATOMIC ENERGY AGENCY, *Remediation Process for Areas Affected by Past Activities and Accidents*, IAEA Safety Standards Series No. WS-G-3.1, IAEA, Vienna (2007).

156. Analysis of data from the International Reporting System for Operating Experience (IRS) continues to indicate a need to learn from events related to design modifications, ageing management, management of internal and external hazards, contamination control and use of operating experience. The analysis also continues to highlight a need to improve learning from events related to operating and maintenance practices, the adequacy of and adherence to procedures, contractor training and the oversight of contractors. Compared to the previous year, the Agency has received a significantly higher number of requests for training workshops on the use of operating experience.

157. An increasing number of nuclear power reactors around the world have programmes to address long term operation (LTO) and ageing management. At the end of 2018, 47% of the 454 operating nuclear power reactors had been in operation for 30–40 years, an increase from 47% of 448 reactors at the end of 2017, and another 17% for more than 40 years, an increase from 17% of 448 reactors at the end of 2017 (see Figure 2).¹⁹

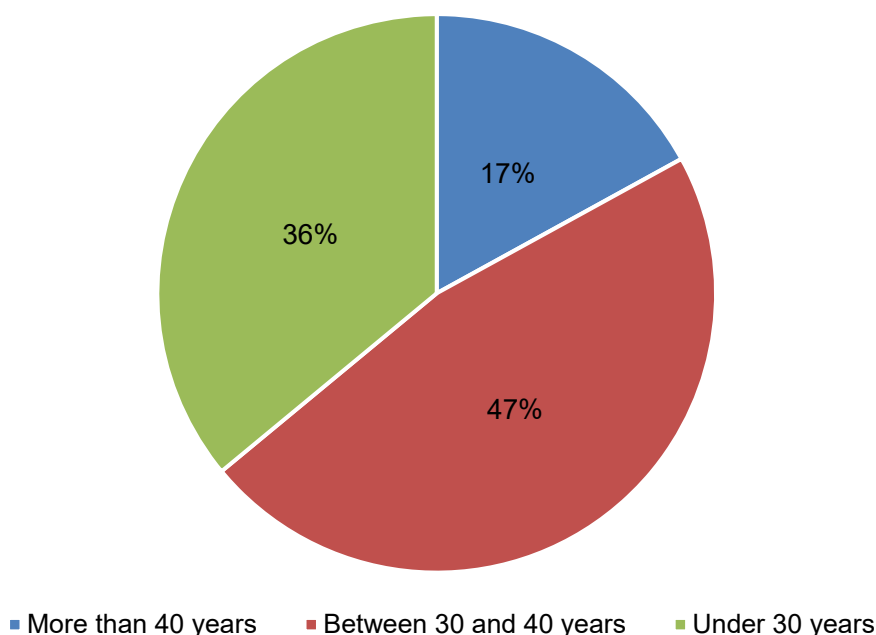


FIG.2. Age distribution of all nuclear power reactors in 2018 based on information from the IAEA Power Reactor Information System.

158. In recent years the Agency has noted an increasing number of Member State requests for SALTO missions. The number of such missions has increased from three to four per year in 2012–2015 to six to nine per year in 2016–2018.

Activities

159. The Agency extended its Memorandum of Understanding with the World Association of Nuclear Operators (WANO) to further enhance cooperation and make provisions for OSART missions to substitute for WANO follow-up peer review visits to NPPs. This is expected to reduce the resource burden on NPP operators where these two missions would otherwise be scheduled to occur in close proximity. Both organizations also agreed on a common approach to independent nuclear oversight.

160. The Agency, in cooperation with the OECD/NEA, issued a publication entitled *Nuclear Power Plant Operating Experience*. This publication, covering the period 2012–2014, highlights lessons based

¹⁹ The Power Reactor Information System (PRIS), developed and maintained by the Agency, is an authoritative and comprehensive database on nuclear power plants worldwide.

on a review of event reports received from the participating Member States through the IRS. IRS reports contain information on and lessons learned from events of safety significance to assist in reducing the potential for their recurrence at other plants.

161. The Agency prepared an OSART mission highlight report that summarizes the most significant observations made during missions and follow-up visits undertaken from 2013 to 2015, describes the main trends and good practices identified, and provides an assessment of overall OSART mission results.²⁰

162. The Agency published a Specific Safety Guide entitled *Operating Experience Feedback for Nuclear Installations* (IAEA Safety Standards Series No. SSG-50).²¹ This provides recommendations for establishing, implementing, assessing and continuously improving an operating experience programmes for nuclear installations and regulatory bodies, and supersedes the Safety Guide entitled *A System for the Feedback of Experience from Events in Nuclear Installations* (IAEA Safety Standards Series No. NS-G-2.11).

163. The Agency, in cooperation with the OECD/NEA, initiated the extension of the IRS database to incorporate the construction experience database (ConEX). Technical work is ongoing to enable the merger, which will add 100 events to the IRS.

164. The Agency supported continuous improvement of operational safety performance in Member States through learning from operating experience by holding two Technical Meetings in Vienna, Austria; one in September 2018 in cooperation with the WANO Moscow Centre, and a second one in October 2018 in cooperation with the OECD/NEA. The Agency held seven workshops in Vienna, Austria, in February 2018, in Ljubljana, Slovenia, in May 2018, in Minsk, Belarus, in July 2018, in Temelin, Czech Republic, in September 2018, in Buenos Aires, Argentina, in December 2018 and two in the Russian Federation, in Moscow in April 2018 and in Sosnovy Bor in August 2018, on event root cause investigations, effective corrective action programmes and the use of operating experience to enhance operational safety.

165. The Agency held two consultancy meetings in Vienna, Austria, in August and November 2018 with the participation of 14 experts from eight Member States to develop a Safety Report to support reviews of safety for LTO. The Safety Report will cover data collection and record keeping, decision-making related to the structures, systems and components to be included in the scope of the review, and a review of plant programmes.

166. The Agency held eight working group meetings, a steering committee meeting and a workshop in the framework of the International Generic Ageing Lessons Learned programme to share lessons learned and assist Member States in ageing management and LTO.

Priorities and Related Activities

167. *The Agency will assist Member States in implementing and improving programmes for ageing management and the safe LTO of nuclear installations. The Agency will facilitate the exchange of operating experience of NPPs and provide assistance to Member States to support their preparation for implementation of safety upgrades in existing NPPs. The Agency will undertake the following activities in relation to these priorities:*

- The Agency will issue a Safety Report on continuous improvement of operational safety performance and will hold workshops to enhance the capacity of Member States focusing on

²⁰ See: https://www.iaea.org/sites/default/files/18/07/osart-mission-highlights_2013-2015.pdf.

²¹ INTERNATIONAL ATOMIC ENERGY AGENCY, *Operating Experience Feedback for Nuclear Installations*, IAEA Safety Standards Series No. SSG-50, IAEA, Vienna (2018).

an effective operating experience programme. The Agency, in cooperation with organizations such as the OECD/NEA, CANDU Owners Group and WANO, will hold Technical Meetings to share operating experience from recent significant events in Member States;

- The Agency will develop a Safety Report to assist the regulatory bodies in oversight of NPP operators' preparedness for LTO;
- The Agency will develop a TECDOC summarizing the experience of Member States regarding ageing management during delayed construction, extended shutdown and post final shutdown periods; and
- The Agency will continue to hold Technical Meetings and workshops and to assist Member States in ageing management and LTO.

C.1.2. Site and Design Safety

Trends

168. Member States continue to request support for the application of the Agency's safety standards for site and design safety against external hazards. Many of the requests for such support concern evaluation of a new site, conservatism in hazard assessments and design, and use of the latest knowledge and techniques in assessing sites and designs.

169. Member States continue to express an interest in the lessons arising from the Fukushima Daiichi accident with regard to site and design safety, and also an interest in sharing experience of safety improvements in existing NPPs.

170. The Agency continues to receive a high number of requests from Member States for SEED review missions, expert missions and capacity building and training workshops. A number of Member States initiated siting and site evaluation activities before they had the necessary regulatory framework in place for these activities. This can result in difficulties during site selection and site evaluation, and during review and licensing.

171. Member States continue to show interest in addressing specific safety assessment and design safety aspects, including: hazards at multi-unit sites, methods for aggregating various contributors to risk, human reliability assessment and the use of a probabilistic approach to the analysis of internal and external events.

172. Member States continue to design and retrofit measures to prevent accidents with radiological consequences and to mitigate consequences should they occur.

Activities

173. The Agency held a workshop on the application of the new Safety Requirements for NPP design in Vienna, Austria, in October 2018, attended by 24 participants from 14 Member States. Participants exchanged experience on the interpretation and practical application of the Safety Requirements publication *Safety of Nuclear Power Plants: Design* (IAEA Safety Standards Series No. SSR-2/1 (Rev. 1)) and discussed new and complex topics, such as design extension conditions and the concept of practical elimination.

174. The Agency held a Technical Meeting to Share Experience on Implementing Safety Improvements at Existing Nuclear Power Plants in Vienna, Austria, in June 2018, attended by 35 participants from 21 Member States and three international organizations. The participants exchanged information on national practices that contribute to enhancing the safety of existing NPPs. The outcome of the meeting will be fed into the development of a related TECDOC.

175. The Agency held a Technical Meeting on Current Approaches in Member States to the Analysis of Design Extension Conditions for New Nuclear Power Plants in Vienna, Austria, in March 2018, attended by 22 participants from 16 Member States. The participants held technical discussions on approaches to defining and analysing design extension conditions, especially those involving core melting, and provided input for a TECDOC under development.

176. The Agency held a Technical Meeting on the Development of a Methodology for Aggregation of Various Risk Contributors for Nuclear Facilities, in Vienna, Austria, in March 2018, attended by 45 participants from 24 Member States. The participants exchanged experience in the field of risk aggregation, including various sources of radioactivity and operational states, multi-unit sites and a full spectrum of hazards.

177. The Agency issued a TECDOC entitled Best Practices in Physics Based Fault Rupture Models for Seismic Hazard Assessment of Nuclear Installations (IAEA-TECDOC-1833), a Safety Report entitled Safety Aspects of Nuclear Power Plants in Human Induced External Events: Assessment of Structures (Safety Report Series No. 87), and a Safety Report entitled *Consideration of External Hazards in Probabilistic Safety Assessment for Single Unit and Multi-unit Nuclear Power Plants* (Safety Report Series No. 92).

178. The Agency completed the case study on multi-unit probabilistic safety assessment (MUPSA) to provide feedback on the MUPSA methodology developed earlier.

179. The Agency conducted two SEED review mission to the Islamic Republic of Iran and Kenya in November 2018. In addition, in the framework of SEED, the Agency conducted five expert missions in Armenia, Bolivia, Jordan, Sudan and Turkey, and nine capacity building workshops in Egypt, Kazakhstan, Malaysia, Pakistan, Philippines, Romania, Sri Lanka, Tunisia and Turkey.

180. The Agency held a regional workshop for Europe on external hazard assessment, design and safety assessment in Vienna, Austria, in January 2018 and an interregional training course on the licensing process for nuclear power plants in Moscow, Russian Federation, in July 2018. The Agency also conducted two regional workshops for Asia and the Pacific on site evaluation for nuclear installations in Daejeon, Republic of Korea, April 2018 and Bangkok, Thailand, September 2018.

181. The CSS endorsed for submission to the Board of Governors the Safety Requirements publication *Site Evaluation of Nuclear installations* (DS484). The Agency completed first drafts of revised Safety Guides provisionally entitled *External Events Excluding Earthquakes in the Design of Nuclear Installations* (DS498), *Seismic Design and Qualification for Nuclear Power Plants* (DS490), and *Seismic Hazards in Site Evaluation for Nuclear Installations* (DS507) in September 2018.

182. The Agency held the Second Workshop on Best Practices in Physics-Based Fault Rupture Models for Seismic Hazard Assessment of Nuclear Installations: Issues and Challenges Towards Full Seismic Risk Analysis in Cadarache, France, in May 2018. The meeting was attended by 126 participants from 29 Member States.

183. The Agency held a Technical Meeting on the Design and Reassessment of Nuclear Installations for Protection against External Hazards in Vienna, Austria, in June 2018, attended by 58 participants from 37 Member States. The Secretariat shared information on the progress of activities for the protection of nuclear installations against extreme external events and the participants discussed plans for future activities in this area.

184. The Agency also held a Technical Meeting on Testing and Updating Probabilistic Seismic Hazard Analysis on the Basis of Observations in Palaiseau, France, in December 2018, attended by 81 participants from 20 Member States. The meeting provided input to the further development of a related TECDOC.

Priorities and Related Activities

185. *The Agency will assist Member States in the application of the Agency's safety standards relating to the evaluation of safety of nuclear installations, such as siting, design, commissioning and operating requirements, including long term operation. The Agency will undertake the following activities in relation to these priorities:*

- The Agency will assist, upon request, Member States embarking on a nuclear power programme in developing a regulatory framework and qualified human resources for siting and site evaluation;
- The Agency will assist, upon request, Member States with operating nuclear installations in the implementation of the recommendations of SEED reviews, the application of safety standards and the use of the latest knowledge and techniques in site assessments and in design against external hazards;
- The Agency will revise and update its safety standards and will develop technical guidance Member States can use to address uncertainties related to the evaluation of natural and human induced external events and the potential combinations of such events at nuclear installations as well as the impact of external hazards on multi-unit sites;
- The Agency will hold a Technical Meeting to share information and obtain feedback on the methodology of multi-unit probabilistic safety assessment;
- The Agency will hold a Technical Meeting to share experience on site evaluation and design to protect nuclear installations against external hazards. It will also hold a Technical Meeting on external human-induced events in site evaluation of nuclear installations to compile feedback from Member States to update the Safety Guide on this topic;
- The Agency will issue the Safety Requirements publication *Site Evaluation of Nuclear Installations* (DS484) and will continue to develop the revised Safety Guides provisionally entitled *External Events Excluding Earthquakes in the Design of Nuclear Installations* (DS498), *Seismic Design and Qualification for Nuclear Power Plants* (DS490), and *Seismic Hazards in Site Evaluation for Nuclear Installations* (DS507); and
- The Agency will continue to organize meetings and to develop technical documents to assist Member States in the application of the Agency's safety assessment and design safety standards, including for existing NPPs, particularly related to the application of the new design safety principles in Safety Requirements No. SSR-2/1 (Rev. 1). Emerging topics, such as the reliability of passive systems, human reliability assessment in the context of dynamic considerations of accidental sequences, risk aggregation and multi-unit considerations, safety assessment of industrial digital devices in instrumentation and control, and analysis of design extension conditions also will be in focus.

C.1.3. Severe Accident Prevention and Mitigation

Trends

186. Member States continue to express an interest in the lessons arising from the Fukushima Daiichi accident, which highlighted the importance of clear, comprehensive, well-designed accident management provisions capable of helping to address the difficulties that operators and decision-makers may face when dealing with a severe accident.

Activities

187. The Agency held a Regional Workshop on Severe Accident Analysis in Tokyo, Japan, in November 2018, attended by 18 participants from 9 Member States. The participants exchanged information on severe accident analysis in order to contribute to the development and improvement of severe accident management guidelines at nuclear power plants.

188. The Agency, in cooperation with the ICTP, held the First Joint IAEA/ICTP Course on Scientific Novelties in Phenomenology of Severe Accidents in Water-Cooled Reactors in Trieste, Italy, in October 2018, attended by 25 participants from 16 Member States. The workshop provided an opportunity to discuss severe accidents in water cooled reactors in the framework of recent scientific novelties and research-supported analyses.

189. The Agency held a Training Workshop on the Development of Severe Accident Management Guidelines Using the IAEA's SAMG-D Toolkit in Vienna, Austria, in October–November 2018, attended by 27 participants from 20 Member States. The participants shared information on their SAMG-D practices and needs for future development.

190. The Agency held a Technical Meeting on Hydrogen Management in Severe Accidents in Vienna, Austria, in September 2018 attended by 28 participants from 21 Member States and the OECD/NEA. The participants exchanged information on state-of-the-art methods and the use of numerical tools, and identified and consolidated knowledge about the currently known gaps in understanding of hydrogen behaviour during severe accidents in water cooled reactors.

191. The Agency finalized a TECDOC entitled In-Vessel Melt Retention and Ex-Vessel Corium Cooling — Summary of a Technical Meeting. The Agency also finalized a TECDOC entitled Development and Implementation of Accident Management Programmes in Nuclear Power Plants.

192. The Agency held a Technical Meeting on the Status and Evaluation of Severe Accident Simulation Codes for Water Cooled Reactors in Vienna, Austria, in October 2018 during which code developers and end users shared experiences and demonstrated state-of-the-art practices. The meeting resulted in a draft TECDOC.

Priorities and Related Activities

193. *The Agency will provide forums for Member States to share knowledge and experience in their efforts to strengthen severe accident management guidelines. The Agency will further develop technical documentation in this area. The Agency will undertake the following activities in relation to these priorities:*

- The Agency will continue to facilitate exchange of experiences in the area of severe accident management and will develop supporting technical documentation; and
- The Agency will use technical cooperation implementation mechanisms to promote and support capacity building and national human resource development in the area of simulation and modelling of severe accidents in water cooled reactors and the advancement of such tools for safe NPP operation.

C.2. Safety of Small and Medium Sized or Modular Reactors

Trends

194. An increasing number of Member States have expressed interest in small and medium sized or modular (SMRs), with a corresponding increase in requests for workshops and expert missions from

embarking countries on SMR technology and associated licensing and safety matters. More than 50 SMR designs are in various stages of development and a few concepts are close to deployment.

195. Feedback from Agency activities, including international meetings and TSR services, has shown increased interest in the application of the Agency's design-related Safety Requirements to SMR designs.

Activities

196. The Agency finalized a study on how the Specific Safety Requirements *Safety of Nuclear Power Plants: Design* (IAEA Safety Standards Series No. SSR-2/1 (Rev. 1)) are applicable to SMRs intended for near term deployment. The study led to the launch of the development of Agency publications that use and expand on the results of the study.

197. The Agency established a Coordination Group on SMRs, which was tasked to coordinate the activities on SMRs carried out by the relevant Agency Departments.

198. The Small Modular Reactor Regulators' Forum initiated its second phase by establishing three working groups on licensing; design and safety analysis; and manufacturing, commissioning and operations. The Agency facilitated the organization of two meetings of the Forum in Vienna, Austria, in March and October 2018 and made available the report from the first phase of the Forum.

199. The Steering Committee of the GNSSN advised the Secretariat on the activities of the Small Modular Reactor Regulators' Forum and the safety aspects of SMRs. These topics were also discussed at the GNSSN Plenary Meeting during the 62nd regular session of the General Conference.

200. The Agency completed a coordinated research project (CRP) on Modular High Temperature Gas Cooled Reactor Safety Design. The final Research Coordination Meeting was held in June 2018. The Second Research Coordination Meeting of the CRP on Design and Performance Assessment of Passive Engineered Safety Features in Advanced Small Modular Reactors was held in Vienna, Austria, in May 2018 with ten participating Member States. The project focused on three areas: system design, reliability assessment, and verification and validation with experiments.

201. The Agency launched a CRP on the Development of Approaches, Methodologies and Criteria for Determining the Technical Basis for Emergency Planning Zone for Small Modular Reactor Deployment in January 2018, with 18 participating organizations from 14 Member States. The first Research Coordination Meeting was held in Vienna, Austria, in May 2018, at which the participating organizations agreed on the structure of the CRP and discussed the scope and approach of the research to be conducted.

Priorities and Related Activities

202. ***The Agency will assist Member State activities related to small and medium sized or modular reactors, particularly their efforts to develop safety requirements, build capacity for design safety and safety assessment, and share good practices. The Agency will undertake the following activities in relation to this priority:***

- The Agency will continue developing publications related to safety assessment and design safety of SMRs in the context of the Agency's safety standards;
- The Agency will continue supporting Member States in strengthening their capabilities on safety assessment of SMRs;
- The Agency will continue to provide support to the Small Modular Reactor Regulators' Forum, including through the GNSSN platform;

- The Agency will continue to carry out the CRP on the Design and Performance Assessment of Passive Engineered Safety Features in Advanced Small Modular Reactors;
- The Agency will hold the second Research Coordination Meeting of the CRP on the Development of Approaches, Methodologies and Criteria for Determining the Technical Basis for Emergency Planning Zone for Small Modular Reactor Deployment; and
- The Agency will promote and support capacity building and human resource development for regulating SMRs.

C.3. Research Reactor Safety

Trends

203. Feedback from Agency activities has shown that an increasing number of Member States are applying the provisions of the Code of Conduct on the Safety of Research Reactors, including on regulatory supervision, ageing management, periodic safety reviews and preparation for decommissioning.

204. Many Member States are planning or implementing modification and refurbishment projects to address ageing of the structures, systems and components of research reactors. Projects on physical protection systems are also planned or implemented to strengthen the security measures at many facilities. Member States have shown increased awareness and have improved their management of the interface between safety and security when planning and implementing these projects.

Activities

205. The Agency published the *Guidelines for Self-assessment of Research Reactor Safety* (IAEA Services Series No. 35)²² to assist research reactor operating organizations in preparing for future INSARR missions. The Agency also finalized the publication *Approaches to Safety Evaluation of New and Existing Research Reactors Facilities in Relations to External Events*.

206. The Agency held a Regional Meeting on the Application of the Code of Conduct on the Safety of Research Reactors for the Africa region in Rabat, Morocco, in July 2018, attended by 15 participants from 10 Member States. The participants exchanged information on the safety status of their research reactors and on their experience in applying the provisions of the Code.

207. The Agency held a Workshop on Regulatory Inspection Programmes for Research Reactors for the Arab Atomic Energy Agency (AAEA), ANNuR and FNRBA in Rabat, Morocco, in November 2018.

208. The Agency conducted two INSARR missions, in Ghana in April 2018 and in the Democratic Republic of the Congo in May 2018, and a follow-up INSARR mission in Jordan in March 2018.

209. The Agency organized a Technical Meeting on the Safety and Utilization of Subcritical Assemblies, in Vienna, Austria, in October 2018. Seventeen participants from 14 Member States discussed aspects related to the safe management and effective utilization of subcritical assemblies, including experiences and good practices.

210. The Agency held a Workshop on Decommissioning Planning for Research Reactors, in Vienna, Austria, in August 2018, attended by 39 participants from 31 Member States. The participants shared information and exchange knowledge and experience related to establishing preliminary decommissioning plans for research reactors and updating plans during the lifetime of the facility. The

²² INTERNATIONAL ATOMIC ENERGY AGENCY, *Guidelines for Self-assessment of Research Reactor Safety*, IAEA Services Series No. 35, IAEA, Vienna (2018).

workshop also addressed safety in extended shutdown and during the transition between operation and decommissioning.

211. The Agency held a workshop on Self-Assessment of Research Reactor Safety in Vienna, Austria, in March 2018, attended by 41 participants from 34 Member States. The participants shared information and exchanged knowledge and experience related to self-assessment of research reactor safety, including the results of self-assessments performed by the participants following the new Agency guidelines.

212. The Agency supported Member States in enhancing the safety of experiments and utilization programmes. The meeting of the Regional Advisory Safety Committee for Research Reactors in Europe, in Istanbul, Turkey in September 2018, focused on the safety of utilization and modifications of research reactors. The Agency also conducted a safety mission to the ETRR-2 research reactor in Egypt, in July 2018, that provided advice based on the Agency's safety standards on safety aspects related to the irradiation of iridium-192 targets.

213. The Agency finalized a Safety Report entitled *Periodic Safety Reviews for Research Reactors* to support operating organizations in conducting periodic safety assessments and regulatory bodies in assessing such assessments.

214. The Agency held a Workshop on Safety Aspects of Ageing Management, in Tashkent, Uzbekistan, in August 2018, as part of the preparation for an ageing management peer review mission to the WWR-SM research reactor.

215. The Agency issued training material entitled *Regulatory Inspection of Research Reactors* (Training Course Series No. 66/CD). The training material is intended to assist Member States in establishing and implementing regulatory inspection programmes for their research reactors and in improving the competences of regulatory staff in charge of regulatory inspection of research reactors.

216. The Agency conducted a Regional Workshop on Regulatory Inspection Programmes for Research Reactors for Asia and the Pacific region in Sydney, Australia, in February 2018, attended by 18 participants from 9 Member States. The workshop created a forum for the participants to share their national practices for regulatory supervision of research reactors. It also provided practical, hands-on training on preparing for, conducting and reporting on regulatory inspections. The Agency also conducted the Annual Meeting on the Safety and Licensing of Research Reactors for the AAEA, ANNuR and FNRBA, in Accra, Ghana, in October 2018, attended by 22 participants from 13 Member States and an expert mission on establishing a regulatory inspection programme for research reactors, in Amman, Jordan, in October 2018.

Priorities and Related Activities

217. ***The Agency will provide assistance to Member States to support their preparation for implementation of safety upgrades resulting from safety assessments of research reactors, managing ageing of research facilities, enhancing regulatory supervision, and strengthening application of the Code of Conduct on the Safety of Research Reactors through application of the relevant Agency safety requirements. The Agency will continue to facilitate the exchange of operating experience. The Agency will undertake the following activities in relation to these priorities:***

- The Agency will assist Member States in their efforts to build capacity to fully implement the provisions of the Code of Conduct on the Safety of Research Reactors through peer review services, regional meetings and training workshops, and updates to Safety Guides for research reactors;
- The Agency will assist Member States in addressing ageing management and periodic safety reviews by conducting peer review and advisory service missions to examine projects for the

refurbishment and upgrading of research reactors, and by organizing training activities and workshops;

- The Agency will assist Member States' regulatory bodies in developing the programmes and competences necessary to ensure effective regulatory control of research reactors, through meetings, training courses, workshops, and peer review and advisory services; and
- The Agency will assist Member States in developing operating experience programmes and facilitate the exchange of safety information and dissemination of operating experience through operation of the Agency's Incident Reporting System for Research Reactors.

C.4. Fuel Cycle Facility Safety

Trends

218. Member States' increased participation in the Fuel Incident Notification and Analysis System (FINAS), a self-reporting system for sharing information on lessons learned from incidents at nuclear fuel cycle facilities, indicates that Member States increasingly recognize the importance of exchange of operating experience. In 2018, 55 events were reported and included in the database, compared to 25 in 2017, and membership has increased from 30 to 32, covering more than 80% of the world-wide fuel cycle facilities within the scope of FINAS.

219. Member States are paying increasing attention to establishing systematic ageing management programmes and processes for periodic safety reviews for fuel cycle facilities, including the development of regulatory competencies.

Activities

220. The Agency held a Technical Meeting on Criticality Safety in Nuclear Fuel Cycle Facilities in Vienna, Austria, in April 2018, attended by 34 participants from 22 Member States. The participants discussed criticality safety in handling fissile materials in nuclear fuel cycle facilities, including the relevant Safety Requirements and Safety Guides, and shared national practices and experience related to criticality safety assessment, regulatory oversight and operating experience.

221. The Agency held the biannual Technical Meeting for the National Coordinators of the Joint IAEA–OECD/NEA FINAS, in Vienna, Austria, in September 2018, attended by 27 Coordinators from 18 Member States. The meeting facilitated the exchange of operating experience and recognized the increased use of FINAS by Member States as indicated by the significant increase in event reporting.

222. The Agency held a Technical Meeting on Application of the Graded Approach to Fuel Cycle Facilities, in Vienna, Austria, in July 2018, attended by 33 participants from 24 Member States. The participants discussed ideas for a new report on this subject and developed a document plan.

223. The Agency held a national Workshop on Regulatory Supervision of Nuclear Fuel Cycle Facilities in Isfahan, Islamic Republic of Iran, in February 2018 and an expert mission on the practical implementation of Agency safety standards on review and assessment for nuclear installations, focused on fuel cycle facilities, in Bucharest, Romania, in July 2018.

224. An expert mission on implementing the Agency's safety standards at a new reprocessing facility was held in Beijing, China, in July 2018.

Priorities and Related Activities

225. *The Agency will provide assistance to Member States to support their preparation for implementation of safety upgrades identified by safety reassessments of nuclear fuel cycle facilities. The Agency will continue to support Member States to enhance regulatory supervision. The Agency will undertake the following activities in relation to this priority:*

- The Agency will assist Member States in developing regulatory competences by organizing workshops, Technical Meetings and other activities to support the application of the Agency's safety standards and by updating safety guidance publications;
- The Agency will continue to facilitate exchanges of operating experience for nuclear fuel cycle facilities between Member States by operating and maintaining FINAS, jointly with the OECD/NEA, and organize and participate in regular meetings with national coordinators and the OECD/NEA; and
- The Agency will assist Member States to ensure effectiveness and sustainability of research reactors by organizing an international conference on this topic.

C.5. Safety Infrastructure for Embarking Countries

C.5.1. Nuclear Power Programmes

Trends

226. Around 30 Member States are considering or planning a new nuclear power programme. A number of Member States have already made a commitment and are preparing the necessary infrastructure for the introduction of nuclear power, or have progressed to the contracting stage. Four of these Member States have commenced the construction of their first nuclear power plant, and two of these expect the commissioning of their first unit in 2019 or 2020.

227. The Integrated Regulatory Review Service, INIR²³ missions and other peer review and advisory services continue to identify the need for regulatory body independence, to build regulatory capacity and competence, and to establish safety regulations and licensing processes together with effective regulatory oversight programmes.

Activities

228. The Agency continued to support safety assessment capacity building in countries embarking on nuclear power programmes. The Agency enhanced the Safety Assessment Education and Training (SAET) Programme, in support of the updated Safety Requirements publication *Safety of Nuclear Power Plants: Design* (SSR-2/1 (Rev. 1)). The Agency produced training materials based on the draft Safety Guides *Deterministic Safety Analysis for Nuclear Power Plants* (DS491) and *Format and Content of the Safety Analysis Report for Nuclear Power Plants* (DS449).

229. Through national or regional technical cooperation and extrabudgetary projects, the Agency conducted various expert missions, workshops or training activities that provided guidance and information on all the elements of establishing an effective safety infrastructure in line with the Specific Safety Guide *Establishing the Safety Infrastructure for a Nuclear Power Programme* (IAEA Safety Standards Series No. SSG-16).

²³ INIR is a service provided by the IAEA Department of Nuclear Energy. It is reported here due to the coordinated delivery of the INIR service with many safety related peer review and advisory services.

230. The Agency conducted three INIR²⁴ Phase 1²⁵ missions, to Niger, Sudan and the Philippines, one INIR Phase 2²⁶ mission to Saudi Arabia, and one INIR Phase 3²⁷ mission to the United Arab Emirates (UAE). The INIR mission to the UAE was the first of two planned pilot missions based on the INIR Phase 3 methodology.

231. The Agency held a National Workshop on Legal and Regulatory Framework for Nuclear Power Programme in Colombo, Sri Lanka, in April 2018; a National Workshop on Regulatory Framework for Safety in Accra, Ghana, in February 2018; a National Workshop on Development and Implementation of Regulatory Framework for Safety in Nairobi, Kenya, in March 2018; a Regional Workshop on National Policy and Strategy for Safety, Including Knowledge Transfer for Safety in Bangkok, Thailand, in November 2018; and a Regional Workshop on Regulatory Infrastructure for Nuclear Safety in Daejeon, Republic of Korea, in December 2018 for ANSN Member States.

232. The Agency provided guidance to the Malaysian Atomic Energy Licensing Board (AELB) on organizational structure and staffing during an expert mission in Dengkil, Malaysia, in September 2018.

233. The Agency held a National Workshop on Writing Safety Evaluation Reports in Jakarta, Indonesia, in May 2018; a National Training Course on Licensing Processes for NPPs in Accra, Ghana, in August 2018, and a Regional Workshop on Safety Review and Assessment by the Regulatory Body in Bangkok, Thailand in July 2018.

234. The Agency held a Workshop on Determining the Safety Significance of Inspection Findings and Applying the Appropriate Enforcement in Minsk, Belarus, in February 2018, and a Nuclear Power Plant Inspector Training and Certification Workshop in Amman, Jordan, in March 2018. The Agency also held a regional school on basic regulatory inspection for nuclear power plants for the Europe region in Warsaw, Poland, in September 2018.

235. The Agency held a Regional Workshop on Using a Graded Approach in Inspection Planning, Performance and Assessment of Findings in Sofia, Bulgaria, in May 2018.

236. The Agency conducted two hands-on regulatory inspector training workshops for Member States embarking on a nuclear power programme at the Zwentendorf NPP in Austria, one in May 2018 with 13 participants from 12 Member States and one in October 2018 with 17 participants from 15 Member States.

237. The Agency conducted four interregional training courses for countries embarking on nuclear power: one on the licensing process for nuclear power plants in July 2018 in Moscow, Russian Federation, attended by 23 participants from 17 Member States; one on safety review and assessment by the regulatory body in August 2018, also in Moscow, Russian Federation, attended by 17 participants from 8 Member States; one on the implementation of national requirements in Helsinki, Finland, in August 2018, attended by 15 participants from 9 Member States; and one on the competencies needed for a nuclear power programme in March 2018 at Argonne National Laboratories, USA, attended by 22 participants from 7 Member States. The Agency conducted six expert missions to support operators and regulators in developing their management systems: one mission to Turkey in

²⁴ INIR is a service provided by the IAEA Department of Nuclear Energy. It is reported here due to the coordinated delivery of the INIR service with many safety related peer review and advisory services.

²⁵ The main objective of an INIR mission in Phase 1 is to assist the national government in their considerations before a decision is taken to launch a nuclear power programme.

²⁶ The main objective of an INIR mission in Phase 2 is to assist the national government in the preparatory work for the contracting and construction of a nuclear power plant after a policy decision has been taken.

²⁷ The main objective of an INIR mission in Phase 3 is to assist the national government by providing a final review of the overall nuclear power infrastructure before the commissioning of the first nuclear power plant.

March 2018; three missions to Poland, in April, May and November 2018; and two missions to Ghana, in May and October 2018.

238. The Agency organized the annual Technical Meeting on Topical Issues in the Development of Nuclear Power Infrastructure in Vienna, Austria, in January–February 2018, which covers diverse issues including nuclear safety infrastructure. The meeting was attended by 66 participants from 28 Member States and one international organization.

239. The Agency conducted 11 meetings to update Integrated Work Plans (IWPs) and provide integrated support to countries embarking on nuclear power programmes. The respective IWPs include planning for peer reviews and advisory services to be requested by the Member States in a timely manner consistent with the development of their nuclear power programmes.

240. The Agency has initiated the development of a TECDOC entitled *Case Studies: Experiences of Member States in Building a Regulatory Framework for the Oversight of New Nuclear Power Plants*, intended to highlight Member States' experiences of establishing or updating a regulatory framework for nuclear power programmes.

Priorities and Related Activities

241. ***The Agency will assist Member States in the development of safety infrastructures for new nuclear power programmes. The Agency will undertake the following activities in relation to this priority:***

- The Agency will organize a Technical Meeting for embarking countries to systematically establish and strengthen the safety infrastructure for nuclear power programmes in line with IAEA Safety Standards Series No. SSG-16;
- The Agency will continue to assist Member States in identifying their needs and establishing priorities in order to develop or enhance their national regulatory infrastructures in a timely manner. For this purpose, the Agency will continue to promote the use of the Integrated Review of Infrastructure for Safety self-assessment tool and will conduct national and regional self-assessment workshops;
- The Agency will assist Member States in the development of a safety assessment infrastructure for new nuclear power programmes;
- The Agency will continue the programme of work agreed for embarking countries on developing the regulatory framework and strengthening regulatory infrastructure;
- The Agency will expand the number of services for assisting capacity building of regulatory authorities of embarking countries under the framework of SEED. Upon request, the Agency will continuously support a Member State's needs in safety aspects of site selection, site evaluation and design of nuclear installations for safety against external events;
- The Agency will initiate a review of the EPR publication *Considerations in Emergency Preparedness and Response for a State Embarking on a Nuclear Power Programme* (EPR-Embarking 2012)²⁸, to update it in the light of the latest developments and to address emerging needs from Member States;
- The Agency will continue the revision of IAEA Nuclear Energy Series No. NG-T-3.7 entitled *Managing Siting Activities for Nuclear Power Plants* to provide guidance on developing all

²⁸ INTERNATIONAL ATOMIC ENERGY AGENCY, *Considerations in Emergency Preparedness and Response for a State Embarking on a Nuclear Power Programme*, Emergency Preparedness and Response Series, EPR-EMBARKING 2012, IAEA, Vienna (2012).

aspects of the site and supporting facilities infrastructure in all phases of siting, to incorporate recent Member State experiences and new developments, as well as to align the publication with the revised milestones publications *Milestones in the Development of a National Infrastructure for Nuclear Power* (IAEA Nuclear Energy Series No. NG-G-3.1 (Rev. 1)) and *Evaluation of the Status of National Nuclear Infrastructure Development* (IAEA Nuclear Energy Series No. NG-T-3.2);

- The Agency will conduct a second INIR Phase 3 pilot mission in 2019. Upon completion, it will publish the INIR Phase 3 methodology, incorporating lessons learned;
- The Agency will continue to encourage Member States to host relevant nuclear safety review missions during the early stages of the development of a nuclear power programme in order to support the evaluation of the safety infrastructure aspects; and
- The Agency will continue to provide assistance to Member States embarking on a nuclear power programme to enhance their technical capabilities in the areas of safety review, assessment and authorization through Agency workshops, expert missions, scientific visits and fellowships with particular attention to those who are in more advanced stages of nuclear power programme development.

C.5.2. Research Reactors Programme

Trends

242. Many Member States are planning or implementing projects to establish their first or a new research reactor, to build capacity for embarking on a nuclear power programme and/or for research and development to support industry and national programmes such as those for medical radioisotope production.

Activities

243. The Agency issued a Nuclear Energy Series publication *Feasibility Study Preparation for New Research Reactor Programmes*²⁹ and finalized Specific Considerations in the Assessment of the Status of the National Nuclear Infrastructure for a New Research Reactor Programme — Reference document for the INIR-RR missions to support Member States embarking on a new research reactor project.

244. The Agency conducted safety missions on site evaluation and regulatory supervision to new research reactor projects in La Paz, Bolivia, in August 2018, and in Bangkok, Thailand, in November 2018. It conducted a safety mission on the construction programme of the LPRR research reactor, in Riyadh, Saudi Arabia, in December 2018.

Priorities and Related Activities

245. ***The Agency will assist Member States in developing safety infrastructure for new research reactor programmes. The Agency will undertake the following activity in relation to this priority:***

- The Agency will conduct peer review missions on safety infrastructure for new research reactor programmes on request and support capacity building through Technical Meetings and training activities.

²⁹ INTERNATIONAL ATOMIC ENERGY AGENCY, *Feasibility Study Preparation for New Research Reactor Programmes*, IAEA Nuclear Energy Series No. NG-T-3.18, IAEA, Vienna (2018).

D. Strengthening Emergency Preparedness and Response

D.1. Arrangements for Information Exchange, Communication and Assistance

Trends

246. Effective information exchange and emergency communication remain a priority for Member States. Their feedback to the Agency has resulted in recommendations for improvements in several areas, including the Unified System for Information Exchange in Incidents and Emergencies (USIE), the International Radiation Monitoring Information System (IRMIS), processes and tools for assessment of emergencies, and the prognosis of a possible emergency progression.

247. In 2018, one Member State designated contact points³⁰ under the Convention on Early Notification of a Nuclear Accident (Early Notification Convention) in accordance with the *Operations Manual for Incident and Emergency Communication* (EPR-IEComm 2012)³¹, increasing the number of such Member States to 125.

248. To date, 34 of the 117 States Parties to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (Assistance Convention)³² have registered National Assistance Capabilities³³ in the Agency's Response and Assistance Network (RANET). New or updated registrations were received from Australia, Austria, Belarus, Bulgaria, China, Czech Republic, Egypt, France, Ireland, Mexico, Nigeria, Pakistan, Romania, Sweden, Switzerland, Turkey, United Kingdom and the USA.

249. The number of nominated contact points for the coordination of IRMIS-related activities continues to grow. In 2018, one Member State nominated a contact point, bringing the total to 39.

250. The number of Member States using the International Nuclear and Radiological Event Scale (INES) to communicate the safety significance of nuclear or radiological events increased by one in 2018 to a total of 77.

251. Many Member States continue to prioritize strengthening preparedness to communicate effectively with the public and the media in a nuclear or radiological emergency.

Activities

252. The Ninth Meeting of the Representatives of Competent Authorities Identified under the Early Notification Convention and the Assistance Convention took place in Vienna, Austria, in June 2018. It was attended by 135 participants from 84 Member States and two international organizations. The participants discussed a range of topics including notification, reporting and information exchange, international assistance, communication with the public, and training and exercises. During this meeting,

³⁰ States Parties to the Convention on Early Notification of a Nuclear Accident are obliged to designate their competent authorities and points of contact that will be responsible for issuing and receiving the notifications and information referred to in the Convention. The Agency has requested that all Member States designate their emergency contact points in accordance with the *Operations Manual for Incident and Emergency Communication* (EPR-IEComm 2012).

³¹ INTERNATIONAL ATOMIC ENERGY AGENCY, *Operations Manual for Incident and Emergency Communication*, Emergency Preparedness and Response Series, EPR-IEComm 2012, IAEA, Vienna (2012).

³² Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, INFCIRC/336, IAEA, Vienna (1986).

³³ States Parties to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency are obliged to "within the limits of their capabilities, identify and notify the Agency of experts, equipment and materials which could be made available for the provision of assistance to other States Parties in the event of a nuclear accident or radiological emergency".

and during three workshops on notification, reporting and requesting assistance held in Vienna, Austria, in March, June and July 2018, the Agency encouraged those Member States which had no contact points established for emergency communication to establish them.

253. The Agency conducted ten web-based training events on the assessment and prognosis process and IRMIS.

254. The Agency released an updated version of its USIE website. The updated site allows information about an event to be easily revised using short messages, in free text fields, instead of completing new reporting forms. The updated site also allows the transfer and storage of encrypted confidential information. The Agency conducted seven web-based training events on the new features of the USIE website, in English, French, Russian and Spanish. The Agency further enhanced the security arrangements for the USIE website by incorporating a two-factor authentication of user accounts.

255. The Agency held an IRMIS implementation workshop in Vienna, Austria, in July 2018, attended by 21 participants from 19 Member States. IRMIS was used during the ConvEx-2a exercise in March 2018 and during the three workshops on notification, reporting and requesting assistance held during 2018, providing valuable hands-on training and exercise opportunities to more than 100 participants.

256. The Agency made further enhancements to IRMIS which included improving compatibility with the International Radiological Information Exchange (IRIX) data standard for information exchange during nuclear or radiological emergencies through a new IRIX validation tool.

257. The Agency held a Regional Workshop on Sharing Information on Early Warning Systems and Implementation of IRMIS for Communication of Monitoring Results for countries in the Co-operative Agreement for Arab States in Asia for Research, Development and Training related to Nuclear Science and Technology in Vienna, Austria, in August 2018, attended by 19 participants from 8 Member States. In addition, the Agency held a Regional Workshop on Emergency Monitoring and International Data Sharing supporting regional nuclear EPR for member countries of the Association of Southeast Asian Nations in Jakarta, Indonesia, in July 2018. This workshop was attended by 21 participants from 10 Member States. The Agency encouraged Member States participating in both workshops to provide routine data to IRMIS.

258. The Agency held an International Symposium on Communicating Nuclear and Radiological Emergencies to the Public in Vienna, Austria, in October 2018. The symposium brought together almost 400 participants from 74 countries and 13 international organizations. It covered topics in EPR, stakeholder engagement, public communication channels and tools in emergencies, social media, effective communication, psychology of communication, coordination of information, communicating in different types of emergencies, responses to the question “Am I safe?”, and lessons learned and the future of communication. The symposium president’s recommendations emphasised the importance of implementing Agency safety standards, training materials and tools. They also covered the use of innovative technologies, and ways to address public concerns in an emergency.

259. The Agency procured a social media simulator for use in its emergency exercise programme. The tool simulates social media use during an emergency, thereby testing the Agency’s preparedness to cope with this aspect. The Agency will also use the simulator when developing scenarios for exercises with Member States.

260. The Agency held a Technical Meeting on a draft of the revised INES User’s Manual in Vienna in April 2018, attended by 71 participants from 57 Member States. Participants discussed the draft and identified areas that need to be further improved.

Priorities and Related Activities

261. *The Agency will further develop operational arrangements for notification, reporting and assistance in a nuclear or radiological incident or emergency. The Agency will undertake the following activities in relation to this priority:*

- The Agency will hold a Technical Meeting to share advances in knowledge on operational arrangements, developments of technology, advances in accident simulations, atmospheric dispersion, and techniques for handling data for emergency response;
- The Agency will continue to enhance arrangements for international assistance in an emergency through the conduct of an exercise with a simulated Agency assistance mission with a joint assistance team comprising field assistance teams and external based support from Member States registered in RANET; and
- The Agency will hold training events and exercises to practise public communication in a nuclear and radiological emergency using the social media simulator.

D.2. Harmonization of Arrangements for Preparedness and Response

Trends

262. Member States are increasingly requesting technical assistance and advice in strengthening national and regional EPR arrangements. Many requests relate to the need for assistance and advice in implementing the requirements established in IAEA Safety Standards Series No. GSR Part 7. There is also an increase in the number of Member States using GSR Part 7 and the Safety Guide *Arrangements for the Termination of a Nuclear or Radiological Emergency* (IAEA Safety Standards Series No. GSG-11) in developing their national emergency response arrangements.

263. Member States are showing increased interest in harmonizing their EPR arrangements based on the requirements in GSR Part 7. Regulators participating in the Senior Regulators' Meeting during the General Conference in September 2018 highlighted the fact that the Agency's safety standards in the EPR area provide a widely accepted solid basis to achieve strengthened and harmonized EPR arrangements.

264. Member States are increasingly using the Emergency Preparedness and Response Information Management System (EPRIMS). In 2018, 103 Member States have appointed national coordinators, with a total of 394 users, an increase from 96 Member States with national coordinators and 339 users in 2017. The number of published modules also increased to 719 in 2018 from 382 in 2017.

265. There is clear interest from Member States in addressing the EPR arrangements for the new generation of reactors, including those that are close to deployment (e.g. SMRs) and those still being developed, such as the Generation IV reactors.

Activities

266. The Agency conducted 51 training activities in 2018, including 32 at interregional and regional levels and 19 at national level.

267. The Agency conducted three Schools of Radiation Emergency Management, in Austria in October 2018, and Morocco and the USA in November 2018, with a total of 82 attendees from 46 Member States.

268. The Agency reviewed information from national self-assessments in EPRIMS to identify areas in which guidance and training is needed. Such areas included protection strategies for a nuclear or

radiological emergency, terminating a nuclear or radiological emergency, and managing the medical response in a nuclear or radiological emergency.

269. The Agency launched a new version of EPRIMS, which provided improved usability and information sharing features. The Agency offered users eight webinars to assist them in the use of EPRIMS. In addition, the Western European Nuclear Regulators Association's (WENRA) DEEPER database, which includes technical information on nuclear power reactors relevant for EPR, was incorporated into the EPRIMS Reactor Technical Information.

270. The Agency published a Safety Guide entitled *Arrangements for the Termination of a Nuclear or Radiological Emergency* (IAEA Safety Standards Series No. GSG-11)³⁴. The Agency held a consultancy meeting in Vienna, Austria, in April 2018 to consider the implications of the Annex on *Attributing Health Effects to Ionizing Radiation Exposure and Inferring Risks* in the 2012 UNSCEAR report specifically for this draft Safety Guide.

271. The Agency issued a new EPR Series publication *Medical Management of Persons Internally Contaminated with Radionuclides in a Nuclear or Radiological Emergency: A Manual for Medical Personnel* (EPR-Internal Contamination, 2018)³⁵.

272. The Agency held a RANET workshop in the RANET Capacity Building Centre in Fukushima Prefecture, Japan, in August 2018. The 33 participants from 11 Member States registered in RANET practised their response and assistance capabilities and arrangements with a view to harmonizing them.

273. In response to a request for assistance from the Government of South Africa, an Agency Assistance Mission involving RANET capabilities provided medical advice in response to the overexposure of a patient.

Priorities and Related Activities

274. *The Agency will assist Member States in the implementation of IAEA Safety Standards Series No. GSR Part 7 and will develop associated Safety Guides, as a main reference for harmonization of EPR arrangements at the international level. The Agency will undertake the following activities in relation to this priority:*

- The Agency will continue developing technical guidance on different aspects related to EPR and initiate the development of technical guidance on EPR for new reactor designs such as SMRs;
- The Agency will continue its series of workshops on EPRIMS to support Member States in their self-assessments and implementation of the Agency's safety standards for EPR;
- The Agency will continue delivering capacity building activities to support Member States in strengthening their EPR arrangements. It will foster synergies and cooperation among CBCs-EPR. The Agency will also support development in EPR education to strengthen Member States' human resource capabilities; and

³⁴ FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL CIVIL AVIATION ORGANIZATION, INTERNATIONAL LABOUR ORGANIZATION, INTERNATIONAL MARITIME ORGANIZATION, INTERPOL, OECD NUCLEAR ENERGY AGENCY, UNITED NATIONS OFFICE FOR THE COORDINATION OF HUMANITARIAN AFFAIRS, WORLD HEALTH ORGANIZATION and WORLD METEOROLOGICAL ORGANIZATION, *Arrangements for the Termination of a Nuclear or Radiological Emergency*, IAEA Safety Standards Series No. GSG-11, IAEA, Vienna (2018).

³⁵ INTERNATIONAL ATOMIC ENERGY AGENCY, *Medical Management of Persons Internally Contaminated with Radionuclides in a Nuclear or Radiological Emergency: A Manual for Medical Personnel*, Emergency Preparedness and Response Series, EPR-Internal Contamination 2018, IAEA, Vienna (2018).

- The Agency will continue assisting Member States upon request, in harmonizing response and assistance capabilities through training for Member States registered in RANET, enabling them to provide international assistance that is compatible with the requirements of a requesting State and other assisting States.

D.3. Testing Readiness for Response

Trends

275. Member States continue to seek the Agency's assistance in improving the preparation, conduct and evaluation of national emergency exercises.

276. The percentage of USIE administrators completing the requested tasks within the required time frame continues to decrease (77% in 2016, 72% in 2017 and 61% in 2018). The Agency followed up on USIE administrators who did not complete the requested tasks on time and, as a result, more than 50 USIE administrator accounts were removed, and 39 new accounts were created for different administrators.

277. The participation of Member States in ConvEx-2 exercises continues to be high. In 2018, a total of 56 Member States participated in ConvEx-2a (compared to 55 in 2017); 45 Member States participated in ConvEx-2b (36 in 2017); 58 Member States participated in ConvEx-2c; and 8 ConvEx-2e exercises were conducted with 5 Member States (8 in 2017).

278. The percentage of emergency contact points that confirmed a test message via the USIE website during simple communication tests decreased from 46% in 2017 to 36% in 2018.

Activities

279. The Agency participated in 35 national emergency exercises and supported Member States in conducting and evaluating these exercises. All exercises included communications using the USIE Exercise website. The Agency tested connections for videoconferencing with emergency contact points in several Member States.

280. The Agency observed and provided feedback for a major national emergency exercise involving simultaneous events at two NPPs with overlapping emergency planning zones in Japan in August 2018.

281. The Agency held a ConvEx-2a exercise in March 2018, with a small increase in participation from 2017. The participation of 74% of Member States with operating NPPs indicates the importance attached by Member States to this exercise. All participating Member States used the correct communication channels.

282. The Agency conducted a ConvEx-2b exercise in October 2018, with 45 participating Member States and one international organization; 17 Member States tested their capabilities to request assistance and prepare to receive it, while 28 Member States and one international organization participated as providers of assistance. For the assisting States, the response times were assessed as part of the exercise objectives. Arrangements for the provision of privileges and immunities to an assistance mission team (in accordance with the *Agreement on the Privileges and Immunities of the International Atomic Energy Agency* (INFCIRC/9/Rev.2)) was also tested during the exercise.

283. The Agency conducted a ConvEx-2c exercise in November 2018, with 58 Member States and 5 international organizations. This exercise was hosted by Ireland and tested the arrangements for a transnational radiological emergency triggered by a nuclear security event.

284. The Agency continued the series of ConvEx-2e exercises to test the assessment and prognosis process, based on national exercises in Member States with operating NPPs. Four ConvEx-2e exercises

were conducted, and the assessment and prognosis process was also tested and evaluated in internal full response exercises and drills.

285. The Agency published an updated *IAEA Response and Assistance Network* manual (EPR-RANET (2018))³⁶ that guides actions to be performed by States providing and requesting international assistance.

286. The ConvEx 2018 exercise schedule was updated to include new exercises to test specific aspects of an emergency response. This includes ConvEx-2f, to test the coordination of public information between the relevant international organizations. The first ConvEx-2f was held in November 2018, with representatives from six international organizations.

287. The ConvEx 2018 exercise schedule was shared with Member States to allow participation planning. The Agency analysed all communication issues arising in ConvEx exercises and followed up with counterparts in Member States.

288. The Agency discussed the inter-agency EPR arrangements and bilateral protocols with the international organizations participating in the Inter-Agency Committee on Radiological and Nuclear Emergencies (IACRNE). Draft practical arrangements were provided to five international organizations for their feedback and comments.

Priorities and Related Activities

289. *The Agency will continue to implement an active exercise programme to test EPR at the international level and support national EPR exercise programmes. The Agency will undertake the following activities in relation to this priority:*

- The Agency will continue to conduct activities with international organizations within the IACRNE, and will continue to implement the ConvEx schedule of exercises with Member States and international organizations;
- The Agency will continue to test and evaluate its international arrangements for notification, reporting, information exchange, communication, assistance, assessment and prognosis, and continue to encourage Member States to engage in the ConvEx exercises and to test their national EPR arrangements in national exercises;
- The Agency will continue to assist Member States in the preparation, conduct and evaluation of their emergency exercises; and
- The Agency will continue to test the international arrangements based on the Joint Radiation Emergency Management Plan of the International Organizations, including arrangements to coordinate public communications, to ensure an effective and harmonized international response.

³⁶ INTERNATIONAL ATOMIC ENERGY AGENCY, *IAEA Response and Assistance Network, Emergency Preparedness and Response Series, EPR-RANET 2018*, IAEA, Vienna (2018).

E. Improving Management of the Safety and Security Interface

Trends

290. Member States continue to encourage the Secretariat to facilitate a coordination process to address safety and security interfaces.

291. An increasing number of radioactive sources are becoming disused and are no longer considered an asset. Ensuring continuous safe and secure management options for disused sealed radioactive sources remains an important priority for Member States.

Activities

292. The Agency held the International Conference on the Security of Radioactive Material: The Way Forward for Prevention and Detection, in Vienna, Austria, in December 2018. The conference, attended by approximately 550 participants from over 100 Member States and co-chaired by Italy and Senegal, featured six main panel sessions and 28 specialized technical sessions. The safety and security interface was discussed in a number of the sessions.

293. The Agency held two consultancy meetings in March and April 2018 to draft revisions to interrelated Safety Guides on the safety of research reactors to address new requirements in *Safety of Research Reactors* (IAEA Safety Standards Series No. SSR-3)³⁷, including requirements on managing the interface between safety and security.

294. The Agency incorporated comments from a 2017 Technical Meeting on addressing areas of potential safety and security interface in the facility description for the Hypothetical Atomic Research Institute, which is intended to be a common point of reference for the research reactor community in Member States.

295. The Agency held a Technical Meeting on the Safety and Security Interface — Approaches and National Experiences in October–November 2018, at which 126 participants from 64 Member States met to exchange information on approaches to addressing the interface in facilities and activities, to identify good practices in this area, and to make any recommendations to the Agency on further activities to assist Member States in managing safety and security interfaces effectively.

296. The Agency held a consultancy meeting to draft a TECDOC on regulatory oversight of the safety and security interface for nuclear power plants, in Vienna, Austria, in November 2018.

297. The GNSSN's 12th Steering Committee and the Plenary meetings discussed management of the nuclear safety and security interface for research reactors.

298. In the framework of the ANSN, the Agency held an Expert Meeting on the Coordination of Safety and Security Aspects for Establishing Synergy and Integration for eight Member States in Malaysia in October 2018.

299. The Agency held an International Workshop on Nuclear Security Measures and Emergency Response Arrangements for Major Public Events, in Washington, DC, USA, in June 2018, and an International Workshop on Nuclear Security Measures and Emergency Response Arrangements for Ports, in Las Vegas, USA in November 2018. These workshops were attended by 52 experts from 28 Member States. The workshops addressed the interface between nuclear security measures and

³⁷ INTERNATIONAL ATOMIC ENERGY AGENCY, *Safety of Research Reactors*, IAEA Safety Standards Series No. SSR-3, IAEA, Vienna (2016).

emergency response arrangements for Member States planning major public events and establishing appropriate arrangements at ports.

300. The Interface Group, comprising representatives of the Safety Standards Committees and the NSGC, reviewed four of the Agency's proposed safety standards to identify any safety and security interfaces. The Interface Group documented the nature of the interfaces and referred them to the appropriate committee(s) for further review and approval. During the year, the NSGC reviewed drafts of 14 safety standards identified as having interfaces with security, and relevant Safety Standards Committees reviewed one draft Nuclear Security Series publication having interfaces with safety.

301. The Agency issued five new nuclear security guidance publications on topics having significant interfaces with safety, and for which relevant safety experts had been involved in their development and review. These include four Implementing Guides (*Physical Protection of Nuclear Material and Nuclear Facilities (Implementation of INFCIRC/225/Revision 5)* (IAEA Nuclear Security Series No. 27-G), *Developing Regulations and Associated Administrative Measures for Nuclear Security* (No. 29-G), *Sustaining a Nuclear Security Regime* (No. 30-G) and *Building Capacity for Nuclear Security* (No. 31-G)) and a Technical Guidance publication (*Computer Security of Instrumentation and Control Systems at Nuclear Facilities* (No. 33-T)).

302. The Agency finalized two documents on managing safety and security interfaces in relation to radioactive material and associated facilities and activities — on notification, authorization, inspection and regulatory enforcement procedures for the safety and security of radioactive sources in use and storage and of associated facilities, and on managing the interface between safety and security for commercial shipments of radioactive material.

Priorities and Related Activities

303. ***The Agency will ensure that safety standards and nuclear security guidance take into account the implications for both safety and security whenever appropriate, recognizing that the activities that address nuclear safety and security are different. The Agency will undertake the following activities in relation to this priority:***

- The Agency will continue to support Member States in managing the interface between nuclear safety and security for nuclear installations by developing new guidance, revising relevant safety standards and holding training activities. A Technical Meeting on the interface between safety and security for nuclear fuel cycle facilities will be held in 2019;
- The Agency will facilitate the exchange of information on Member States' approaches to addressing the interface in facilities and activities; and
- The Agency will continue the development of technical documents on interfaces, including publishing one on the interface between transport safety and transport security. A module on this subject will also be developed and uploaded to the e-learning transport safety platform.

F. Strengthening Civil Liability for Nuclear Damage

Trends

304. Member States continue to attach importance to having in place effective and coherent nuclear liability mechanisms at the national and global level to ensure prompt, adequate and non-discriminatory compensation for damage to people, property and the environment resulting from a nuclear accident or incident.

305. Member States continue to encourage the Agency to assist them, upon request, in their efforts to adhere to the international nuclear liability conventions, taking into account the recommendations on how to facilitate the achievement of a global nuclear liability regime, adopted by Agency's International Expert Group on Nuclear Liability (INLEX) in 2012³⁸.

Activities

306. INLEX held its 18th regular meeting in Vienna, Austria, in May 2018. The Group discussed liability issues relating to disposal facilities for radioactive waste and reaffirmed its conclusions of the last meeting that during the period where institutional controls remain active (the duration of which will differ from country to country and with different classes of waste), there will still be an operator and the waste can be regarded as being in storage. The nuclear liability conventions would therefore continue to apply to such disposal facilities. Following the cessation of institutional controls over the site, INLEX noted that in the absence of an operator the nuclear liability conventions cannot be applied, and therefore the State which has agreed to the closure of the installation would implicitly be expected to assume the responsibility in case of any nuclear incident.

307. INLEX also addressed the liability issues concerning the exclusion of radioisotopes that have reached the final stage of fabrication from the definition of "radioactive products or waste" in the nuclear liability conventions and therefore from the scope of such conventions. In this context, INLEX concluded that "materials which have not reached the final stage of fabrication so as to be usable for any industrial, commercial, agricultural, medical, scientific or educational purpose, and the facilities where such materials are transformed into their final form, are covered by the nuclear liability conventions". INLEX specifically considered the case of molybdenum-99 contained in 'generators' sent to hospitals and medical clinics and noted that notwithstanding that the molybdenum-99 is not in itself "usable for any scientific, medical, agricultural, commercial or industrial purpose", the fact that it decays naturally results in it having reached its final stage of fabrication so as to be usable for any medical purpose and that molybdenum-99 generators hence fall outside the scope of the nuclear liability conventions.

308. INLEX continued to discuss the issue of the application of the nuclear liability conventions to transportable nuclear power plants (TNPPs) and reiterated its conclusions that such a TNPP in a fixed position (that is, in the case of a floating reactor, anchored to the seabed or the shore, and attached to shore by power lines) would fall under the definition of a "nuclear installation" and therefore be covered by the nuclear liability regime. INLEX also noted that in case of transport of a factory-fuelled reactor, the TNPP would also be covered by the nuclear liability conventions just as any other transport of nuclear material. INLEX will however continue to keep the issue under review at its next meeting, in particular in the case of a factory-fuelled reactor transported and deployed in a host State not party to the same Convention as the sending state.

309. The seventh Workshop on Civil Liability for Nuclear Damage was held in Vienna, Austria, in May 2018, and was attended by diplomats and experts from 21 Member States. Participants were given an overview of the international nuclear liability regime and of related matters. A National Workshop on Civil Liability for Nuclear Damage was also held in Khartoum, Sudan, in November 2018 to address matters relating to the implementation of the international nuclear liability regime.

³⁸ The text of the recommendations is available at: <https://ola.iaea.org/ola/documents/ActionPlan.pdf>. These recommendations were adopted by INLEX following a request in the IAEA Action Plan on Nuclear Safety (document GOV/2011/59-GC(55)/14).

Priorities and Related Activities

310. *The Agency will continue to facilitate the establishment of a global nuclear liability regime and assist Member States in their efforts to adhere to and implement the international nuclear liability instruments, taking into account the recommendations adopted by INLEX in 2012. The Agency will undertake the following activities in relation to this priority:*

- The Agency will organize the next meeting of INLEX in May 2019;
- The Agency, with the support of INLEX, will undertake further activities, such as regional and subregional workshops, as well as Agency–INLEX missions, that may be requested by individual Member States, to raise awareness of the international legal regime of civil liability for nuclear damage and facilitate its national implementation; and
- The Agency will also continue to support Member States, upon request, in adopting and revising national legislation on civil liability for nuclear damage, in the context of its legislative assistance programme.

Appendix

The IAEA Safety Standards Activities during 2018

Summary of the Agency's Safety Standards Activities during 2018

1. The Agency issued the Safety Requirements *Regulations for the Safe Transport of Radioactive Material, 2018 Edition* (IAEA Safety Standards Series No. SSR-6 (Rev. 1)). This revision of the Agency's Transport Regulations includes a new category of surface contaminated objects (SCO-III) and establishes additional requirements to assess the effects of storage time on package design.
2. The Agency issued seven General Safety Guides and five Specific Safety Guides after endorsement by the Commission on Safety Standards (CSS).
3. The General Safety Guides are:
 - *Occupational Radiation Protection* (IAEA Safety Standards Series No. GSG-7);
 - *Radiation Protection of the Public and the Environment* (IAEA Safety Standards Series No. GSG-8);
 - *Regulatory Control of Radioactive Discharges to the Environment* (IAEA Safety Standards Series No. GSG-9);
 - *Prospective Radiological Environmental Impact Assessment for Facilities and Activities* (IAEA Safety Standards Series No. GSG-10);
 - *Arrangements for the Termination of a Nuclear or Radiological Emergency* (IAEA Safety Standards Series No. GSG-11);
 - *Organization, Management and Staffing of the Regulatory Body for Safety* (IAEA Safety Standards Series No. GSG-12); and
 - *Functions and Processes of the Regulatory Body for Safety* (IAEA Safety Standards Series No. GSG-13).
4. The Specific Safety Guides are:
 - *Establishing the Infrastructure for Radiation Safety* (IAEA Safety Standards Series No. SSG-44);
 - *Radiation Protection and Safety in Medical Uses of Ionizing Radiation* (IAEA Safety Standards Series No. SSG-46);
 - *Decommissioning of Nuclear Power Plants, Research Reactors and Other Nuclear Fuel Cycle Facilities* (IAEA Safety Standards Series No. SSG-47);
 - *Ageing Management and Development of a Programme for Long Term Operation of Nuclear Power Plants* (IAEA Safety Standards Series No. SSG-48); and
 - *Operating Experience Feedback for Nuclear Installations* (IAEA Safety Standards Series No. SSG-50).

5. The CSS met twice in 2018. It endorsed for submission to the Board of Governors the draft Safety Requirements *Site Evaluation for Nuclear Installations* (DS484), to be issued as IAEA Safety Standards Series No. SSR-1. This draft publication takes into account scientific knowledge and incorporates advances in technology relating to site evaluation for nuclear installations.

6. The CSS also endorsed for submission for publication the following draft Safety Guides:

- *Organization, Management and Staffing of the Regulatory Body for Safety* (IAEA Safety Standards Series No. GSG-12);
- *Functions and Processes of the Regulatory Body for Safety* (IAEA Safety Standards Series No. GSG-13);
- *Operating Experience Feedback for Nuclear Installations* (IAEA Safety Standards Series No. SSG-50);
- *Decommissioning of Medical, Industrial and Research Facilities* (DS403), which is a revision of WS-G-2.2;
- *Radiation Safety of X-ray Generators and other Radiation Sources Used for Inspection Purposes and for Non-Medical Human Imaging* (DS471);
- *Design of the Reactor Coolant System and Associated Systems in Nuclear Power Plants* (DS481), which is a revision of NS-G-1.9;
- *Design of Reactor Containment and Associated Systems for Nuclear Power Plants* (DS482), which is a revision of NS-G-1.10;
- *Accident Management Programmes for Nuclear Power Plants* (DS483), which is a revision of IAEA Safety Standards Series No. NS-G-2.15 taking account of lessons learned from the Fukushima Daiichi accident;
- *Establishing the Safety Infrastructure for a Nuclear Power Programme* (DS486), which is a revision of SSG-16;
- *Design of the Reactor Core for Nuclear Power Plants* (DS488), which is a revision of NS-G-1.12;
- *Deterministic Safety Analysis for Nuclear Power Plants* (DS491), which is a revision of SSG-2; and
- *Human Factors Engineering in the Design of Nuclear Power Plants* (DS492).

7. In 2018, the CSS also approved the following document preparation profiles (DPPs) for Safety Guides:

- *Assessment of the Application of General Requirements for Design of Nuclear Power Plants* (DS508);
- Three DPPs for the revision of the various Safety Guides on research reactors: DS509 for the revision of NS-G-4.1 to NS-G-4.6, SSG-10 and SSG-37; DS510 for the revision of SSG-20 and SSG-24; and DS511 for the revision of SSG-22;
- *Borehole Disposal Facilities for Radioactive Waste* (DS512), which is a revision of SSG-1;
- *Equipment Qualification of Items Important to Safety in Nuclear Installations* (DS514); and

- *Compliance Assurance for the Safe Transport of Radioactive Material* (DS515), which is a revision of TS-G-1.5.

8. A number of drafts are being prepared to complete the process of bringing Safety Guides up to date in light of the Fukushima Daiichi accident:

- *Format and Content of the Safety Analysis Report for Nuclear Installations* (DS449), which is a revision of GS-G-4.1;
- *Remediation Process for Areas with Residual Radioactive Material* (DS468), which is a revision of WS-G-3.1;
- *Arrangements for Public Communications in Preparedness and Response for a Nuclear or Radiological Emergency* (DS475);
- *Design of Fuel Handling and Storage Systems for Nuclear Power Plants* (DS487), which is a revision of NS-G-1.4;
- *Storage of Spent Nuclear Fuel* (DS489), which is a revision of SSG-15;
- *Seismic Design and Qualification for Nuclear Power Plants* (DS490), which is a revision of NS-G-1.6;
- *Protection against Internal Hazards in the Design of Nuclear Power Plants* (DS494), which is a revision and combination of NS-G-1.7 and NS-G-1.11;
- The revision of eight closely interrelated Safety Guides on operational safety for nuclear power plants (DS497): NS-G-2.2 to 2.8 and NS-G-2.14;
- *External Events Excluding Earthquakes in the Design of Nuclear Installations* (DS498), which is a revision of NS-G-1.5;
- *Protection against Internal and External Hazards in the Operation of Nuclear Power Plants* (DS503), which is a revision of NS-G-2.1;
- *Arrangements for Preparedness and Response for a Nuclear or Radiological Emergency* (DS504), which is a revision of GS-G-2.1;
- *Seismic Hazards in Site Evaluation for Nuclear Installations* (DS507), which is a revision of SSG-9;
- *Assessment of the Application of General Requirements for Design of Nuclear Power Plants* (DS508); and
- The revision of the various Safety Guides on research reactors (DS509 for the revision of NS-G-4.5, DS510 for the revision of SSG-24, and DS511 for the revision of SSG-22).

9. Similarly, further draft Safety Guides are advancing in different stages of the preparation and review process:

- *Radiation Safety in the Use of Nuclear Gauges* (DS420);
- *The Management System for the Predisposal and Disposal of Radioactive Waste* (DS477), which is a revision and combination of GS-G-3.3 and GS-G-3.4;
- *Design of Auxiliary and Supporting Systems for Nuclear Power Plants* (DS440);

- *Preparedness and Response for an Emergency during the Transport of Radioactive Material* (DS469), which is a revision of TS-G-1.2;
- *Radiation Safety in Well Logging* (DS419);
- *Radiation Safety of Accelerator Based Radioisotope Production Facilities* (DS434);
- *Management of Residues Containing Naturally Occurring Radioactive Material from Uranium Production and other Activities* (DS459), which is a revision of WS-G-1.2;
- *Predisposal Management of Radioactive Waste from the Use of Radioactive Materials in Medicine, Industry, Research, Agriculture, Research and Education* (DS454).
- *Radiation Safety of Radiation Sources used in Research and Education* (DS470);
- *The Structure and Information to be Included in a Package Design Safety Report (PDSR) for the Transport of Radioactive Material* (DS493);
- *Application of the Concept of Exemption* (DS499), which is a revision of part of RS-G-1.7;
- *Application of the Concept of Clearance* (DS500), which is a revision of part of RS-G-1.7;
- *Source Monitoring, Environmental Monitoring and Individual Monitoring for Protection of the Public and the Environment* (DS505), which is a revision of RS-G-1.8;
- *Schedules of Provisions of the IAEA Regulations for the Safe Transport of Radioactive Material (2018 Edition)* (DS506), which is a revision of SSG-33;
- *Borehole Disposal Facilities for Radioactive Waste* (DS512), which is a revision of SSG-1;
- *Equipment Qualification of Items Important to Safety in Nuclear Installations* (DS514); and
- *Compliance Assurance for the Safe Transport of Radioactive Material* (DS515), which is a revision of TS-G-1.5.

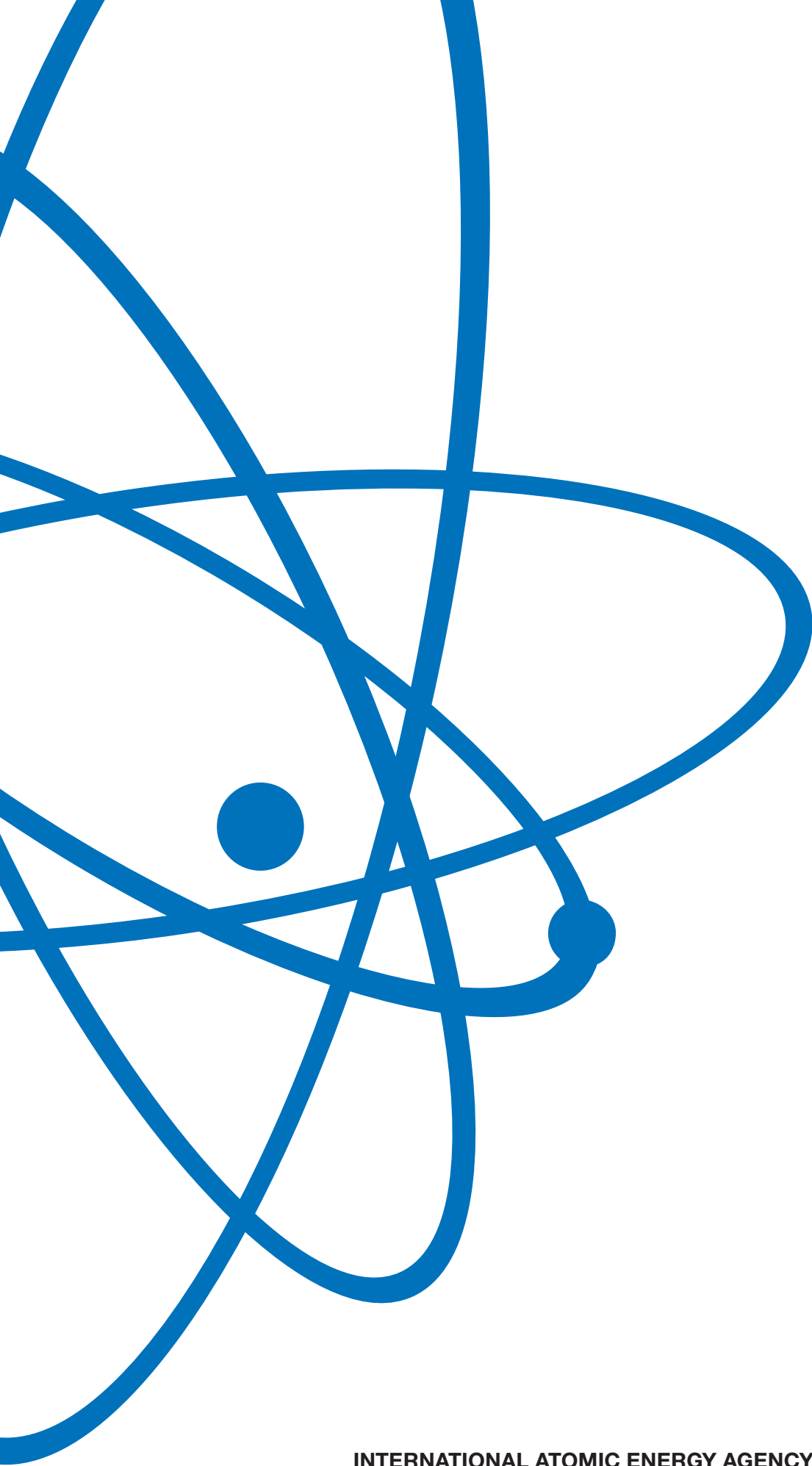
10. The Agency held a consultancy meeting in Vienna, Austria, in February 2018 to analyse the Safety Fundamentals to determine whether there is a need to refine certain parts of the text with respect to retrospective attribution of radiation health effects to past radiation exposures, prospective inference of health risks from radiation exposures, and the prediction of notional health effects for comparative purposes (e.g. use of collective dose). The experts concluded that, although the Safety Fundamentals does not address the distinction between these concepts, this alone is not sufficient for initiating a revision of the Safety Fundamentals.

11. The Agency included newly issued safety standards and nuclear security guidance in the Nuclear Safety and Security Online User Interface (NSS-OUI) platform. All IAEA Safety Standards Series and IAEA Nuclear Security Series publications are available in full, are up-to-date and can be searched as a uniform knowledge base. The advanced search functionality of the platform has been enhanced. The platform contains information on the relationship between the publications and helps users to navigate from one publication to other relevant guidance and recommendations from other publications.

12. From 2018, NSS-OUI explicitly displays relevant term definitions used in safety standards. The definitions are based on the relevant version of the IAEA Safety Glossary.

13. The NSS-OUI constitutes a centralized platform to collect, store and retrieve feedback on the use of the current publications in both series. The functionality ensures that any revision of the safety standards or part of the safety standards is justified by the above-mentioned feedback, therefore also ensuring stability of the parts of the standards that remain valid. In 2018, the feedback mechanisms were

tested and proved to be applicable for every step of the development or revision process of safety standards and nuclear security guidance. The NSS-OUI platform was used to develop a strategic plan for the revision of Safety Guides on the safety of nuclear fuel cycle facilities and will be further used for the systematic revision of other Safety Guides.



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