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STRENGTHENING THE AGENCY'S ACTIVITIES RELATED TO NUCLEAR SCIENCE, TECHNOLOGY AND APPLICATIONS

Report by the Director General

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Atoms for Peace and Development

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(GC(69)/1 and Add.1)

Strengthening the Agency's Activities related to Nuclear Science, Technology and Applications

Report by the Director General

Summary

In response to General Conference resolutions GC(68)/RES/11 and GC(66)/RES/9, this document contains progress reports on:

- Part A: Non-Power Nuclear Applications
  - General (Annex 1)
  - Development of the Sterile Insect Technique Package for the Management of Disease-Transmitting Mosquitoes (Annex 2)
  - Strengthening the Support to Member States in Food and Agriculture (Annex 3)
  - Use of Isotope Hydrology for Water Resources Management (Annex 4)

- Part B: Nuclear Power Applications
  - Introduction (Annex 5)
  - IAEA Communication, Cooperation with Other Agencies and Stakeholder Involvement (Annex 6)
  - Nuclear Fuel Cycle and Waste Management (Annex 7)
  - Research Reactors (Annex 8)
  - Operating Nuclear Power Plants (Annex 9)
  - Agency Activities in the Development of Innovative Nuclear Power Technology (Annex 10)

- Approaches to Supporting Nuclear Power Infrastructure Development (Annex 11)
- Small and Medium Sized or Small Modular Reactors — Development and Deployment (Annex 12)

Further information on the Agency's activities related to nuclear science, technology and applications can be found in the *Nuclear Technology Review 2025* (document GC(69)/INF/9); the *IAEA Annual Report 2024* (GC(69)/3), in particular the section on nuclear technology; and the *Technical Cooperation Report for 2024* (GC(69)/INF/6).

Recommended Action

It is recommended that the Board take note of Annexes 1–12 of this report and authorize the Director General to submit the report to the General Conference at its 69th regular session.

General
Non-Power Nuclear Applications

A. Background

1. In resolution GC(68)/RES/11.A.1, the General Conference requested the Director General, in conformity with the Statute, to continue to pursue, in consultation with Member States, the Agency's activities in the areas of nuclear science, technology and applications, with special emphasis on supporting the development of nuclear applications in Member States with a view to strengthening infrastructures and fostering science, technology and engineering for meeting the sustainable growth and development needs of Member States in a safe manner.

2. The General Conference recommended that the Secretariat report to the Board of Governors and to the General Conference at its sixty-ninth (2025) regular session on the progress made in the areas of nuclear science, technology and applications. This report has been prepared in response to that recommendation.

B. Progress since the 68th Regular Session of the General Conference

3. The Agency continued to support Member States in enhancing their capabilities to address needs relating to nutrition and the prevention, diagnosis and treatment of health problems through the development and application of nuclear and related techniques within a quality assurance framework.

4. The Agency led a landmark medical commission on the global availability of two key cancer treatments. Published in September 2024, the report of the Lancet Oncology Commission on Radiotherapy and Theranostics, which includes experts from 44 academic institutions and medical centres across 23 different countries, identifies strategies to optimize health outcomes, proposing actions and investments that can realize health and economic benefits worldwide while reducing the global burden of cancer.

5. The Agency's Human Health Campus remained a critical resource for nuclear medicine, radiology, radiation oncology, medical physics, radiation metrology and nutrition professionals. During the reporting period, the Agency expanded the Campus' content, which now features a new e-learning course on clinical radiobiology — a key prerequisite for treating cancer with ionizing radiation. Launched during an October 2024 webinar, which brought together over 540 participants from around the world, this resource can augment training programmes for radiation oncologists and other professionals from all regions, especially those in low- and middle-income countries. Within a week of its official release, more than 820 health professionals globally had engaged with the course's content.

6. Throughout the reporting period, the Agency continued to serve as an active member of the United Nations Interagency Task Force on the Prevention and Control of Non-communicable Diseases,

especially within the context of the upcoming fourth high-level meeting of the United Nations General Assembly on non-communicable diseases and mental health.

7. The Agency continued to strengthen its partnership with the World Health Organization (WHO), including through recommendations on the adoption of advanced techniques and equipment in Member States. For global initiatives such as the Cervical Cancer Elimination Initiative, the Global Breast Cancer Initiative and the Global Initiative for Childhood Cancer, the Agency provided its technical expertise to the initiatives' dedicated working groups. The Agency and the WHO also released the joint publication Guidance on Setting Up a Comprehensive Cancer Centre, which serves as a key resource for policy makers, national programme managers and planners.

FIG. B.1. The IAEA's Rays of Hope Forum returned to Ethiopia, where the cancer care initiative was launched in 2022, Addis Ababa, Ethiopia. (Source: IAEA)

8. Under Rays of Hope, the Agency continued to provide its technical expertise to Member States on the establishment and expansion of cancer centres. It also continued to review applications from cancer institutes interested in becoming Rays of Hope Anchor Centres, designating one from Thailand in September 2024 during the sixty-eighth regular session of the General Conference; one from the Republic of Korea in November 2024 during the Ministerial Conference on Nuclear Science, Technology and Applications and the Technical Cooperation Programme; and one from India in March 2025 during the Director General's visit to the country. There are currently 12 designated Anchor Centres under Rays of Hope. As capacity building and knowledge hubs, these Centres strengthen cancer care within their respective regions by providing targeted support to neighbouring countries in key areas such as education, training, research, innovation and quality assurance. The Agency organized the first-ever event hosted by a Rays of Hope Anchor Centre in Latin America and the Caribbean in November 2024: a workshop on the status of paediatric radiotherapy services in the region. Held in Buenos Aires, the event brought together 46 senior radiotherapy professionals, WHO representatives and other key collaborators to develop a roadmap to strengthen paediatric cancer care. The workshop also led to the creation of a regional network for knowledge exchange and expert support.

FIG. B.2. Rays of Hope Anchor Centre signing ceremony for Tata Memorial Centre. (Source: Tata Memorial Centre)

9. The Agency held the Rays of Hope Forum in June 2025 in Addis Ababa, Ethiopia. The event marked three years of progress under the Rays of Hope initiative and gathered over 150 participants. Delegates from across all regions, donors, and partners shared achievements and discussed future priorities. The role of Anchor Centres in ensuring sustainability through regional training and cooperation was featured. The forum highlighted significant advancements in cancer care access across low and middle income countries and globally. Live streaming enabled global participation, reinforcing the initiative's inclusive and collaborative spirit.

FIG. B.3. In September 2024, the IAEA signed strategic partnership agreements with IBA Dosimetry, PTW-Freiburg Physikalisch-Technische Werkstätten Dr. Pychlau GmbH to enhance dosimetry and quality assurance efforts under Rays of Hope. (Source: IAEA)

10. In tackling the global need for adequately trained professionals to address the incidence and mortality of gynaecological cancers in low and middle income countries, in March 2025, the Agency carried out a workshop which convened radiation oncologists, radiation therapists and medical physicists from its Anchor Centres in Algeria, Argentina, India, Japan, Jordan, Republic of Korea, Morocco, Pakistan, Slovenia, South Africa, Thailand and Türkiye. The successful development of a unified training programme in gynaecological cancers helps to ensure a more harmonized approach for professionals undertaking fellowships at Anchor Centres. As part of its assistance to these Centres, and through an extrabudgetary contribution from Japan, the Agency equipped each Anchor Centre with virtual reality headsets to enable them to utilize innovative educational tools.

11. Together with its latest Collaborating Centre in human health — the University of Texas MD Anderson Cancer Center in the United States of America — the Agency organized a year-long, virtual lecture series to enhance the research capacities of cancer centres around the world. Despite the importance of attending to cancer specificities within low and middle income countries, a lack of training research methodology is often cited as a barrier to cancer-related research projects and clinical trials. Over 300 cancer care professionals have regularly attended the monthly series, which covers topics ranging from translational research to the design of clinical trials.

12. During the reporting period, the Agency continued to carry out quality assurance audits in radiation medicine — helping to improve patient care in Member States. In January 2025, the Agency conducted a Quality Assurance Audit for Diagnostic Radiology Improvement and Learning (QUAADRIL) mission, which assessed diagnostic radiology services at 16 hospitals in Qatar representing the first such review carried out at a national level.

13. The Agency continued its research activities under coordinated research projects (CRPs) in nutrition, diagnostic imaging, nuclear medicine, radiation oncology and medical physics. Newly launched projects include a CRP to advance maternal and child health by optimizing the dose-to-mother deuterium oxide method, a CRP to improve the accuracy of radiopharmaceutical therapy dosimetry, a doctoral CRP to enhance the academic development of radiation metrology specialists in LMICs, and a CRP to enhance nutrition-related outcomes in cancer patients undergoing radiotherapy.

14. The Agency's three nutrition-related databases continue to grow and to be utilized by researchers and scientific investigators around the globe. The Doubly Labelled Water Database has led to the development of a novel predictive equation to help researchers assess the accuracy of self-reported dietary information in studies and surveys. After applying the equation, over a quarter of the data in two widely used nutritional databases was discovered to be inaccurate.

15. In July 2025, the Agency reviewed the use of nuclear techniques in the area of nutrition and food safety in the context of complex food systems and identified opportunities for synergies with the FAO and the WHO. By bringing together a multidisciplinary team of experts on food contaminants and residues of public health interest, and evaluating how exposure impacts human nutrition and health, a research agenda was defined that will inform the Agency’s Atoms4Food initiative.

16. Throughout the reporting period, the Agency maintained its Nuclear Medicine Database (NUMDAB) and the IAEA Medical Imaging and Nuclear Medicine Global Resources Database (IMAGINE). The data in these databases have been used to provide advice to Member States on needs within nuclear medicine, radiology, as well as diagnostic and therapeutic applications, to tackle the burden of non-communicable and communicable diseases. Actively used in peer reviewed publications, these databases enable researchers, practitioners and policy makers across the globe to better understand the current state of resources for medical practice, training and research.

17. The Agency continued to support the professional development of medical imaging specialists by facilitating complementary livestream access to major medical conferences organized by partner professional organizations — such as the American Society of Nuclear Cardiology, European Association of Nuclear Medicine, European Society of Radiology, International Society of Radiology and the Radiological Society of North America — for thousands of professionals worldwide.

18. The fifth International Conference on Hybrid Imaging (IPET 2024) was held at the Agency’s Headquarters in Vienna from 7 to 11 October 2024. The Agency brought together over 50 speakers, 570 participants from 103 countries and over 3000 virtual registrants for in-depth explorations of multimodality imaging techniques. Through sessions covering specific disease sites, the Agency examined the critical role that these techniques play in cancer management, deepening attendees’ understandings of complex cases and applications.

FIG. B.4. IAEA Director General Rafael Mariano Grossi, Deputy Prime Minister and Minister of Health of the Czech Republic Vlastimil Válek during the opening of IPET 2024 Conference. (Source: IAEA)

19. The Agency's International Conference on Advances in Radiation Oncology (ICARO-4) was held in Vienna from 2 to 6 June 2025. The conference enabled more than 400 health care professionals to review current developments across radiation oncology, radiation biology and medical physics. Attendees discussed cutting-edge techniques, such as stereotactic radiotherapy, intensity modulated radiation therapy, image-guided and motion management, MRI-guided linear accelerators, 3D conformal brachytherapy, proton therapy and light ion therapy.

20. In March 2025, the Agency released Quality Assurance and Optimization for Fluoroscopically Guided Interventional Procedures, its first-ever publication on the topic. The resource advances the field of interventional medicine by providing comprehensive guidance that can help to enhance patient safety, ensure the effective use of advanced imaging technology and promote adherence to global standards.

21. The Agency regularly updated and maintained its Secondary Standard Dosimetry Laboratory Network database (DOLNET); Dosimetry Audit Networks (DAN) database; and its Directory of Radiotherapy Centres (DIRAC). As the world's most comprehensive database on radiotherapy resources for patient treatment, DIRAC continues to provide data-driven insights informing cancer care. For the second year in a row, DIRAC enabled the World Intellectual Property Organization (WIPO) to measure the worldwide availability of cancer therapy equipment and include radiotherapy as an element in its assessment of global innovation.

22. The Agency continued to improve accuracy in radiation dosimetry globally through the IAEA/WHO Network of Secondary Standard Dosimetry Laboratories (SSDLs), which currently consists of 89 laboratories in 76 countries. The Agency's Dosimetry Laboratory in Seibersdorf, Austria — the Network's central laboratory — provided reference dosimeter calibrations, comparisons and reference irradiations, facilitating traceability between end users, such as hospital staff, and the

international measurement system for ionizing radiation to ensure consistency across all countries. The Laboratory also checked beams in hospitals around the world via the IAEA/WHO postal dose audit programme, helping with the safety and accuracy of radiotherapy treatments for cancer patients.

23. To further support countries on accurately measuring radiation doses, the Agency issued a Spanish edition of its first-ever code of practice on brachytherapy dosimetry entitled Dosimetry in Brachytherapy – An International Code of Practice for Secondary Standards Dosimetry Laboratories and Hospitals. In addition, the Agency has issued Spanish and Russian editions of its updated version of Absorbed Dose Determination in External Beam Radiotherapy: An International Code of Practice for Dosimetry Based on Standards of Absorbed Dose to Water. The multilingual editions will help with the quality and standardization of dosimetry globally, ensuring that cancer patients receive care in a consistent and verifiable manner wherever they are.

24. The Agency continues to work on improving access to, and use of, isotope tracers to understand groundwater vulnerability and sustainability. It has developed a methodology to increase accessibility for sampling and analysing radio-sulphur, a radionuclide with a half-life that is ideal for identifying water fractions of less than a year. This year, the Agency began receiving samples from Member States to gain an initial understanding of the global distribution of radio-sulphur in natural waters.

25. The Agency employed the use of artificial intelligence (AI) and machine learning tools to analyse stable isotope data from 136 rivers and 45 large catchments worldwide using Global Network of Isotopes in Rivers (GNIR) data. By monitoring isotopes in rivers, AI models could predict how river flow dynamics change under different environmental conditions, information that is important for improving water resource allocation and developing effective management strategies under changing climate and land use.

26. The Agency continues to strengthen its participation in UN Water and its collaboration with other UN Agencies working on water resource management, including the United Nations Educational, Scientific and Cultural Organization (UNESCO) and the World Meteorological Organization (WMO). For 2025–2026, the Agency has a position on the joint steering group of UN Water. The Agency also has representation on the UN Water expert groups on groundwater and climate change. During 2024, the Agency conducted the first joint interlaboratory exercise with the United Nations Environment Programme (UNEP) on water quality as part of the Agency's Global Water Analysis Laboratory (GloWAL) Network.

27. The Agency, through its Marine Environment Laboratories, continued to ensure the coordination among UN Agencies as a member of the UN-Oceans mechanisms and the UN Environment Management Group (EMG). It contributed to the preparatory work for a legally binding instrument to end plastic pollution and to the implementation of a UN common approach towards a pollution-free planet.

28. Under the Nuclear Technology for Controlling Plastic Pollution (NUTEC Plastics) initiative, more than 100 Member States are being supported to monitor microplastic abundance and polymer types in coastal zones. NUTEC Plastics continues to strengthen and scale up the development of reliable and cost effective techniques to assess the abundance and character of marine plastic pollution to better understand their origin, transport mechanisms and impact on the marine environment. This includes the development of harmonized protocols to identify microplastics in environmental samples, the implementation of analytical techniques in line with best practices and state of the art science, and training for scientists and technicians in their use.

FIG. B.5. IAEA Director General Rafael Mariano Grossi joined by Argentine Minister of Foreign Affairs H.E. Diana Mondina at the side event "NUTEC Plastics Outlook and the Antarctic Mission" at the 68th General Conference where the preliminary findings of the Antarctic Mission show how plastic pollution has reached every corner of the earth, and how microplastics are threatening the health of the global ocean. (Source: IAEA)

29. During the reporting period, the Agency signed a memorandum of understanding (MoU) under NUTEC Plastics with Brazil to set frameworks of scientific cooperation for gathering data on microplastics in the Antarctic. The Agency collaborated with Latin America and Caribbean Member States Institutions, through the Research Network of Marine-Coastal Stressors in Latin America and the Caribbean (REMARCO) network, to develop harmonized microplastics sampling protocols in order to guide the collection and analysis of samples for the monitoring of microplastics in coastal areas. The Agency continued to actively contribute to the International Negotiating Committee to develop a legally binding instrument on plastic pollution, including in the marine environment. At the 2025 UN Ocean Conference in Nice, the Agency organized a side event with international partners on Combating Marine Pollution, including Plastics, Through Innovative International Action.

FIG. B.6. IAEA Director General Rafael Mariano Grossi during the high-level event on combatting marine pollution at the United Nations Conference in Nice, France. (Source: IAEA)

30. The Agency, through its Ocean Acidification International Coordination Centre (OA-ICC), supports Member States in their efforts to tackle ocean acidification. Since its launch in 2013, the OA-ICC and its partners have provided opportunities for hands-on training, capacity building, dissemination of information and networking to more than 850 scientists from 110 Member States, promoted the development of harmonized methodologies and best practices in ocean acidification research, and provided access to scientific databases and a range of other resources for various audiences. From 2025, the OA-ICC will also be addressing marine carbon dioxide removal techniques (mCDR) by providing training to Member States in assessing the potential effects of ocean alkalinity enhancement on marine ecosystems.

31. The OA-ICC was represented at the 29th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP29), co-organizing and participating in side events addressing aspects of ocean acidification research, policy and governance, capacity building and interdisciplinary and cross-sectoral approaches to climate change adaptation and mitigation, including nature-based solutions. During the One-Ocean Science Congress in Nice, France in June 2025, the OA-ICC presented its achievements in capacity building and on ocean alkalinity enhancement assessments.

32. During the reporting period, the Agency supported projects in more than 30 Member States, jointly with research institutes, to use radionuclides to assess the rates of carbon sequestration in vegetated coastal marine areas and to aid Member States in data collection for the evaluation of the capacity of these ecosystems for long term carbon storage. In Africa, the Agency is working with 16 Member States on capacity building in the topic of blue carbon through a regional technical cooperation project.

33. The Agency continued to support regional seas programmes, such as the United Nations Environment Programme Mediterranean Action Plan (UNEP/MAP), the Oslo-Paris Convention for the

Protection of the Marine Environment (OSPAR), the Baltic Marine Environment Protection Commission (HELCOM). It also supported international conventions, such as the Minamata Convention on Mercury and the Stockholm Convention on Persistent Organic Pollutants, in their effectiveness evaluation by providing high quality matrix certified reference materials and organizing interlaboratory comparisons for the analysis of contaminants in marine matrices. During the reporting period, one new certified reference material for persistent organic pollutants in marine sediments was released to support reliable and highly accurate monitoring of harmful contaminants in the marine environment. The Agency also organized one worldwide interlaboratory comparison for the determination of heavy metals and trace elements in marine sediments with over 130 participating laboratories.

34. In May 2025, the Agency designated the Institute of Marine and Coastal Research (INVEMAR) in Colombia as the first IAEA Collaborating Centre in the field of the marine environment in South America. The partnership with INVEMAR will help the Agency deliver its research activities for an initial period of four years (2025–2029). Under the agreement, the Agency will be able to access INVEMAR's expertise in the application of nuclear and isotopic techniques to safeguard ocean health in the Latin America and Caribbean Region.

35. The Agency continued to support the network of Analytical Laboratories for the Measurement of Environmental Radioactivity (ALMERA), which currently consists of 200 member laboratories in 90 countries. The network aims to provide timely and reliable measurements in case of nuclear or radiological accidents resulting in releases of radionuclides to the environment. The Agency supports them in this effort through proficiency testing and related feedback, allowing the laboratories to demonstrate and improve their analytical performance. In 2024, the ALMERA Coordination Meeting was hosted in Rabat by the National Centre for Nuclear Energy, Sciences and Technology (CNESTEN) and brought together over 200 participants.

36. The Agency continued to provide Member States with a state of the art global marine environmental radioactivity database, accessible through the Marine Radioactivity Information System (MARIS) webpages. Over 900 000 measurements on radionuclides in sea water, sediment and marine organisms are available through a graphic user interface, which has been expanded to allow mapping of radioactivity levels. MARIS is a valuable tool for research, supporting easy access and full traceability of data, facilitating data-based science, including climate and ocean modelling, environmental and radiological assessment and the interpretation of monitoring data.

37. The Agency continued to conduct and promote research projects using radioactive and stable isotopes, along with associated analytical techniques, to advance understanding of the impact of climate change on food hazards and to minimize the health risks on consumers. These efforts address issues such as antimicrobial resistance, emerging biotoxins, changes in plant uptake of toxic elements and the presence of microplastics in food through biodegradation pathways.

FIG. B.7. Participants of an Asia-Pacific meeting on proficiency testing and interlaboratory studies, Xiamen, China, August 2024. (Source: CAAS)

38. The Agency continued to actively support the introduction and scale-up of food irradiation technologies to enhance food safety, strengthen phytosanitary measures and reduce post-harvest losses. The Agency, through the participation of Member States, developed protocols for food irradiation purposes and contributed to the drafting of several international standards and guidelines.

39. The Agency established the public-private partnership with Anglo American and launched a new CRP to develop climate smart agricultural practices through nuclear and related techniques to effectively manage and improve soil health and fertility in saline, sodic and saline-sodic soils, as well as increasing crop productivity by applying polyhalite fertilizer.

FIG. B.8. Tom McCulley, CEO of Anglo American's Crop Nutrients business, and IAEA Director General Rafael Mariano Grossi signed a new partnership agreement for a research project to fight soil salinization, under the joint FAO and IAEA Atoms4Food initiative. (Source: IAEA)

40. The Agency continued its efforts to address antimicrobial resistance (AMR) in agricultural soils through a CRP with eight Member States (Australia, Brazil, China, Germany, Norway, South Africa, the USA and Viet Nam). Isotope labelled antibiotics were produced and their dynamics and degradation have been tested in the field experiments. Under the Agency's Peaceful Uses Initiative, two major projects were launched in 2025 to address AMR in aquaculture, with a particular geographic focus on West Africa and Southeast Asia.

41. The Agency initiated new projects to apply AI to better understand and improve drought tolerance in complex coffee-banana intercropping systems. These projects initially focused on East Africa and are now being expanded to Latin America to enhance climate resilience. They aim to analyse and model the interactions between soil, plant and environmental variables to enhance resilience to climate stress. Collaborations with other organizations, such as the International Centre for Theoretical Physics (ICTP) in Italy, are also being developed to support this work.

42. In the Western Huayna Potosí glacier in Bolivia, the Agency introduced cosmic ray neutron sensor technology to monitor soil moisture dynamics in the highland wetlands and to quantify snow accumulation on the glacier. The data collected are critical for developing predictive models and informing climate adaptation strategies for local communities that rely heavily on glacial water resources for agriculture and drinking water.

43. The recently concluded CRP entitled "Remediation of Radioactive Contaminated Agricultural Land", enhanced nuclear emergency preparedness, particularly in under-explored agro-ecological environments. It improved understanding of radiocaesium and radiostrontium behaviour through experimental studies, field monitoring and modelling. The project also created decision support systems using machine learning to optimize remediation efforts during nuclear emergencies.

44. The Agency conducted a comprehensive genomic diversity analysis of zebu cattle in Asia. This analysis established crucial baseline data related to inbreeding, population size and overall genetic diversity within these important breeds. Complementing this work, Genome-Wide Association Studies (GWAS) were undertaken in Argentina. These studies aimed to pinpoint specific genetic variants associated with economically significant traits in cattle, such as milk production, reproductive efficiency, disease resistance and general health. The results of these studies are expected to inform breeding strategies and improve livestock productivity. Furthermore, an estimation of genetic admixture in crossbred cattle was conducted in Sri Lanka. This analysis provides vital information for optimizing dairy cattle management practices and enhancing milk productivity within the country.

45. To address the critical issue of animal nutrition and feeding strategies, research and development activities under a CRP profiled local and alternative non-conventional feed resources, with the dual goal of improving animal nutrition and reducing greenhouse gas (GHG) emissions from livestock production. Recommendations have been made to Member States on the role of silvopastoral systems on sustainable beef production and GHG emissions, on graded replacement of concentrate with oat brewery waste in ruminant feeding to mitigate against animal production related GHG emissions, and on various ruminant diet composition and feeding strategies with reduced GHG emissions associated with animal production.

46. Recognizing the vital role of underutilized highly nutritious crops in ensuring food and nutrition security under changing climatic conditions, the Agency launched a five-year CRP under Atoms4Food focused on accelerating genetic improvement of key dryland millets for climate change adaptation. The project involves 11 institutions from nine countries, and aims to develop climate-resilient millet varieties through mutation breeding and biotechnologies. The focus is on enhancing stress tolerance, improving nutritional quality and accelerating genetic gain using advanced screening methods and genomic tools.

47. Under the Atoms4Food initiative, the Agency is supporting a project on ‘Enhanced Crop Resilience and Nutritional Quality’, which aims to increase the climate change resilience of smallholder farmers and improve their livelihoods by introducing climate-resilient mutant varieties of groundnut, soybean and rice. The project focuses on enhancing crop productivity and scaling up the production and distribution of high-quality seeds, thereby contributing to food security and sustainable agricultural development.

48. Under the Atoms4Food initiative, the first expert mission was conducted in Burkina Faso in May 2025 to assess how nuclear and related technologies are being used in Burkina Faso to address challenges in enhancing crop production, improving soil quality and in animal production and health, as well as human nutrition. A detailed mission report is currently being developed and will inform the creation of a national Atoms4Food action plan, paving the way for dedicated programme implementation.

FIG. B.9. The joint IAEA and FAO Assessment Mission team examine new rice varieties during the first Atoms4Food Initiative Assessment Mission in Burkina Faso. (Source: IAEA)

49. The Agency organized the Third International Conference on Radiation Science and Applications (ICARST-2025) from 7 to 11 April 2025 in partnership with the International Society of Tracers and Radiation Applications (ISTRA). In addition to almost 900 participants from 105 Member States, the conference also featured 120 exhibitors from over 70 organizations and companies.

FIG. B.10. IAEA Director General Rafael Mariano Grossi opening ICARST-2025. (Source: IAEA)

50. The Agency signed Practical Arrangements with the International Committee for Non-Destructive Testing (ICNDT) and the International Society for Tracers and Radiation Applications (ISTRA) on the margins of ICARST.

51. In December 2024, the Agency brought together its Collaborating Centres in the fields of radiation technology applications and advanced non-destructive testing, industrial applications of radiotracers and sealed sources at a meeting in Vienna. The meeting discussed and reviewed the current and planned activities of the IAEA Collaborating Centres, evaluated the contribution of these activities to the Agency's mandate and recommended pathways for more effective and efficient implementation of radiation technologies. High-level representatives from ten Collaborating Centres attended the event.

FIG. B.11. IAEA Director General Rafael Mariano Grossi together with representatives of IAEA Collaborating Centres at a meeting in December 2024, Vienna, Austria. (Source: IAEA)

52. In November 2024, the IAEA organized the Ministerial Conference on Nuclear Science, Technology and Applications and the Technical Cooperation Programme. The event brought together ministers, senior officials and policymakers to address global challenges in health, food safety and security, water resource management and climate change through the application of nuclear techniques. A total of approximately 1500 participants from 144 Member States including at least 50 high-level officials and ministers and around 45 participants attending from private organisations. Delegates unanimously adopted a declaration recognizing the unique contribution of nuclear science, technology and applications to the global efforts addressing current and evolving challenges. The declaration underscored the synergies between the IAEA's technical cooperation efforts and nuclear science, technology and applications, demonstrating how, when combined, they drive transformative impact.

FIG. B.12. IAEA Director General Rafael Mariano Grossi alongside the Co-chairs, Mr Kai Mykkänen, Finland's Minister of Climate and the Environment, and Mr Kwaku Afriyie, Ghana's Minister for Environment, Science, Technology and Innovation, opening the Ministerial Conference on Nuclear Science, Technology and Applications and the Technical Cooperation Programme held at the Agency headquarters in Vienna, Austria. 26 November 2024. (Source: IAEA)

53. During a side event to the Ministerial Conference on Nuclear Science, Technology and Applications and the Technical Cooperation Programme, the Agency inaugurated the Non-Destructive Testing (NDT) Centre in Seibersdorf. The centre is equipped with state of the art equipment donated by Japan to support disaster emergency response in affected countries. The centre will provide training to enhance civil infrastructure recovery outcomes and promote resilience of civil structures in Member States.

FIG. B.13. IAEA Director General Rafael Mariano Grossi at the inaugural ceremony of the NDT Centre, held during the IAEA Ministerial Conference. (Source: IAEA)

54. In October 2024, the Agency launched a CRP on Optimising Mining Wastewater Remediation with the support of a non-traditional donor, URENCO. This initiative aims to revolutionize wastewater treatment from metalliferous mines — including copper, gold and uranium — by enhancing the understanding of hydrodynamics in constructed wetlands and validating their effectiveness as sustainable treatment solutions. With 34 research proposals from organizations across 23 Member States, this project exemplifies global collaboration in tackling environmental challenges.

55. In the reporting period, the Agency launched a CRP entitled “Mitigating Greenhouse Gases using Radiation”, focused on developing innovative radiation-based solutions — primarily electron beam accelerators — to convert GHGs such as carbon dioxide and methane into less harmful compounds or produce materials for their capture and secure storage. Given their critical role in accelerating global warming — leading to severe weather, rising sea levels and ecosystem disruptions — addressing GHG emissions is essential. Furthermore, these gases pose significant health risks to humans and wildlife.

56. To support the availability of theranostic radiopharmaceuticals, especially for countries with limited availability of positron emission tomography (PET) imaging systems, the Agency launched a CRP entitled “Development of new generation of Tc-99m kits”. This project is aimed at enhancing knowledge transfer related to the development and clinical translation of new Tc-99m radiopharmaceuticals, specifically targeting prostate or breast cancers and the tumour micro-environment. Institutions from 20 Member States participated in the first research coordination meeting during the reporting period.

57. Agency technical officers and global experts in the theranostic field published three papers in The Lancet Oncology journal in June 2024, which addressed different aspects of the radiopharmaceutical sciences as they pertain to oncology including Recent advances and impending challenges for the radiopharmaceutical sciences in oncology, Trends in nuclear medicine and the radiopharmaceutical sciences in oncology: workforce challenges and training in the age of theranostics, and Production and regulatory issues for theranostics.

58. In September 2024, a Train the Trainer Autumn School for Radiopharmacists was organized at the IAEA Collaborating Centre National Institute for Nuclear Science and Technology (INSTN), in France, where participating radiopharmacists from the African region developed technical competencies, practical experience and teaching skills required to train nuclear pharmacy technicians in their home countries. A technical workshop providing hands-on experience to participants on the preparation and quality control of 225Ac radiopharmaceuticals was conducted at the National Medical Institute in Warsaw in June 2025.

59. To continue exploring and enhancing the use of cyclotrons, research reactors and accelerators for the production of radiopharmaceuticals, the Agency launched a new Radiopharmacy Database in the reporting period. The database will help facilitate connections among the different producers of these products, improving access to radioisotopes and radiopharmaceuticals, identifying supply gaps and market trends.

60. In support of strengthening the analytical capabilities of Member States, the Agency organized its annual Worldwide Proficiency Test Exercise. The proficiency test aligns to multiple thematic areas, including environmental, health, food safety and security. In the reporting period, 515 sample sets were distributed to 100 Member States. The exercise provided an opportunity for Member States to monitor and demonstrate their analytical capabilities and identify areas where further development is needed. The exercise was followed by the first Worldwide Proficiency Test Technical Webinar that, over three days, provided a discussion of the results and opportunities for training and development for the proficiency test participants.

61. The Agency held a Technical Meeting on Expanding the Stakeholder Base of Nuclear Techniques for Forensic Science: Novel Applications and Niche Areas in Vienna from 30 September to 3 October 2024 with participants from 20 Member States and the United Nations Interregional Crime and Justice Research Institute (UNICRI). The event enhanced collaboration and provided information exchange within forensics science stakeholders and end users.

62. In May 2025, the Agency held the Annual Training Workshop on Synchrotron Technologies and Techniques and their Applications with Elettra in Trieste, Italy. The workshop targeted mainly young scientists with no or limited experience in synchrotron light experiments to participate in hands-on experiments and training at different beamlines, as well as to learn how to write successful proposal applications in order to be able to secure beamtime for themselves.

63. In December 2024, the Agency held an Advanced Workshop on the Sustainable Management of Ion Beam Analysis Data for Heritage Science within an Artificial Intelligence and Open Science Context together with the French Ministry of Culture in Gif-sur-Yvette, France, which was attended by 35 participants from 10 Member States and international organizations. The event discussed the characterization of heritage objects and materials using ion beam accelerators for collecting, processing and sharing data in line with artificial intelligence and open science policy.

64. The Agency published a TECDOC in April 2025 entitled “Good Practices in the Operation and Maintenance of Low Energy Electrostatic Accelerators” to serve both as a guide and a service manual, providing valuable information and knowledge, complementing materials from accelerator and related equipment manufacturers, and offering educational and training material for accelerator personnel and users.

65. In May 2025, the Agency held a Regional Training Workshop on Accelerator-based Analytical Techniques for Socioeconomic Development in Bariloche, Argentina. The event helped build capacity and provide advanced training to young researchers from the Latin America and Caribbean region in ion beam analysis techniques for socioeconomic development.

66. Recognizing the importance of international collaboration, the Agency continued its efforts in coordinating the involvement of relevant stakeholders to address the different aspects of fusion energy by convening the inaugural meeting of the World Fusion Energy Group (WFEG) in Rome in November 2024. The WFEG brought together public and private sectors, industry, academia and civil society to form a cohesive global fusion community.

FIG. B.14. Group Photo of the Inaugural Ministerial Meeting of the IAEA World Fusion Energy Group. International Conferences Hall, Italian Ministry of Foreign Affairs and International Cooperation, Piazzale della Farnesina, Rome, Italy. 6 November 2024. (Source: IAEA)

67. The Agency published the IAEA World Fusion Outlook 2024, which provides an overview of current developments and key achievements in the fusion world, highlights emerging plant concepts, projected development timelines, policy frameworks and trends in both public and private investment; covers research output metrics and offers regional and sectoral outlooks.

68. In November 2024, the Agency convened global fusion experts and industry representatives to develop and publish Fusion Key Elements. The publication outlines six foundational components for advancing fusion energy and builds a common understanding of the pathway from research, development and demonstration to the commercialization of fusion energy, charting a collaborative framework that helps to sustain and move forward fusion energy initiatives globally.

69. The Agency continued its efforts to increase international collaboration to advance fusion by holding specialized international workshops and technical meetings with the active collaboration of interested Member States and international organizations on fusion plants development activities, fusion machines steady state and long pulse operation, and fusion data processing, validation and analysis. Furthermore, in November 2024, the Agency signed an MoU with the ITER Organization and Practical Arrangements with the Fusion Industry Association on fusion energy, focusing on outreach, public engagement, knowledge sharing, training and other key areas.

70. The Agency continued its efforts to organize meetings and training in fusion energy. It collaborated with ITER to organize the 13th ITER International School in Nagoya, Japan, in December 2024, and also worked with the Thailand Institute of Nuclear Technology (TINT). In addition, the Joint ICTP–IAEA Fusion Energy School was held in Trieste, Italy in May 2025. Further strengthening the efforts in training and education in fusion energy, the Agency signed Practical Arrangements with TINT in January 2025 and with the European Fusion Education Network (FuseNet) in March 2025.

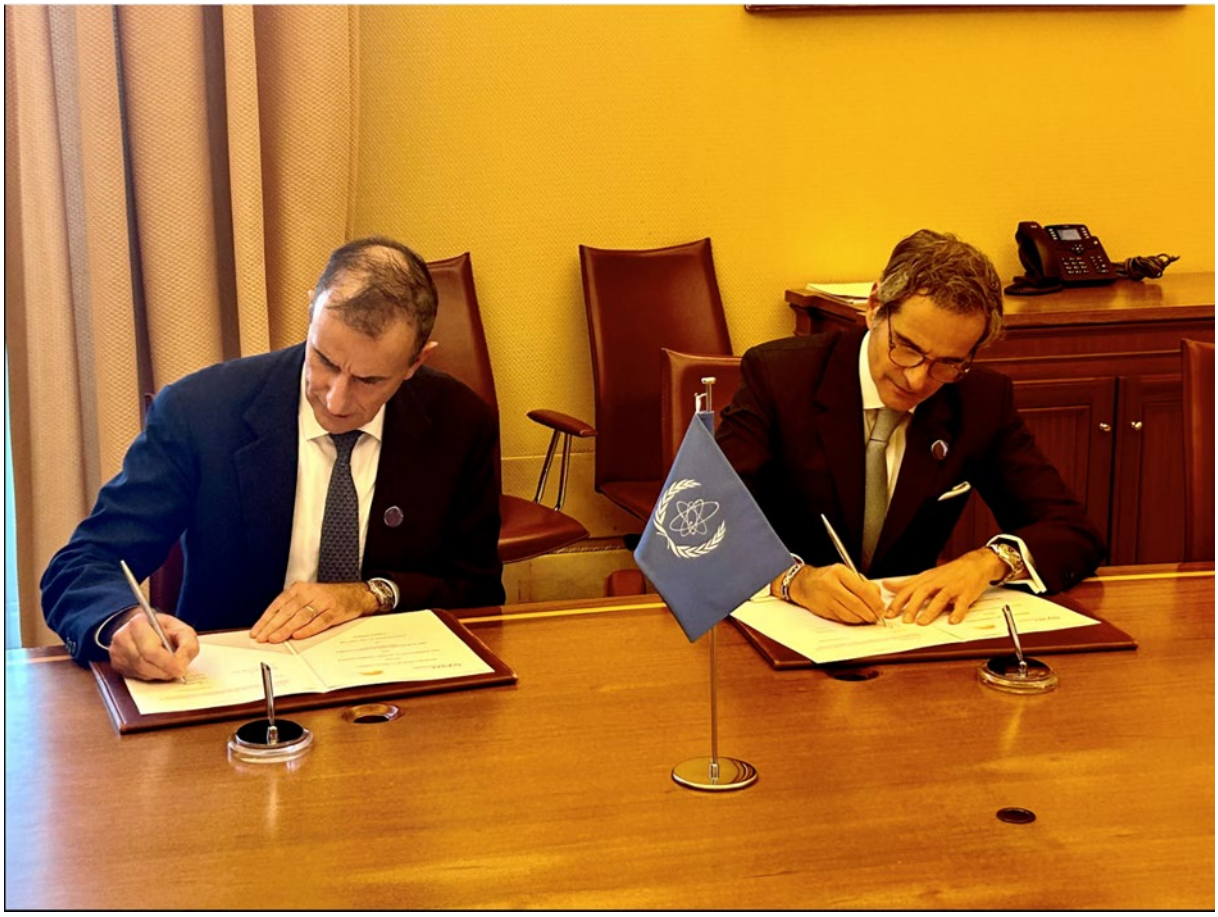


FIG. B.15. On the sidelines of the World Fusion Energy Group meeting, Director General Rafael Mariano Grossi and ITER Director General Pietro Barabaschi signed a new MoU, strengthening cooperation on fusion. (Source: ITER)

71. In May 2025, the Agency held the Seventh International Workshop on Models and Data for Plasma-Material Interactions in Fusion Devices in Vienna. This event brought together researchers and scientists from the areas of fusion energy and materials science to review advances in modelling of processes relevant to plasma-wall interactions and plasma-material interactions in fusion machines.

72. In June 2025, the Ninth DEMO and Fusion Plants Workshop took place on in Aomori, Japan. The meeting reviewed progress on international activities and road maps towards the establishment of a demonstration fusion power plant. The technical topics of this workshop included Magnets, Tritium Fuel Cycle and Neutronics. The event was attended by 67 participants from 16 Member States.

73. The Pre-Integrated Research Reactor Utilization Review Mission for Ghana Research Reactor (GHARR-1) took place from 4 to 5 February 2025. The event discussed and defined the scope and methodology to conduct the Integrated Research Reactor Utilization Review mission in agreement with the requesting research reactor operating organization, namely the Ghana Atomic Energy Commission (GAEC).

74. The Agency continued to collaborate with designated Member State institutions to implement the Agency's programmatic activities and promote the practical use of nuclear techniques. At the end of 2024, the Agency had 78 active Collaborating Centres (54 of which in fields related to non-power nuclear applications) in 39 Member States, representing an increase of eight centres compared with the end of 2023.

75. The Agency continued its efforts to inform Member States about coordinated research activities and their results on a dedicated webpage. At the end of 2024, the Agency operated 1616 active research contracts and agreements in 119 Member States as part of 128 active CRPs, of which 95 were related to non-power nuclear applications.

Support to the African Union's Pan African Tsetse Trypanosomosis Eradication Campaign (AU-PATTEC)

A. Background

1. In resolution GC(68)/RES/11/A.2, the General Conference recognized that "tsetse flies and the trypanosomosis [T&T] problem which they cause constitute one of the greatest constraints on the African continent's socioeconomic development, affecting the health of humans and livestock, limiting sustainable rural development, and thus causing increased poverty and food insecurity".

2. The General Conference requested "the Agency and other partners to strengthen capacity building in Member States, upon request, for informed decision making regarding the choice of efficient strategies to control T&T and the cost-effective integration of SIT operations in AW-IPM campaigns". The General Conference also requested the Secretariat, in cooperation with Member States and other partners, to maintain funding through the Regular Budget and the Technical Cooperation Fund for consistent assistance to selected operational SIT field projects, and to strengthen its support for research and development activities and technology transfer to African Member States in order to complement their efforts to create and subsequently expand tsetse-free zones.

3. The General Conference, in resolution GC(68)/RES/11.A.2, requested the Director General to report on the progress made in the implementation of this resolution to the Board of Governors and to the General Conference at its sixty-ninth (2025) regular session.

B. Progress since the 68th Regular Session of the General Conference

B.1. Strengthening Collaboration with AU-PATTEC

4. The Agency has continued its collaboration with the African Union's Pan African Tsetse and Trypanosomosis Eradication Campaign (AU-PATTEC) on its goal to eliminate tsetse and trypanosomosis (T&T) through the creation of sustainable T&T-free areas. The Agency was represented at the Workshop on Mainstreaming of the progressive control pathway (PCP) into regional and national strategies and policies against animal trypanosomosis in Africa, which was held in Mombasa, Kenya from 24 to 26 March 2025. The aim of the workshop was to promote the mainstreaming of the PCP into national strategies and policies against animal trypanosomosis in Africa. The workshop was attended by 62 participants from 21 African countries. In addition, representatives from the Food and Agriculture Organization of the United Nations (FAO), the International Cooperation Centre of Agricultural Research for Development (CIRAD), the Institute of Research for Development (IRD), the Gates Foundation, the Global Alliance for Livestock Veterinary Medicines (GALVmed), the Economic Community of West African States (ECOWAS), the Intergovernmental Authority on Development's Centre for Pastoral Areas and Livestock Development (ICPALD), and the Controlling and Progressively Minimizing the Burden of Trypanosomosis (COMBAT) project were present.

FIG. B.1.1. Participants from the Workshop on Mainstreaming of the progressive control pathway (PCP) into regional and national strategies and policies against animal trypanosomosis (AT) in Africa, held in Mombasa, Kenya, on 24–26 March 2025. (Source: AU-IBAR secretary).

B.2. Capacity Building through Applied Research and Technical Cooperation

5. The Agency continued to respond to Member States' requests for support in building and enhancing capacities to incorporate the sterile insect technique (SIT) into area-wide integrated pest management (AW-IPM) field campaigns through the regional project RAF5087 "Enhancing Regional Capacity for the Implementation of the Sterile Insect Technique as a Component for Area-Wide Tsetse and Trypanosomosis Management (AFRA)" for 2022–2025 to eliminate or control tsetse-transmitted trypanosomosis. The disease is recognized as a major constraint on both livestock and agricultural crop production in sub-Saharan Africa. The support has included the provision of technical advice, the procurement of specialized equipment and materials, training courses and workshops, fellowships and scientific visits through the relevant technical cooperation projects and research conducted at the Insect Pest Control Laboratory in Seibersdorf, Austria. In addition, experts from affected Member States continued to participate in the CRP entitled "Improvement of Colony Management in Insect Mass-rearing for Sterile Insect Technique Applications", which includes a research group on tsetse flies.

6. Recognizing the importance of understanding the spatial population genetic structure of target tsetse species for identifying isolated populations that can be potential candidates for AW-IPM eradication campaigns using SIT, the Agency initiated a CRP entitled "Tsetse Population Genetics and the Sterile Insect Technique: Bridging the Gap for Effective Vector Control" in 2024.

7. The Agency published an updated Thematic Plan for the development and application of SIT for tsetse AW-IPM programmes. Recognizing the successful results in AW-IPM operational programmes in Senegal and on Unguja Island in the United Republic of Tanzania with the eradication of Glossina austeni and Glossina palpalis gambiensis and the new technological challenges regarding efficient and economical delivery of the SIT package for tsetse species, the updated version aims to support the creation of sustainable T&T-free areas in sub-Saharan Africa.

8. The Agency's support strengthened capacities in Member States, enabling them to obtain and analyse baseline data to support informed decision making regarding the choice and feasibility of available T&T suppression or eradication strategies, including the cost effective integration of SIT operations into AW-IPM campaigns. In that context, the Agency continued providing support through

national technical cooperation projects to Burkina Faso, Chad, Ethiopia, Senegal, South Africa and the United Republic of Tanzania.

9. The Agency is currently maintaining tsetse strains from eight countries. Research activities at the Agency continued to focus on improving sterile male quality by refining feeding, sterilization, packing, transportation, release and quality control protocols, and understanding the impact of pathogenic viruses and symbiotic bacteria on tsetse colonies.

10. Recognizing the increasing challenges associated with using isotopic irradiators for the sterilization of tsetse, the Agency assessed the relative efficiency of X-rays and gamma rays to induce sterility in male tsetse pupae. The Agency also assessed the major factors impacting dose response and quality of tsetse, including temperature, atmospheric conditions and life stage. A cabinet style X-ray irradiator has been characterized and assessed for its applicability in tsetse sterilization.

11. The Agency, in collaboration with universities in Austria, Belgium, Burkina Faso and the Netherlands, continued to enhance capacity building in Member States through the training of interns and doctoral candidates.

12. The Agency continued supporting the European Commission-funded Horizon 2020 COMBAT project by making a technical contribution to its external advisory board. As part of this collaboration under COMBAT, the Agency also supported expert missions to Chad and Zambia to assist these Member States in developing their national atlas of tsetse flies and African animal trypanosomosis.

13. Advances in knowledge and applicable technologies arising from the above-mentioned research activities are widely disseminated through publications in peer reviewed scientific journals, as well as at conferences.

B.3. Support for the Planning and Implementation of SIT Activities

14. Under the regional technical cooperation project RAF5087, the Agency continued providing support to area-wide T&T management programmes to improve livestock productivity by developing knowledge and enhancing regional capacities through training courses, supplying equipment and consumables for field entomological surveillance activities and the operation of mass rearing facilities and molecular biology laboratories in Angola, Burkina Faso, Cameroon, Chad, Côte D'Ivoire, Djibouti, Democratic Republic of Congo, Ethiopia, The Gambia, Ghana, Kenya, Mali, Mozambique, Nigeria, Senegal, South Africa, Sudan, Uganda, the United Republic of Tanzania, Zambia and Zimbabwe. Capacity building activities also included the implementation of two regional training courses to develop knowledge, skills and capabilities in 19 Member States in genetic population studies and tsetse identification techniques. The training was instrumental in building capabilities in African Member States for planning, implementing and evaluating an AW-IPM with a SIT component targeting tsetse control. Furthermore, a workshop on dosimetry and irradiation procedures was also supported by this project aiming to develop knowledge and address challenges on relevant SIT components for future implementation of field projects against tsetse flies.

15. From 24 to 28 February 2025, five experts from Burkina Faso, Kenya, Senegal, Uganda and the United Republic of Tanzania supported the design on a new regional project proposal for the control of tsetse and trypanosomiasis in Africa.

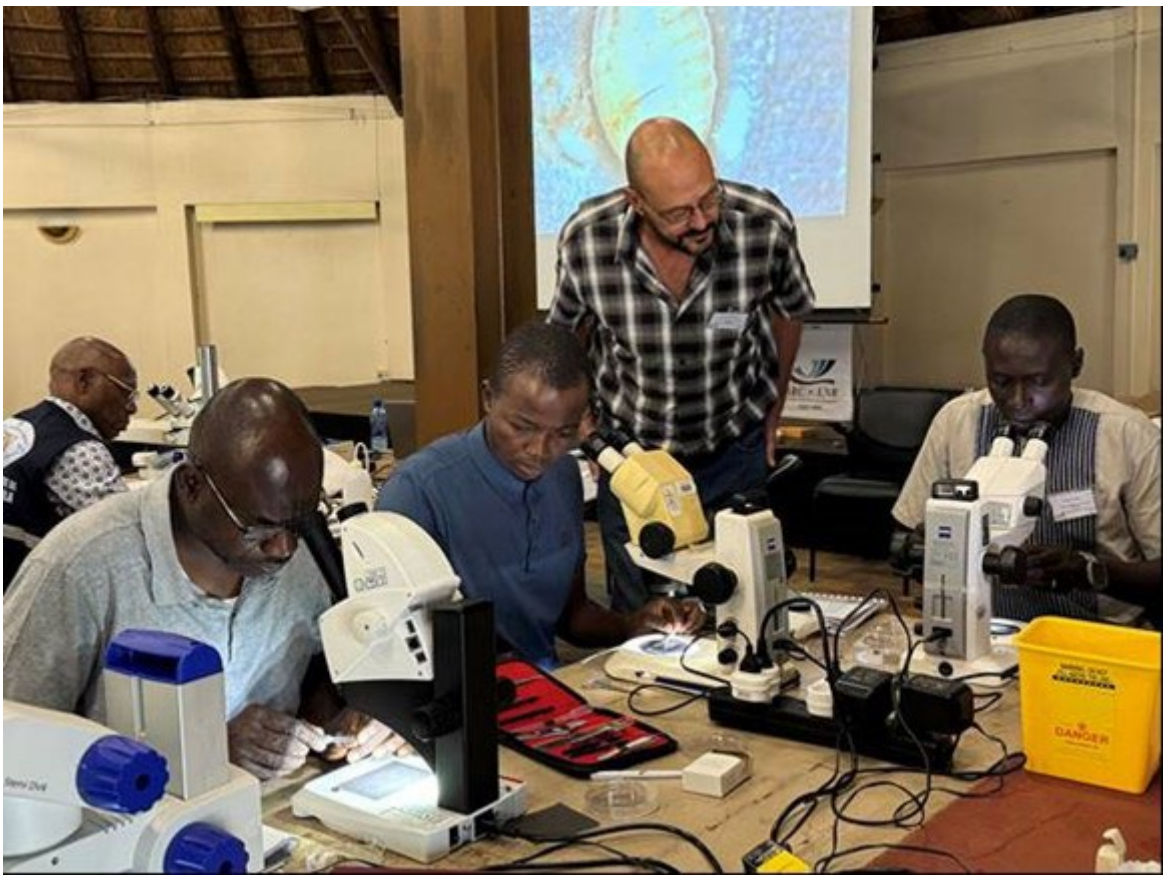


FIG. B.3.1. An expert from South Africa guiding participants of the FAO/IAEA Regional training course on tsetse identification and dissection techniques. (Source: IAEA).

16. Through the Technical Cooperation Programme, the Agency continued to provide technical support to Senegal in its efforts to eradicate Glossina palpalis gambiensis, a species of tsetse fly, from the highly productive agricultural region of Niayes to the north-east of Dakar, using an AW-IPM approach with an SIT component. Analysis of the disease incidence in resident cattle indicates that transmission of animal trypanosomosis has ceased. Senegal continues to import more productive cattle into the area. Extensive tsetse monitoring is currently under way to identify in a timely manner any residual tsetse populations; when such populations are found, they will be treated with sterile male releases. Socioeconomic surveys on the eradication project revealed significant positive impacts such as an improvement in cattle health, an increase in dairy production and cattle farmer incomes, and a growth in dairy and livestock employment opportunities, especially for women and youth. Further support was also provided through a national training course on strategy development for entomological and parasitological baseline data collection in the Sine Saloum, the next area in Senegal to be targeted.

FIG. B.3.2. A local expert from Senegal instructing participants of the national training course on strategy development for entomological and parasitological baseline data collection in the Sine Saloum area of Senegal. (Source: IAEA)

17. In Burkina Faso, the Agency continued to provide technical support to the insectarium in Bobo-Dioulasso that is part of a campaign to eradicate tsetse flies and trypanosomosis (IBD-CETT), which resulted in the continued production of Glossina palpalis gambiensis sterile males for field releases in the Niayes area under the SIT project in Senegal.

18. In Chad, Ethiopia, Senegal, South Africa and the United Republic of Tanzania, the Agency continues to provide technical support through fellowships and scientific visits, and to enhance capacity building by supplying tsetse monitoring and mass rearing equipment.

FIG. B.3.3 A fellow from Burkina Faso received training in Senegal to perform flight quality control tests on long distanced transported sterile males. (Source: IAEA)

19. African trypanosomosis affecting livestock continues to pose a significant constraint on development in much of sub-Saharan Africa, especially rural areas. Where technically feasible, the SIT, as a component of AW-IPM interventions, can be a significant tool for alleviating this constraint. It provides an environmentally friendly option for eradicating tsetse fly vector populations, removing the risk not only of animal trypanosomosis, but also of human trypanosomosis (sleeping sickness) where it occurs. The benefits achieved, such as the improved ability to rear livestock for milk and meat production, crop productivity, and the use of animals for transporting and traction can significantly contribute to an increase in the quality of people's lives. The Agency continues to assist in building and enhancing capacities in this area for the benefit of 23 Member States in sub-Saharan Africa.

20. The constraints on successful and more widespread application of SIT in suitable areas targeting tsetse eradication as well as the lack of current socioeconomic data to measure the cost-benefit of AW-IPM against tsetse with an SIT component continue to limit Member States in securing and mobilizing sustainable funds for targeted AW-IPM programmes.

Renovation of the Agency's Nuclear Applications Laboratories at Seibersdorf

A. Background

1. During the 56th regular session of the General Conference in September 2012, the Director General called for an initiative to modernize and renovate the eight laboratories of the Department of Nuclear Sciences and Applications in Seibersdorf, Austria, to enable them to meet the growing and evolving needs of Member States. The General Conference supported the initiative of the Director General in resolution GC(56)/RES/12.A.5, and the Renovation of the Nuclear Applications Laboratories (ReNuAL) project was officially launched on 1 January 2014. The strategy for the project was issued in May 2014 in documents GOV/INF/2014/11 and GOV/INF/2014/11/Corr.1.

2. ReNuAL Plus (ReNuAL+) was delineated in an addendum to the strategy that was issued in September 2014 (document GOV/INF/2014/11/Add.1) to provide for improvements required by the laboratories that could not be accommodated within the scope of the ReNuAL project. In February 2017, the Secretariat issued document GOV/INF/2017/1, Renovation of the Nuclear Applications Laboratories (ReNuAL) Project, which updated Member States on the status of ReNuAL and ReNuAL+ and provided details on the implementation of ReNuAL, the scoping and costing of ReNuAL+, and efforts on resource mobilization

3. The combined ReNuAL/ReNuAL+ phase of the initiative delivered new laboratory buildings to house four of the eight nuclear applications laboratories in Seibersdorf and provided a new linear accelerator facility for the Agency's Dosimetry Laboratory. It was expected that the four remaining laboratories would be expanded, and core infrastructure enhanced in the existing buildings once the other laboratories then sharing those facilities moved into their new space. However, in early March 2020, an assessment by external experts concluded that the full renovation of the existing 60-year-old laboratory building, intended to make the laboratories 'fit for purpose' to support Member State requirements, would likely take longer, cost more and result in lower-quality laboratory space than the construction of a new building to house three of the laboratories (the Terrestrial Environmental Radiochemistry Laboratory, the Plant Breeding and Genetics Laboratory, and the Nuclear Science and Instrumentation Laboratory). The ReNuAL project management team determined the conclusions of the experts to be appropriate and concurred that a new building was the most suitable option for enhancing the three laboratories.

4. In that context, at the March 2020 meetings of the Board of Governors, the Director General announced plans to build a second new Flexible Modular Laboratory (FML2) to house the three above-mentioned laboratories. The Dosimetry Laboratory would be refurbished as originally planned in its current location adjacent to its new linear accelerator facility. Ageing greenhouses, on which the work of three laboratories heavily depends, will also be replaced. The Director General provided information on the resources required and further elaborated planning for this final phase of the project, known as 'ReNuAL2', during a technical briefing on 3 September 2020. On 6 September 2022, the Deputy Director General, Head of the Department of Nuclear Sciences and Applications provided an informal technical briefing to Member States to present the revised ReNuAL2 project cost projections and timelines based on the rapidly escalating prices and supply chain challenges encountered in the bidding process for construction of FML2, the greenhouse foundations and the Dosimetry Laboratory refurbishment. The Deputy Director General provided data to show that, notwithstanding extensive

value engineering and other measures undertaken to hold down project costs, the total cost of the ReNuAL2 phase could rise to €41 million or more. The successful conclusion of this final project phase will enable the nuclear applications laboratories to respond to the growing and evolving needs of Member States and assist their efforts to achieve the SDGs.

5. The General Conference, in resolution GC(68)/RES/11/2024, requested the Director General to report on the progress made in the implementation of this resolution to the Board of Governors and to the General Conference at its sixty-ninth (2025) regular session.

B. Progress since the 68th Regular Session of the General Conference

B.1. Implementation Status

6. The construction and laboratory furnishing of the FML2 building was completed in November 2024. The transition of the three relevant laboratories (i.e. the Terrestrial Environmental Radiochemistry Laboratory, the Plant Breeding and Genetics Laboratory, and the Nuclear Science and Instrumentation Laboratory) into the new building began in early 2025 and will continue throughout the year. Work on the Dosimetry Laboratory is complete, and the refurbished facility became fully operational in July 2024. Construction of the new laboratory greenhouses was completed in April 2025. The three remaining Nuclear Applications Laboratories are all projected to become fully operational in the new facilities (building and greenhouses) in the course of 2025, marking the conclusion of the ReNuAL2 project.

FIG. B.1. Façade of the new laboratories building (FML2). (Source: IAEA)

B.2. Financial Status and Resource Mobilization

B.2.1. Financial Status

7. Over €39 million in extrabudgetary funds were raised for ReNuAL and ReNuAL+, with financial and in-kind contributions received from 42 Member States and additional financial and in-kind support received from non-traditional donors. The combined ReNuAL/ReNuAL+ project target budget of €57.8 million was exceeded by approximately €590 000, which was ultimately made available to the ReNuAL2 project in addition to €9.7 million from this project budget that was initially designated to address the requirements of the four remaining laboratories in the ReNuAL2 project phase. The ReNuAL2 phase includes the construction and full operation of a new laboratories building (FML2), construction of new greenhouses and refurbishment of the Dosimetry Laboratory.

FIG. B.2.1. Exterior and interior of the new greenhouses. (Source: IAEA)

8. Preliminary cost estimates totalling €34.5 million for the final phase of laboratory modernization were provided to Member States in the Director General's technical briefing in September 2020. With €9.7 million initially made available from the ReNuAL/ReNuAL+ budget to address the needs of these laboratories, the Director General requested Member State support to raise the remaining €24.8 million. As of the beginning of the third quarter of 2025, the estimated total budget remained at €44.96 million, which includes cost elements identified as required to complete the project but not previously included in the project budget, such as laboratory transition, information technology infrastructure, photovoltaic and project energy costs.

9. As of the third quarter of 2025, 38 Member States, one international organization, one private sector donor and two individuals had announced extrabudgetary contributions for the ReNuAL2 phase, totalling over €29 million. An additional €5.9 million in funding was provided from the Major Capital Investment Fund. As the Agency informed Member State representatives at a comprehensive project briefing hosted by the Friends of ReNuAL co-chairs, Germany and South Africa, on 19 March 2024, further extrabudgetary contributions to ReNuAL2 are no longer required.

B.2.2. Funding Priorities

10. With major ReNuAL2 project elements all under contract and funded, the sole budget uncertainty relates to additional costs to complete the project, which will only be finalized upon project completion later in 2025. Available funding is expected to be sufficient for these additional costs.

B.2.3. Resource Mobilization Strategy

11. During the period of active resource mobilization, the Secretariat pursued an element-specific resource mobilization strategy that sought resources from Member States and non-traditional donors based on existing and estimated funding requirements. In support of this strategy, new and targeted resource mobilization products were developed to highlight the importance of the timely completion of the laboratory modernization and the relevance of individual project elements to meeting Member States' demands for training, applied research and services. Tailored donor packages included comprehensive information on the remaining elements of the project and their funding requirements. Resource mobilization products were continually updated to account for progress in completing specific project elements, any changes in expected costs and expected resource requirements.

12. Laboratory tours remain invaluable to highlight the important work of the laboratories and played an essential role in fundraising efforts. The Secretariat continues to develop and expand access to online resources, including virtual laboratory tours, as an additional means of highlighting the important work of the laboratories and the need to complete their modernization. Special events organized by the Secretariat provided valuable additional support to resource mobilization efforts. A centrepiece of these events was a donor display on which new contributors to ReNuAL2 were recognized with a plaque. The donor display will be permanently installed in the lobby of the new laboratories building as it is brought into full operation.

B.2.4. Resource Mobilization Efforts with Member States

13. Throughout the ReNuAL initiative, the Secretariat has continually engaged in bilateral discussions with a large number of Member States to support fundraising, resulting in 42 Member States providing financial contributions towards the ReNuAL and ReNuAL+ phases of the initiative, and 38 Member States announcing contributions to the ReNuAL2 phase. A total of 52 Member States have

contributed to one or both phases of the ReNuAL initiative. The Friends of ReNuAL, an informal group open to all Member States and co-chaired by Germany and South Africa, continued to play an important role in resource mobilization. Participants in the group, which meets on a regular basis, have been significant bilateral contributors to the ReNuAL initiative, and the group remains an important vehicle for maintaining and increasing awareness of the importance of laboratory modernization and for generating Member State support for these efforts.

B.2.5. Resource Mobilization Efforts with Non-Traditional Donors

14. The ReNuAL initiative has enjoyed success in securing support from non-traditional donors, particularly during the first phase, aligning the initiative with the guidance in the Agency's 2012–2017 Medium Term Strategy calling on the Agency to "be more innovative in finding and justifying additional sources of funds". Apart from Member States, the project received financial contributions in the ReNuAL2 phase from two private individuals, one international organization and one private sector donor.

C. Next Steps

15. With resource mobilization and construction complete, the focus for the remainder of the project will be on the successful transition of the laboratories and addressing any remaining requirements to bring them into full operation. It is expected that the laboratory transition and the full operation of all new facilities will be completed in 2025, marking the end of the ReNuAL2 project.

Zoonotic Disease Integrated Action (ZODIAC) Project

A. Background

1. In resolution GC(68)/RES/11.A.4., the General Conference took note of the Director General's report as contained in document GC(68)/10, Annex 4.

2. The General Conference recognized that the Agency has a long-standing practice of cooperation with other relevant international organizations and specialized agencies, namely the Food and Agriculture Organization of the United Nations (FAO), the World Organisation for Animal Health (WOAH) and the World Health Organization (WHO), and further recognizing the importance of complementing the respective mandates of such organizations, as well as long-standing protocols that guide cooperation such as the Taking a Multisectoral, One-Health Approach: A Tripartite Guide to Addressing Zoonotic Diseases in Countries (the Tripartite Zoonoses Guide).

3. The General Conference noted that early detection and diagnosis of zoonotic diseases such as, but not limited to, COVID-19 and vector-borne diseases including malaria, yellow fever, chikungunya, and dengue, continue to have significant short- and long-term implications on human health and the socioeconomic development of Member States.

4. The General Conference recognized the importance of nuclear science, technology and applications to detect, trace and control emerging pathogens that could develop into diseases and pandemics, and further recognized the importance of making these technologies available to all Member States.

5. The General Conference noted that ZODIAC could support Member States to enhance their preparedness to diseases through the use of nuclear and nuclearderived methods, including molecular biology, by enhancing their capacity to detect, trace and respond to emerging pathogens that could develop into zoonotic diseases and pandemics.

6. The General Conference welcomed that ZODIAC builds upon existing, relevant Agency nuclear science and technology applications and structures, such as the Veterinary Diagnostic Laboratories (VETLAB) Network, and other delivery mechanisms such as coordinated research projects (CRPs) and the technical cooperation programme under project INT5157, and that they form part of the Agency's support to Member States in combatting zoonotic diseases and preventing future pandemics.

7. The General Conference, in resolution GC(68)/RES/11.A.4, requested the Director General to report on the progress made in the implementation of this resolution to the Board of Governors and to the General Conference at its 69th (2025) regular session.

B. Progress since the 68th Regular Session of the General Conference

8. The Agency actively addressed Member States' needs and priorities in zoonotic diseases through its core programmatic activities. This included implementing initiatives, pursuing adaptive R&D in animal health, coordinating the VETLAB Network, and providing crucial support to Member States via relevant national and regional technical cooperation projects through the ZODIAC National Laboratories.

9. After a steady increase in Member State participation during the first years of ZODIAC, the level of participation has, as expected, stabilized. As of June 2025, 151 Member States had designated a ZODIAC National Coordinator and 129 had designated a ZODIAC National Laboratory (ZNL).

10. Verification of generic Standard Operating Procedures (SOPs) is fundamental to ensuring reliable and comparable diagnostic results for zoonotic pathogens across different laboratories and countries. Standardized SOPs guarantee consistency and accuracy in testing, which is essential for early detection, accurate diagnosis and effective surveillance of zoonotic outbreaks. Two regional training courses were carried out on Generic Verification of Standard Operating Procedures (SOPs) for Serology and Molecular Diagnostic. One course was held in Ethiopia in October 2024 for English-speaking African countries, and another in Mexico in March 2025 for Latin America, with more than 50 participants being trained. These courses complement the face-to-face regional training courses held in other regions.

FIG. B.1. Regional Training Course on Generic Verification of Standard Operating Procedure Addis Ababa, Ethiopia. (Source: IAEA)

11. Whole Genome Sequencing (WGS) is a powerful tool for understanding the genetic composition of zoonotic pathogens. It enables the identification of mutations, tracking the evolution of viruses and bacteria, and determining the source of outbreaks. This detailed information is vital for effective epidemiological investigations and the development of targeted control strategies to combat zoonotic diseases. A group fellowship on WGS Illumina- Bioinformatics was completed in Morocco. This fellowship continues the process of training ZODIAC National Laboratories who received WGS equipment in their use and best practices.

12. Activities complementary to ZODIAC were carried out under regional projects. These play a crucial role in building regional capacity and fostering collaboration in the fight against zoonotic diseases. Training in genomics and bioinformatics equips professionals with the skills to analyse pathogen data, understand disease dynamics, and contribute to effective surveillance and control efforts. A Regional Training course in Genomics and Bioinformatics of animal diseases was held in Chile in October 2024 and a Virtual Training Course on Genomics and Bioinformatics Command Line was also held in October 2024 under the project RLA5085 "Strengthening the Capacity of Official Laboratories for Monitoring and Response to an Outbreak of Priority Animal and Zoonotic Diseases (ARCAL CLXXIV)".

13. Under the CRP entitled "Application of Advanced Molecular Characterization Technologies through the Veterinary Diagnostic Laboratory Network" the development of free-of-charge WGS services continued. Four pipelines covering capripox, avian influenza, brucella and salmonella were developed.

14. Regional meetings are essential for fostering collaboration and coordination among countries in addressing zoonotic disease threats. They provide a platform for stakeholders to discuss the implementation of initiatives such as ZODIAC, share experiences and identify opportunities for joint efforts in surveillance, prevention and response. In November 2024, a Regional Meeting on ZODIAC Implementation in Africa took place in Morocco. It brought together representatives of 34 African ZODIAC National Laboratories (ZNLs). The event reviewed the achievements of ZODIAC in the Africa Region and identified collaborative perspectives to be carried out among ZNLs as well as synergetic cooperation with other initiatives ongoing in Africa under the One Health umbrella.

FIG. B.2. Regional Meeting on ZODIAC Implementation in Africa, Rabat, Morocco. (Source: IAEA)

15. The ZODIAC Discussion Series was launched in March 2025. The Discussion Series facilitates knowledge sharing and collaboration with key international organizations and laboratories involved in animal and human health. Engaging with organizations such as the Food and Agriculture Organization of the United Nations (FAO) and World Organisation for Animal Health (WOAH) ensures a coordinated One Health approach to tackling zoonotic diseases, leveraging their respective expertise and resources. The Discussion Series involves a presentation about relevant topics for zoonotic laboratories followed by a moderated discussion. Three Discussion Series were carried out in the reporting period, Discussion Series #1: ZODIAC Overview and presentation of the series and Discussion Series #2: FAO EMPRES-I and #3 Presentations from WOAH related to coordinating, supporting and promoting animal disease control.

16. Understanding the role of vectors and wildlife in the transmission of zoonotic diseases is critical for implementing targeted surveillance and control measures. Training in the capture, identification and characterization of vectors and potential wildlife reservoirs provides valuable insights and helps in mitigating the risk of spillover events. With the support of regional projects RAS5100 "Strengthening Regional and National Surveillance Capacity and Capability Through Nuclear and Molecular Techniques for Priority Animal and Zoonotic Diseases and Potential Vector-Borne Diseases" and RER5027 "Enhancing Preparedness Capacities of the Veterinary Sector to Confront with Emerging and Re-emerging Diseases of Livestock and Wildlife" the following activities related to vectors and wildlife capture and identification were carried out in the reporting period. In February 2025, a regional training course on the capture, sorting, detection and differentiation of the most important vectors for vector-borne diseases was held in Vietnam. An update of SOPs for the capture, sorting, detection and differentiation of the most important vectors (culicoides, ticks, mosquitos, sandflies) for the Asia Region was completed and teaching videos on the procedure for capturing and sampling of carnivores, small rodents, bats and wild ruminants were produced and disseminated.

17. Adherence to international standards such as ISO 17025 ensures the quality and reliability of laboratory testing for zoonotic pathogens. Training in the maintenance, calibration and biosafety aspects of laboratory equipment is crucial for accurate diagnostics and the safe handling of potentially dangerous biological materials. Under regional projects RAF5089 "Strengthening the Capacities of National Veterinary Laboratories for the Early Warning, Control and Prevention of Outbreaks of Animal and Zoonotic Diseases (AFRA)" and RAS5100 "Strengthening Regional and National Surveillance Capacity and Capability Through Nuclear and Molecular Techniques for Priority Animal and Zoonotic Diseases and Potential Vector-Borne Diseases", two regional training courses were held. A regional training course on maintenance and calibration of veterinary laboratory equipment was held in Eritrea in September 2024, and a regional training course on biosafety cabinets verification and calibration was held in Thailand in October 2024.

18. The significance of syndromic testing lies in its capacity to deliver rapid and comprehensive diagnoses for a range of infections presenting with similar symptoms. By simultaneously screening for multiple pathogens, it accelerates the identification of the causative agent, facilitating timely and targeted treatment, promoting better antimicrobial stewardship and aiding in the rapid management of disease outbreaks. Syndromic testing for abortifacient bacteria has been successfully implemented in Botswana, Nepal and Sri Lanka. Similar approaches for poxviruses, including zoonotic poxviruses, were applied in Tanzania and Tunisia, leading to the detection of bovine popular stomatitis during investigations for lumpy skin disease.

19. Serological assays are vital diagnostic tools that provide insights into an animal's immune status by detecting antibodies or antigens: enzyme-linked immunosorbent assay (ELISA) for wider veterinary laboratory adoption, Luminex-based multiplex assays for the simultaneous detection of antibodies against multiple pathogens, and species-independent serology using luciferase immunoprecipitation systems (LIPS). This capability is crucial for determining past exposure and immunity, diagnosing infections when direct pathogen detection is difficult, monitoring disease progression and treatment response, conducting valuable epidemiological studies and informing the development of vaccine interventions. The Agency developed serological assays to simultaneously detect antibodies against Rift Valley fever virus and capripoxviruses in small ruminants and cattle. A LIPS assay for lyssaviruses was finalized and will be validated and disseminated during training in 2025.

20. The Agency continued its efforts in sequencing, metagenomics and molecular epidemiology. It developed workflows and pipelines for molecular characterization and epidemiology of zoonotic pathogens using next generation and third generation sequencing. As well as this, it supported VETLAB partners and ZODIAC National Laboratories in sequencing and characterizing pathogens, including

H5N1, bovine popular stomatitis virus (BPSV) genomes, camelpox vaccine sequences, vaccinia virus genomes and rabies viruses.

21. The research and development activities resulted in several publications during the reported period. For example: molecular characterization of H7N6 avian influenza in Mozambique (Emerg Microbes Infect, 2024), Syndromic testing of zoonotic bacteria in Botswana (Microorganisms, 2024), Development of Luminex-based assays for Rift Valley fever and capripoxvirus antibodies (Virol J, 2024), Detection and characterization of lumpy skin disease and bovine papular stomatitis viruses in Tanzania (Virol J, 2024) and Posters on Lyssavirus LIPS assay and viral family-based assays presented at the eighth World One Health Congress in Cape Town, South Africa.

22. Leveraging VETLAB Network resources, R&D efforts enabled the training of 21 scientists (including representatives from five ZODIAC National Laboratories and ZODIAC CRP Asia contract holders) in Next Generation Sequencing Bioinformatics and Molecular Phylogeny at the Agency's laboratories in Seibersdorf, Austria in November 2024. In addition, the Agency actively transferred viral family-based assays to Mongolia and Indonesia and next generation sequencing protocols for zoonotic and transboundary animal diseases to Ethiopia through dedicated duty travels.

23. These efforts were further amplified through dedicated side events, including a plenary session at the eighth World One Health Congress in September 2024, which highlighted the role of VETLAB and ZODIAC in controlling transboundary animal and zoonotic diseases via veterinary laboratory networks. In addition, ZODIAC's contribution to enhancing laboratory capacity for zoonotic disease detection and pandemic preparedness was part of a One Health Approach side event co-organized by the Agency, the FAO and Preventing Zoonotic Disease Emergence (PREZODE) during the FAO Global Conference on Animal Health Innovation on 24 September 2024.

24. The Agency continues to develop a prototype to digitalize national veterinary processes. This prototype currently features a module for basic sampling and initial monitoring plans, an ongoing development focus on automating standardized submission letters, integrating test and results management within laboratory systems, and generating comprehensive reports for timely submission to veterinary authorities.

25. The Agency continued to participate and engage in the WHO-led Joint External Evaluations (JEEs) under the One Health framework, leading five evaluations in Bangladesh, East Timor, Maldives and Zanzibar (United Republic of Tanzania) within the reporting period. The WHO also regularly consults the Agency on strategic matters, including enhancing the JEE country assessment process. These JEE engagements continue to raise ZODIAC's profile and ensure its integration within the global pandemic preparedness landscape.

26. Following the declaration of the mpox outbreak as a public health emergency of international concern on 14 August 2024, the Agency collaborated with the WHO to organize an mpox workshop. Subsequently, the Agency has actively participated in WHO-led weekly mpox coordination meetings.

27. At the same time, the Agency has held coordination meetings with WOAH, focused on four main topics: supporting national reference laboratories to become WOAH reference laboratories for priority disease in priority areas, WOAH-approved International Standard Reagents and biobank, proficiency tests and other laboratory capacity building activities, and supporting genomic analysis and consolidating genomic information for specific diseases during outbreaks.

28. The ZODIAC Ad-Hoc Scientific Panel (ZOSP) that was formed to discuss ZODIAC related activities and receive insights and advice from leading experts in the field of zoonotic diseases is planned to meet once a year. The second ZOSP meeting, held virtually on 11 December 2024, had two main goals. First, the Agency updated the ZOSP on the progress of ZODIAC, both technical and financial.

Second, the ZOSP provided strategic, political, policy and technical input regarding the current global zoonotic disease situation and financing landscape. The meeting had broad Agency support and participation. The ZOSP validated the scientific work, emphasizing the need for research and development into novel and robust detection tools amid limited resources and shared their insights on mobilizing resources. Several ideas for resource mobilization were proposed with related support from ZOSP members.

29. The ZODIAC Portal continues to expand its resources. Since September 2024, the Discussion Series and wildlife and vector capture training videos have been added. This portal provides Member States with readily accessible training materials and comprehensive information about the initiative.

30. The availability of extrabudgetary funds to proceed with the implementation of ZODIAC is critical. As of April 2025, the Agency has mobilized a total of €16.8 million from 15 Member States. Out of this amount €16 million have been allocated to the implementing projects. The implementation of ZODIAC will continue as planned and as extrabudgetary contributions become available.

31. During the reporting period, the CRP entitled “The ZODIAC Respiratory Disease Phenotype Observatory: an IAEA International Cooperative Study for Early Detection of New Pandemics (The IAEA CT Artificial Intelligence-Cooperative Study-ICAI Project)” finalized its clinical protocol, established a project governance structure, developed guidelines on anonymization and conducted training sessions on uploading data for participating institutions. The setting up of the repository’s platform was completed in the first quarter of 2025. Following the completion of the pilot phase and the incorporation of feedback, full-scale implementation commenced with large scale data collection across all participating institutions, which will continue throughout 2025.

Nuclear Power Applications

Introduction

A. Background

1. In resolution GC(68)/RES/11.B.1, the General Conference affirmed the importance of the role of the Agency in facilitating the development and use of nuclear energy for peaceful purposes, in fostering international cooperation among interested Member States, and in disseminating well-balanced information on nuclear energy to the public.

2. The General Conference requested the Director General to keep Member States informed on the progress of the implementation of the IAEA Marie Skłodowska-Curie Fellowship Programme (MSCFP) and the Lise Meitner Programme (LMP).

3. The General Conference encouraged the Agency to continue its support to interested Member States in building their national capacities in the operation of nuclear power plants (NPPs) and their nuclear power infrastructure when embarking on new nuclear power programmes. It encouraged the Secretariat to support initiatives in the areas of knowledge management, including capacity building activities and the development of e-learning materials, and to facilitate participation in regional Nuclear Energy Management (NEM) Schools for qualified professionals and students, in particular those from developing countries through regional funding or cooperation mechanisms. It also encouraged the Agency to maintain and strengthen the assistance and peer review and advisory services provided to Member States embarking on a nuclear power programme or expanding such programmes, including the coordination and integration of such services.

4. The General Conference encouraged Member States that are considering developing nuclear power to voluntarily use the support provided by the Agency to Member States on energy planning and assessment of energy systems in relation to environmental, climate and economic factors, and requested the Agency to continue its services to help interested Member States in this regard.

5. The General Conference commended the Agency’s efforts in providing comprehensive information on nuclear energy’s potential as a low carbon energy source and its potential to contribute to mitigating climate change, during the 28th session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP28) held in Dubai, United Arab Emirates in 2023, and noted with appreciation that the Agency had a dedicated pavilion. The General Conference encouraged the Secretariat to continue these efforts at COP29 to be held in Baku from 11 to 22 November 2024.

6. The General Conference encouraged the Secretariat to support interested Member States in transitioning to net zero, including through projects on the introduction of nuclear energy, and addressing energy security and transition to sustainable energy systems, and called upon the Secretariat to continue developing its Atoms4NetZero activities with interested Member States and to continue promoting tools for the development of national energy system analysis in full conformity with the national laws and regulations of Member States.

7. The General Conference encouraged the Secretariat to continue to enhance interested Member States' understanding of funding requirements for nuclear power infrastructure and potential approaches to financing nuclear power programmes, including management of radioactive waste and spent fuel, and encouraged interested Member States to work with the relevant financial institutions towards addressing financial issues related to the introduction of enhanced safety design and technologies for nuclear power.

8. The General Conference also encouraged the Secretariat to analyse the technical and economic cost drivers for economic sustainability of nuclear power operation, especially with regard to decisions of Member States concerning the long term operation of NPPs, to determine the value of nuclear power in the energy mix considering environmental conditions and, inter alia, climate objectives.

9. The General Conference encouraged the Secretariat's efforts to streamline, harmonize and improve peer review and advisory services based on Member States' needs, including through the Advisory and Peer Review Services Committee (APReSC).

B. Progress Since the 68th Regular Session of the General Conference

10. The Agency's International Conference on Small Modular Reactors and their Applications, held in Vienna in October 2024, brought together more than 1200 participants (a further 1100 attended virtually) from 97 Member States and 18 international organizations. It featured 44 technical sessions, 5 topical plenaries, 5 side events and 6 poster sessions, providing an international forum to take stock of progress and discuss opportunities, challenges and enabling conditions for the accelerated, safe and secure development and deployment of small modular reactors (SMRs). An Industry Night event was held for public and private SMR developers to present their designs and discuss innovative deployment strategies.

FIG. B.1. The International Conference on Small Modular Reactors (SMR) held at the IAEA headquarters in Vienna, Austria. A session with the participation of Hon. Collins Adomako-Mensah, Ghana Deputy Minister of Energy and Maria Korsnick, United States of America President and Chief Executive Officer, Nuclear Energy Institute as keynote speakers. (Source: IAEA)

11. In September 2024, the Agency launched a fully redesigned Advanced Reactors Information System (ARIS) database — a web-accessible platform that provides Member States with balanced, comprehensive and up-to-date information on advanced NPP designs and concepts. ARIS covers a diverse spectrum of technologies: water cooled reactors, gas cooled reactors, fast reactors, molten salt reactors, small modular reactors and microreactors, and provides standardized, impartial data to support informed assessments of both evolutionary and innovative reactor technologies at every stage of nuclear power development.

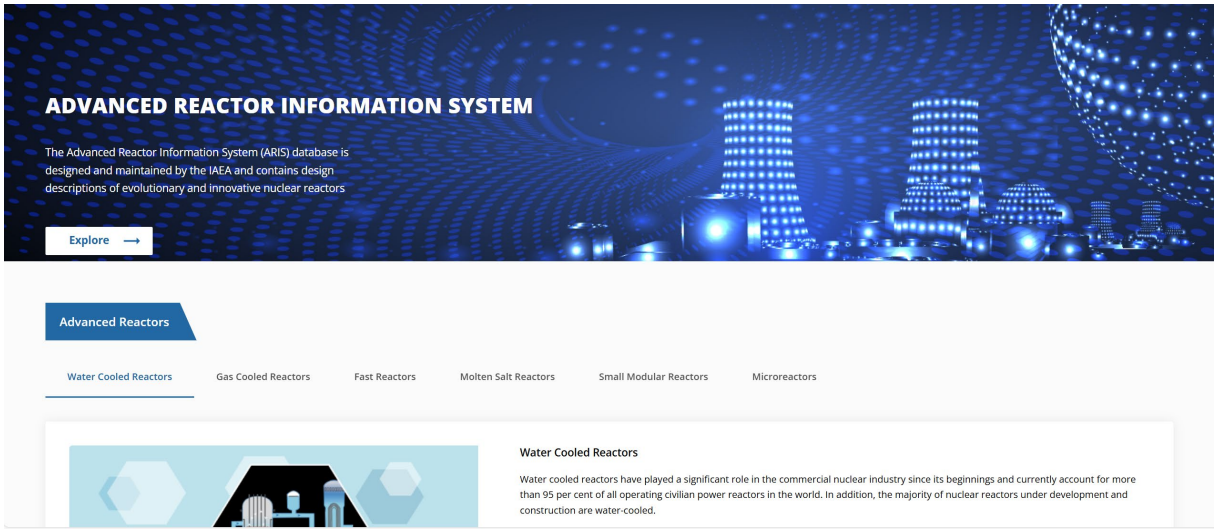


FIG. B.2. The Advanced Reactor Information System (ARIS) database contains design descriptions of evolutionary and innovative nuclear reactors. (Source: IAEA)

12. The Agency continued to maintain and strengthen its assistance and peer review and advisory services to Member States embarking on or expanding a nuclear power programme through Integrated Nuclear Infrastructure Review (INIR) missions to assess the status of nuclear power infrastructure development. An INIR Phase 2 mission to Poland in April 2024 and an INIR Phase 1 follow-up mission to the Philippines in December 2024 were conducted upon Member States' requests. Sri Lanka officially requested an INIR Phase 1 follow-up mission in October 2024, which will be implemented in July 2025; Viet Nam requested a Phase 2 INIR mission in February 2025 and Rwanda requested a Phase 1 INIR mission in February 2025. These requests are in addition to the missions already requested by Bangladesh (a Phase 3 INIR mission), Türkiye (a Phase 3 INIR mission) and Zambia (a Phase 1 INIR Mission), which are planned for 2026–2027.

13. The coordination and sequencing of Agency services and assistance for Member States embarking on a nuclear power programme, or expanding such programmes, is typically addressed in Integrated Work Plan (IWP) and Midterm IWP meetings between the Member States and Agency cross-departmental core teams. Since the last General Conference, IWP or midterm IWP meetings were conducted with Bangladesh, Egypt, Estonia, Kazakhstan, Poland, Saudi Arabia, Türkiye and Uzbekistan.

14. In support of embarking countries, the Agency developed a new IAEA Management Systems Advisory Service to Support the Introduction of Nuclear Power (IMSAS). This service supports the self-assessment and review of the management systems in the owner/operator organizations and regulatory bodies during Phases 2 and 3 of the Agency's Milestones Approach. A pilot IMSAS mission was conducted to the Duwayhin Nuclear Energy Company (DNEC) in the Kingdom of Saudi Arabia in May 2025. The IMSAS mission concluded that DNEC has a well-developed management system that effectively supports the organization in carrying out its current and future activities.

15. The Agency participated actively at the COP29 held in Baku in November 2024. As in COP27 and COP28, the Agency hosted the Atoms4Climate pavilion dedicated to the contribution of nuclear power and technologies to climate change mitigation and adaptation. Agency staff were on hand to share information and answer questions about the many ways that nuclear energy, science and technologies can help tackle the challenges of climate change. Over 30 events were organized at the pavilions of Member States and other international organizations, focusing on the financing of nuclear power and more clean energy solutions, small modular reactors, low carbon hydrogen, climate resilience and more.

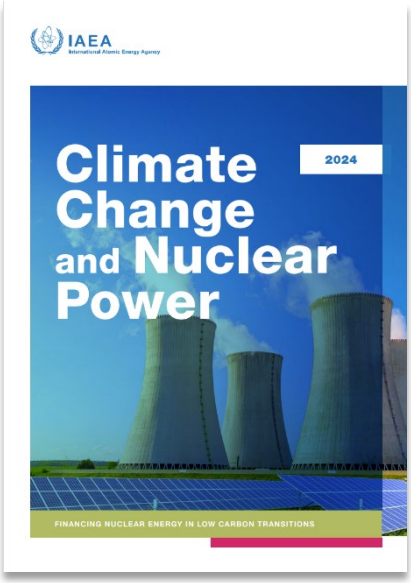
FIG. B.3. IAEA Director General Rafael Mariano Grossi at the United Nations Climate Change Conference UNCCC COP29 in Baku, Azerbaijan, 12 November 2024. (Source: IAEA)

16. After a Technical Meeting on Modelling Net Zero Transition Scenarios held in June 2023 and a Workshop on Modelling the Contribution of Nuclear Power to Net Zero Transitions held in July 2024, the Agency continued to provide assistance to interested Member States in transitioning to net zero. In July 2025, the Agency will conduct a Technical Meeting on Modelling the Contribution of Nuclear Power to Clean and Secure Transitions. This meeting will help share best practices and guidelines for Member States to model the role of nuclear in their future energy mix.

17. As part of the process to assess the value of nuclear power, the Agency continued to support its Member States by providing capacity building in energy planning and helping national experts evaluate the contribution of nuclear power to the countries' sustainable development and climate objectives. At the 68th regular session of the General Conference, the Agency organized a side event entitled "Powering the future through Atoms4NetZero", with contributions from Argentina, China, Estonia, Ghana, Indonesia, Kenya, Nigeria, Tunisia and the UK.

18. Specific collaborations under the Atoms4NetZero framework were developed with Azerbaijan (Ministry of Energy), China (CINIS) and Estonia (University of Tartu) to provide capacity building in energy planning and energy system modelling. China and Estonia used the Agency's Model for Energy Supply Strategy Alternatives and their General Environmental Impacts (MESSAGE) tool to develop models for the countries' energy system. China assessed the role of nuclear power using small modular reactors and large reactors to model electricity supply, while Estonia focused on SMRs for both electricity and heat supply. A study on the potential role of nuclear power in Italy started in April 2025, using the Agency's energy system modelling tools.

19. The Agency continued to analyse the technical and economic cost drivers for economic sustainability of nuclear power operation. In October 2024, it released Climate Change and Nuclear Power 2024: Financing Nuclear Energy in Low Carbon Transitions at the Clean Energy Ministerial Conference in Foz do Iguaçu, Brazil. The report analyses the different cost drivers and metrics, including system costs, to assess the value of nuclear power in decarbonized energy systems, and reviews current and new approaches to financing nuclear power projects, including for SMR projects and for projects in Emerging Markets and Developing Economies.



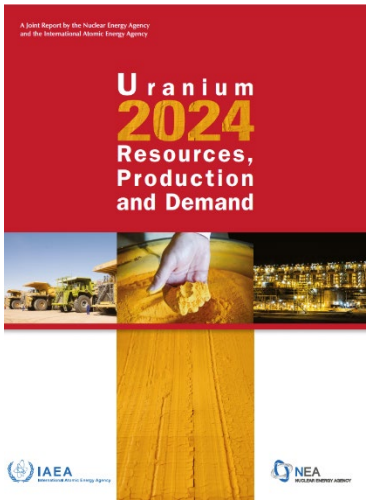
20. Integrated energy systems modelling using the Agency's energy planning tools such as MESSAGE, can help assess the value of a technology to meet climate and development objectives. For instance, modelling scenarios with or without nuclear power can help evaluate the overall cost of an energy transition, taking into account the cost of the technologies that are deployed, but also the necessary grid, storage and backup technologies needed to ensure a reliable and resilient supply of energy.

21. The Agency organized several Dialogue Forums in Vienna: the 23rd INPRO Dialogue Forum on Nuclear Energy Innovations to Support Net-Zero Transition in October 2024 and the 24th INPRO Dialogue Forum on the Sustainable Deployment of Floating Nuclear Power Plants for Transitioning to Net Zero in May 2025. The meetings were attended by 53 participants from 34 Member States and 64 participants from 26 Member States, respectively.

FIG. B.4. Opening of INPRO Dialogue Forum-24, Vienna, Austria. (Source: IAEA)

22. The International Conference on Research Reactors: Achievements, Experience and the Way to a Sustainable Future, held in Vienna in November 2024, discussed a wide range of topics, including research reactor utilization and applications, operation, maintenance and ageing management, fuel cycle issues, safety and security, new research reactor projects and common management considerations.

FIG. B.5. Opening of the International Conference on Research Reactors: Achievements, Experience and the Way to a Sustainable Future in Vienna, Austria on 11 November 2024. (Source: IAEA)



23. In April 2025, the Agency co-published with the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD/NEA) the 30th edition of Uranium 2024: Resources, Production and Demand (Red Book 2024), marking the 60th anniversary of its establishment as a recognized global reference on uranium. The publication provides analyses and insights from 62 uranium-producing and consuming countries — some participating for the first time.

24. In November 2024, the Agency published *World Distribution of Uranium Deposits*, Third Edition, which presents new information, such as additional deposits, a broader range of deposit sizes, a revised deposit classification system and improved geological visualization information.

25. In May 2025, the inaugural joint session of the Technical Working Group on Radioactive Waste Management and Technologies (TWG-WATEC) and the Technical Working Group on Decommissioning and Environmental Remediation (TWG-D&ER) was held in Vienna. This session aimed to strengthen the interface between radioactive waste management and decommissioning activities. Participants highlighted key cross-cutting issues in radioactive waste management, decommissioning and environmental remediation, underscoring the need for better communication among experts in these fields.

26. The Secretariat continued its efforts to streamline, harmonize and improve peer review and advisory services based on Member States' needs. During the reporting period, the APReSC held two meetings where it endorsed the creation of the Advisory Service for Establishing and Reviewing

Management Systems to Support New Nuclear Power Programmes, discussed common criteria for establishing new schools by the Agency's Department of Nuclear Energy, and reviewed the implementation of key performance indicators (KPIs) related to the Agency's Department of Nuclear Energy peer review and advisory services.

27. In November 2024, the Agency organized a Technical Meeting on Capitalizing on Artificial Intelligence Analysis to Accelerate the Technological Development of Evolutionary and Innovative Reactor Designs. The meeting explored how AI-driven simulations, advanced data analytics and virtual prototyping can streamline the development life cycle of advanced reactor concepts, highlighting the potential uses of artificial intelligence (AI) in support of nuclear science, technology and applications.

28. The Agency also continues to operate the IAEA Collaborating Centre on AI for Nuclear Power, driving programmatic activities to advance and validate AI applications, and delivering specialized training and educational courses.

29. In March 2025, the Agency convened the Joint IAEA–ICTP Workshop on Artificial Intelligence and Machine Learning in Advancing Nuclear Engineering and Technology in Trieste, Italy, offering in-depth insights into AI applications for advanced reactor design, operation and maintenance, process control and decision-support systems. It was attended by 45 participants from 28 Member States.

FIG. B.6. Lecture on AI and ML Methods and Techniques during the Joint IAEA–ICTP Workshop on Artificial Intelligence and Machine Learning in Advancing Nuclear Engineering and Technology, Trieste, Italy. (Source: IAEA)

30. Under the auspices of the International Network on Innovation to Support Operating Nuclear Power Plants (ISOP), the Agency supported a pilot multilateral regulatory sandboxing exercise, referred to as a RegLab, which took place on the margins of the fifth International Conference on Disruptive,

Innovative and Emerging Technologies (DIET), organized in October 2024 by the Canadian Nuclear Society in cooperation with the Agency. DIET welcomed over 200 participants from 8 countries and 3 international organizations. The Agency's role was to work with representatives of the nuclear power industrial sector to develop hypothetical use cases on artificial intelligence, which were fed into a RegLab workshop involving regulators from Canada, the UK and the USA, and industry representatives from Canada, Germany, the UK and the USA who had also contributed to the development of use cases. The RegLab workshop explored the challenges and issues linked to deploying the use cases and developed recommendations for both regulators and industry. Based on the success of the pilot, an international joint project, hosted by the OECD/NEA, was launched in March 2025. The regulators from the three original countries, plus France, Japan, the Republic of Korea, Spain and the United Arab Emirates, joined the joint project, and the Agency, again under the auspices of the ISOP Network, was formally invited by the members to support the project — in partnership with the Electric Power Research Institute (EPRI) — by coordinating nuclear industrial sector participation and the development of hypothetical use cases from problem/opportunity statements developed by the joint project members. The joint project plans to implement four RegLab workshops between 2025 and 2027.

31. The ISOP Network launched an international innovation awards programme that gathered 39 use cases of innovative solutions deployment at operating NPPs. Awards were presented to winning submissions during the 68th IAEA General Conference in September 2024. The use cases remain available on the ISOP site within the IAEA Connect platform. They have been used to develop an Innovation in Action webinar series. The first webinar was organized in March 2025 on robotics and other innovations, and welcomed over 175 viewers from more than 50 countries. The second was organized in May 2025 on artificial intelligence, machine learning and large language models with 254 viewers from 42 countries. A final Innovation in Action webinar on advanced manufacturing was implemented at the end of June and welcomed 83 viewers from 26 countries.

32. In June 2025, the ISOP Robotics and Drones working group implemented a Workshop on Robotic and Drone Applications at Operating Nuclear Power Plants in partnership with the Electric Power Research Institute and Axpo in Leibstadt, Switzerland. Over 120 participants from 26 Member States and 2 International Organizations gathered for a practical workshop on the use of robots, drones and other uncrewed/remote technologies at operating NPPs.

33. Publication *Considerations for Deploying Artificial Intelligence Applications in the Nuclear Power Industry*, facilitated by the ISOP Network, is publicly available via the Agency's preprint repository. It provides considerations when deploying AI applications in NPPs; presents the latest information, up-to-date best practices, experiences, benefits and challenges related to AI in the life cycle of NPPs; and cybersecurity.

34. In June 2024, the Agency organized a Technical Meeting on Innovative Solutions to Address Technical Issues in the Long Term Operation of Nuclear Power Plants in Vienna with 44 participants from 20 countries attending the meeting. The participants discussed practical cases of applying innovative approaches, including advanced manufacturing, materials development, digitalization, advanced sensor technology, artificial intelligence, and the application of robots and drones, to address issues in long term operation in NPPs. The possible innovative solutions for various challenges in LTO were also explored.

35. With regard to nuclear data, the Agency has been awarded the J. Robert Oppenheimer coin by the Director of Los Alamos National Laboratory. This rarely awarded coin represents the highest accomplishment in scientific excellence and technical leadership. The accompanying letter emphasizes the importance of the Agency's work on nuclear theory, simulation and nuclear data to applied nuclear science.

36. A Technical Meeting on Nuclear Data Retrieval, Dissemination and Data Portals was held in Vienna in November 2024, which evaluated and assessed the capabilities of existing tools within various nuclear data retrieval systems, including application programming interfaces and data format conversion tools. The impact of this meeting is visible in the various modernized nuclear databases now available at the Agency, which are ready for use in AI applications.

37. With regard to the IAEA Marie Skłodowska-Curie Fellowship Programme (MSCFP), the fifth application period concluded on 30 September 2024, resulting in the selection of 200 MSCFP students from 108 Member States studying in 47 countries. A total of 760 students from 129 Member States, studying in 76 countries, have been selected since the programme's inception in 2020.

38. As of May 2025, 358 students had completed their master's programmes with support from the MSCFP. Of these graduates, 200 have been confirmed for an internship at the Agency's departments/laboratories (in Seibersdorf and Monaco) and at external organizations, including IAEA Collaborating Centres and other public or private sector partners in various countries. Over 40 external host organizations have received MSCFP interns. The internships are linked to students' areas of specialization in diverse fields, including nuclear energy, nuclear science and applications, nuclear non-proliferation, nuclear safety and security, and nuclear law. As of May 2025, the MSCFP had received cash contributions of €15.8 million as well as in-kind contributions sponsoring 110 students. Donors include the European Union, 24 Member States, 2 Member State institutions, industry and 2 academic institutions. The next MSCFP application period will open in mid-July 2025 and close on 30 September 2025.

39. During the reporting period, an additional three Lise Meitner visiting professional programmes were hosted. The first programme for this period took place in Argentina and was hosted by the country's National Atomic Energy Commission from 5 to 16 May 2025. This LMP visit provided insights into Argentina's nuclear power programme, including the design, operation and safety of research reactors, pressurized heavy water reactors and small modular reactors. Participants gained insights into NPP projects such as the refurbishment of the Embalse and Atucha I NPPs and the CAREM SMR project. The programme provided an opportunity for international collaboration, knowledge exchange and networking, from a comprehensive and inclusive perspective which also considers strategic and programmatic aspects. It presented a broad overview of Argentina's contributions in the nuclear sector, while also enhancing participants' leadership and management skills, essential for tackling complex nuclear projects.

FIG. B.7. Participants of the Lise Meitner visiting professional programme in Argentina in a group discussion in May 2025. (Source: IAEA)

40. The second visiting professional programme for this period took place in Japan in June 2025 and was hosted by the University of Tokyo and the Japan Atomic Energy Agency, under the coordination of the Cabinet Office of Japan. The focus of the programme was on advanced nuclear technology and Fukushima recovery efforts. Participants familiarized themselves with Japan's advancements in nuclear technology, from innovative reactor designs and safety measures to environmental management strategies, with expertise drawn from the University of Tokyo and the Japan Atomic Energy Agency, under the overall coordination of the Cabinet Office of Japan. The programme combined enhancement of technical expertise, facility tours and management/leadership development, preparing participants for leadership positions in the nuclear sector.

41. The third visiting professional programme will take place in Canada in July 2025 and will be hosted by McMaster University and Canadian Nuclear Laboratories. This LMP visiting professional programme will offer the opportunity to gain hands-on experience and deep technical knowledge about research reactors, with a particular focus on the cutting-edge facilities at McMaster University and the Canadian Nuclear Laboratories. Beyond reactor operation, safety and security considerations, and innovation, participants will also enhance their leadership and management skills, preparing them for key roles in the nuclear industry.

IAEA Communication, Cooperation with Other Agencies and Stakeholder Involvement

A. Background

1. In resolution GC(68)/RES/11.B.2, the General Conference welcomed the efforts of the Secretariat to involve interested Member States in the preparation of Nuclear Energy Series publications, including through the Member States' external review process, and the sharing of information on drafts under preparation, and encouraged the Secretariat to continue consolidating the drafting and review process of Nuclear Energy Series publications and to report to the Member States on this matter.

2. The General Conference welcomed the development of the IAEA website in all official languages of the UN and encouraged the Secretariat to further develop the translation of IAEA documents and organization of activities in all UN official languages.

3. The General Resolution also encouraged the Agency to seek efficiencies in the development and management of digital information systems, to ensure and improve long term accessibility and public access to these tools and databases, as relevant, and to anticipate the needs to update and maintain these tools in the long term.

4. The General Conference encouraged the strengthening of mutual cooperation between Member States by exchanging information on relevant experiences and good practices with respect to nuclear power programmes, through international organizations such as the IAEA, OECD Nuclear Energy Agency (NEA), the International Framework for Nuclear Energy Cooperation (IFNEC), the World Nuclear Association (WNA) and the World Association of Nuclear Operators (WANO).

5. The General Conference encouraged the Secretariat to work further with the OECD/NEA, in particular, on capacity building issues and in the preparation of key IAEA publications such as the Status and Trends in Spent Fuel and Radioactive Waste Management and the next edition of the 'Red Book' on Uranium: Resources, Production and Demand.

6. The General Conference recommended that the Secretariat continue to explore opportunities for synergy between the Agency's activities (including the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO)) and those pursued under other international initiatives in areas relating to international cooperation in peaceful uses of nuclear energy, safety, proliferation resistance and security issues and, in particular, support collaboration among the IAEA, including INPRO, the Generation IV International Forum (GIF), IFNEC, the Sustainable Nuclear Energy Technology Platform (SNETP) and ITER with regard to innovative and advanced nuclear energy systems.

7. The General Conference encouraged the Secretariat to continuously assist interested Member States in enhancing public awareness and understanding of peaceful uses of nuclear energy, as well as in building their stakeholder engagement capacity, including through the NESECC, and by publishing relevant reports as well as by organizing schools on stakeholder engagement, conferences, technical meetings and workshops, among other mechanisms.

B. Progress Since the 68th Regular Session of the General Conference

8. The Agency continued to support interested Member States embarking on new nuclear power programmes in building their national nuclear infrastructure through early awareness-building and guidance, including the organization of relevant Technical Meetings, capacity building workshops and training courses as well as providing integrated support through the Integrated Work Plan process.

9. In May 2025, the Agency conducted a joint webinar with the Generation IV International Forum on Advanced Nuclear Technologies for Maritime Applications, which provided a comprehensive overview of the current status and future prospects of advanced nuclear reactor technologies in the maritime sector and was attended by 264 participants from 23 Member States.

10. The Agency and WANO continued cooperating through the New Unit Assistance Working Group interface meetings organized on a regular basis to build synergy and optimize Agency services to ensure maximum added value to the Member States during commissioning and subsequent operations. The Agency participated in the WANO event on Fundamentals of Operational Excellence at NPPs and, in October 2024, the Agency delivered a presentation on its activities on operational excellence.

11. The Agency and the Association of Southeast Asian Nations (ASEAN) continued cooperating through the Nuclear Energy Cooperation Subsector Network (NEC-SSN), sharing information on nuclear infrastructure and on Agency support tools.

12. The Agency and the African Commission on Nuclear Energy (AFCONE) continued their cooperation in the areas of nuclear power infrastructure development, nuclear safety and security, and nuclear applications under the Memorandum of Understanding (MoU) signed in September 2022. A midterm action plan in the framework of the MoU was issued for the period 2024–2025 to guide the implementation of activities under this framework, with a focus on supporting capacity building across the continent.

13. The Agency and the Arab Atomic Energy Agency (AAEA) continued cooperating in the areas of nuclear power infrastructure development, nuclear safety and security, and nuclear applications through the MoU between the Agency and the AAEA, signed in June 2022. In January 2025, six Member States of the AAEA participated in the Interregional Training Course on Understanding the Physics and Technology of Small Modular Reactors (iPWR design). The course, held in Tunis, used the Agency’s educational simulator.

FIG. B.1. Interregional Training Course on Understanding the Physics and Technology of SMRs using the IAEA's educational simulator, held in Tunis, Tunisia, 20–23 January 2025. (Source: AAEA)

14. The International Conference on the Nuclear Fuel Cycle (GLOBAL 2024), organized in cooperation with the Agency, was held in Tokyo in October 2024 and focused on nuclear power development worldwide and on issues relating to both innovative reactor technologies and associated fuel cycles deployment. It was attended by more than 500 participants from more than 30 countries.

15. The Agency maintained strong collaborative relationships with the European Commission's Joint Research Centre (EC-JRC), the Nuclear Energy Agency of the Organisation for Economic Co-operation and Development (OECD-NEA), and WANO in the areas of decommissioning and environmental remediation. Both the EC-JRC and WANO regularly participate as observers in the annual meetings of the TWG-D&ER, with the latest meeting held in May 2025. In addition, the Agency takes part in the joint annual meetings of the OECD-NEA's Radioactive Waste Management Committee (RWMC) and the Committee on Decommissioning of Nuclear Installations and Legacy Management (CDLM) to facilitate effective information exchange and coordination of ongoing activities.

16. The Agency attended, as an observer, the 22nd annual meeting of the OECD-NEA Working Party on Scientific Issues and Uncertainty Analysis of Reactor Systems (WPRS), held in Paris, France, in February 2025, contributing to discussions on computational analysis for advanced reactor design and operation, and on the application of AI in nuclear technology.

17. The Agency continued working with the OECD/NEA, the EC and relevant counterparts to launch the new (fourth) cycle of the Status and Trends in Spent Fuel and Radioactive Waste Management project. The steering group meeting, held in June, recommended to place greater emphasis on explaining the "why" behind national approaches and to revise the report structure to clearly inform on Status, trends, achievements, challenges and lessons learned in this trusted, factual reference informing all Member States and diverse audiences.

18. In February 2025, the Agency hosted the 60th Meeting of the Joint OECD/NEA–IAEA Uranium Group, attended by 64 participants from 39 Member States and 3 international organizations, who reviewed the draft edition of the Red Book 2024, coordinated the preparation of the 2026 edition, and reviewed the country report survey form.

19. The Agency continued to explore opportunities for synergy between the Agency's activities, including the International Project on Innovative Nuclear Reactors and Fuel Cycles (INPRO), and those pursued under other international initiatives in areas relating to international cooperation in peaceful uses of nuclear energy, safety, proliferation resistance and security issues. The Agency coordinated a siting study and fostered synergies between INPRO and GIF through the Proliferation Resistance and Physical Protection Working Group (PRPPWG), focusing on 3S by design (safety, security, safeguards). The Agency attended a PRPPWG meeting in Ispra, Italy from 18 to 20 February 2025, which supported coordination and synergies in the efforts of the PRPPWG and INPRO. GIF PRPPWG is supporting the planning of the upcoming Technical Meeting on Proliferation Resistance of Fast Reactors and Associated Fuel Cycles, to be held in August 2025.

20. The Agency continued to assist interested Member States in enhancing public awareness and understanding of peaceful uses of nuclear energy. The Technical Meeting on Strengthening Local Stakeholder Engagement, held in October 2024, provided a good opportunity to share the latest developments and achievements related to the local stakeholder engagement activities at the Agency as well as to promote dialogue among representatives of municipalities with nuclear facilities, raise awareness, and share experiences on topics relevant to local stakeholders. The meeting was attended by 123 participants from 56 Member States.

21. In October 2024, the Agency conducted a pre-mission to Malaysia for the Stakeholder Engagement Advisory Service for Nuclear Power Programmes. As a result of the mission, the Malaysian counterpart is now better prepared for such a mission and is expecting to submit a request for the Stakeholder Engagement Advisory Service for Nuclear Power Programmes.

22. In November 2024, it piloted the Nuclear Stakeholder Engagement School, hosted by the Abdus Salam International Centre for Theoretical Physics in Trieste, Italy. The school brought together 26 participants from 18 countries and provided an overview of theory and practice in this field.

FIG. B.2. Participants working on a group project during the IAEA Nuclear Stakeholder Engagement School, hosted by the Abdus Salam International Centre for Theoretical Physics in Trieste, Italy in November 2024. (Source: IAEA)

23. In response to growing interest by Member States in public information centres as a tool for communication on nuclear power, the Agency organized an Interregional Training Course on Nuclear Communication and Public Information Centres, which was hosted by the Government of South Africa in December 2024.4 It was attended by 20 participants from 11 countries and, through a series of lectures and interactive sessions, presented creative and effective approaches to designing, implementing and operating public information centres.

FIG. B.3. During the IAEA Interregional Training Course on Nuclear Communication and Public Information Centres, hosted by the Government of South Africa in December 2024, participants had an opportunity to experience a virtual tour of nuclear power plants. (Source: IAEA)

24. At the request of the Ugandan Ministry of Energy and Mineral Development, the Agency reviewed Uganda's Energy Stakeholder Engagement and Communication Strategy and presented good practices in this field at a workshop held in April 2025 and attended by 25 participants. Also in April 2025, the Agency organized a Workshop on Stakeholder Engagement for a Nuclear Power Programme for Phase 3, requested by the Ministry of Energy of the Kingdom of Saudi Arabia and hosted by the King Abdullah City for Atomic and Renewable Energy. The workshop gathered 30 participants from various institutions involved in the development of nuclear power programmes.

FIG. B.4. Participants discuss prioritization of stakeholders during the IAEA Workshop on Stakeholder Engagement for a Nuclear Power Programme for Phase 3, requested by the Ministry of Energy of the Kingdom of Saudi Arabia and hosted by the King Abdullah City for Atomic and Renewable Energy in April 2025. (Source: IAEA)

25. In May 2025, the Agency held its first International Conference on Stakeholder Engagement for Nuclear Power Programmes, gathering 450 in-person and 450 online participants from 81 countries, representing engagement practitioners, communication experts, policy makers, government officials, regulators, owner/operators, waste management organizations, industry and others. The Conference provided a global platform to exchange good practices, experiences, challenges and lessons learned related to stakeholder engagement for nuclear power programmes. It also helped enhance global understanding of diverse perspectives, concerns, and interests of stakeholders involved in nuclear power programmes at various levels.

FIG. B.5. Dialogue between IAEA Director General Rafael Mariano Grossi and Robert Stone, Director of the documentary film Pandora's Promise, at the opening session of the International Conference on Stakeholder Engagement for Nuclear Power Programmes, held in Vienna, Austria on 26-30 May 2025. (Source: IAEA)

26. The Conference also featured a half-day event dedicated to communities hosting nuclear facilities entitled Nuclear Communities and Mayors in Focus, which welcomed 71 mayors and a dozen other community representatives from 24 countries and also produced a Mayors' joint statement. The event provided a unique platform for open dialogue and the exchange of ideas among municipal leaders from around the world. Mayors and communities' representatives had the opportunity to deliver statements related to their experience as well as the benefits and challenges of hosting nuclear facilities.

FIG. B.6. The IAEA International Conference on Stakeholder Engagement for Nuclear Power Programmes, held in May 2025 in Vienna, Austria, featured an event entitled Nuclear Communities and Mayors in Focus, which welcomed 71 mayors and a dozen other community representatives from 24 countries. (Source: IAEA)

27. Also in May, the Agency hosted a delegation of 35 senior officials, local governors and policy makers from Kenya, requested by Kenya's Nuclear Power and Energy Agency, to raise awareness regarding the commitments and infrastructure required for a nuclear power programme. The comprehensive programme included presentations on nuclear infrastructure issues by Agency staff as well as a visit to Paks NPP in Hungary and a discussion with the local community, and visits to Seibersdorf and the Incident and Emergency Centre.

FIG. B.7. A high-level delegation from Kenya visited Hungary's Paks Nuclear Power Plant and Maintenance and Training Centre (seen here) and met with senior officials who offered insights into the social, economic and environmental aspects of hosting a nuclear power plant. (Source: Paks NPP)

28. The Agency organized an Interregional Training Course on Effective Stakeholder Engagement for New Nuclear Power Programmes, hosted by the Government of the Russian Federation in Saint Petersburg in June 2025. The event provided 20 participants from 18 countries with the knowledge and tools required to effectively engage and communicate with key stakeholders, including governmental authorities, local communities, environmental organizations, the general public and others.

FIG. B.8. Stakeholder mapping activity at the Interregional Training Course on Effective Stakeholder Engagement for New Nuclear Power Programmes, organized through the IAEA Technical Cooperation Programme, in Saint Petersburg in June 2025. (Source: IAEA)

Nuclear fuel cycle and waste management

A. Background

1. In resolution GC(68)/RES/11.B.3, the General Conference recognized the importance of assisting Member States interested in uranium production to improve and maintain safe and sustainable activities through appropriate technology, infrastructure and stakeholder engagement, including indigenous engagement where Member States deem it appropriate, and the development of skilled human resources.

2. The General Conference encouraged the Secretariat to assist interested Member States in analysing the technical challenges that may hinder the sustainable operation of nuclear fuel cycle facilities, such as ageing management issues, and encouraged the Secretariat and interested Member States to further improve the understanding of the behaviour of current and advanced nuclear fuel through testing and modelling; and analyse the potential technical challenges that may affect the transportability of spent fuel after long storage. The General Conference also encouraged the Secretariat to keep Member States informed of the status of the LEU Bank.

3. The General Conference requested the Secretariat to continue and strengthen its efforts relating to nuclear fuel, the fuel cycle, spent fuel and radioactive waste management, as well as decommissioning, including through coordinated research projects (CRP), and to assist Member States to develop and implement adequate programmes, in accordance with relevant safety standards and security guidance.

4. The General Conference encouraged the Secretariat to promote information sharing to better integrate approaches to the back end of the fuel cycle that impact processing, transport, storage, recycling of spent fuel and radioactive waste management.

5. The General Conference encouraged the Secretariat's continued effort in assisting Member States, including those embarking on nuclear power programmes, to develop and implement adequate disposal programmes, in accordance with relevant safety standards and security guidance.

6. The General Conference encouraged further strengthening of Agency safety standards as well as strong cooperation with international and regional organizations, such as through the Spent Fuel and Radioactive Waste Information System (SRIS) and the joint reporting tool Spent Fuel and Radioactive Waste Information Tool (SWIFT).

7. The General Conference requested the Agency to formulate guidance documents on decommissioning and action plans to support decommissioning, with a view to promoting the safe, secure, efficient and sustainable execution of these activities, and to facilitate the systematic review of these guidance documents based on recent developments.

8. The General Conference requested the Secretariat, in close consultations with Member States, to continue its activities on the 'Global status of decommissioning of nuclear installations' by identifying and disseminating good practices and lessons learned among all Member States and encouraged the Secretariat to formulate recommendations on practical enablers of end-state definition, controls and long term stewardship for decommissioning and contaminated sites, including compliance demonstration and stakeholder engagement aspects.

9. The General Conference encouraged the Agency to further strengthen its activities in the area of environmental remediation, in close collaboration between the Department of Nuclear Energy and the Department of Nuclear Safety and Security.

10. The General Resolution also encouraged the Agency to further strengthen its activities in support of the effective management of disused sealed radioactive sources (DSRS) through, inter alia, the DSRS Technical Centre peer review mission (DSRS-TeC) and cooperative efforts to strengthen supporting information on the borehole disposal of DSRS, with a view to enhancing safety and security of DSRS in the long term.

B. Progress Since the 68th Regular Session of the General Conference

11. A Technical Meeting on Assessing and Quantifying Prognosticated and Speculative Uranium Resources was held in Rio de Janeiro, Brazil, in November 2024 (Fig. B.1). It was attended by 25 experts from 11 Member States, who reviewed and evaluated new data and techniques for systematically assessing and quantifying prognosticated and speculative uranium resources. This was done in a standardized manner for reporting purposes in the Red Book.

FIG. B.1. IAEA lecturer (M. Mihalasky) during the Technical Meeting on Assessing and Quantifying Prognosticated and Speculative Uranium Resources held in Rio de Janeiro, Brazil, in November 2024. (Source: IAEA)

12. In November 2024, the Agency organized a webinar on the launch of E-learning Lectures on Milestones in the Development of National Infrastructure for the Uranium Production Cycle, which attracted 99 participants from 39 Member States.

13. In November 2024, the Agency published *Uranium Exploration Planning, Management and Practice* (IAEA-TECDOC-2074), which provides clear guidance including best practices and recommendations for the planning, management and implementation of uranium exploration projects.

14. In November 2024, a pre-mission for an Integrated Uranium Production Cycle Review mission to Argentina planned in 2025 was implemented in Trelew City and Buenos Aires. The IUPCR mission assisted the CNEA with identifying gaps and identifying the priorities required to mine uranium.

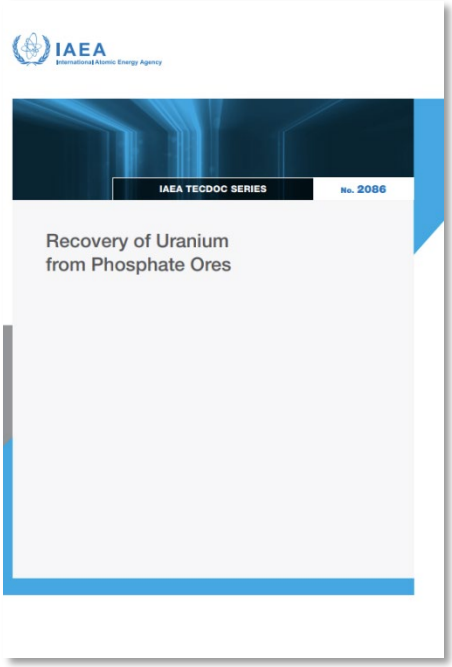
15. In November 2024, the Agency organized a webinar on the Outcomes of the International Conference on the Management of Spent Fuel from Nuclear Power Reactors: Meeting the Moment, to disseminate to the 129 participants from 40 Member States the main conclusions of the Conference, notably that, regardless of the national approaches or fuel cycles adopted, repositories are needed to manage the wastes arising from the fuel cycles, whether these are technical, spent fuel or reprocessing wastes.

16. In February 2025, the Agency organized a webinar on Global Uranium Exploration, Resources, Production and Deposits: the IAEA's World Distribution of Uranium Deposits (UDEPO) Database, the Red Book and New Developments, which was attended by 96 participants from 44 Member States, who received an overview of recent developments related to the Joint OECD/NEA–IAEA Uranium Group's biennial global survey, the 'Red Book' and its database , and the IAEA UDEPO database.

17. In March 2025, the Agency published *Life Cycle Asset Management of Uranium Mining and Processing Facilities* (IAEA-TECDOC-2084), which offers guidance on management strategies and maintenance techniques for ageing uranium production cycle facilities. In May 2025, a webinar was organized to launch the publication.

18. In March 2025, the Agency organized a webinar to launch the E-Learning Lectures on Conventional Safety and Radiation Protection in the Uranium Production Cycle, attended by 51 participants from 30 Member States.

19. In April 2025, the Agency published *Recovery of Uranium from Phosphate Ores* (IAEA-TECDOC-2086), which examines the benefits and challenges of recovering uranium from phosphate ores as an alternative to conventional uranium mining. It considers the low cost of uranium extraction from phosphate ores, its potential profitability and discusses the relative speed of equipping fertilizer plants with uranium recovery units (two to three years) compared with conventional uranium mines, which can take 10 years or longer to mature.



20. The first Research Coordination Meeting for the CRP on Establishing Waste Form Testing Protocols for Geopolymers as a Matrix for the Immobilization of Radioactive Waste, kicked off in April 2025. The objective of the CRP, among others, is to provide a comprehensive set of testing protocols to assist Member States in making an informed decision on the consideration of geopolymers as a matrix in immobilizing radioactive waste.

21. Strengthening the management of radioactive waste and spent fuel is achieved through solid policies and definitive strategies. The draft guidance on developing policy and strategies for radioactive waste and spent fuel was presented and discussed during the Technical Working Group on Radioactive Waste Management and Technologies (TWG-WATEC) meeting in Vienna in May 2025. This document

will complement *Policies and Strategies for Radioactive Waste Management* (IAEA Nuclear Energy Series No. NW-G-1.1), published in 2009. The publication *Managing Irradiated Graphite Waste* (IAEA-TECDOC-2072) provides a comprehensive overview of managing irradiated graphite waste provided by the members of the International Project on Irradiated Graphite Processing Approaches (GRAPA) network.

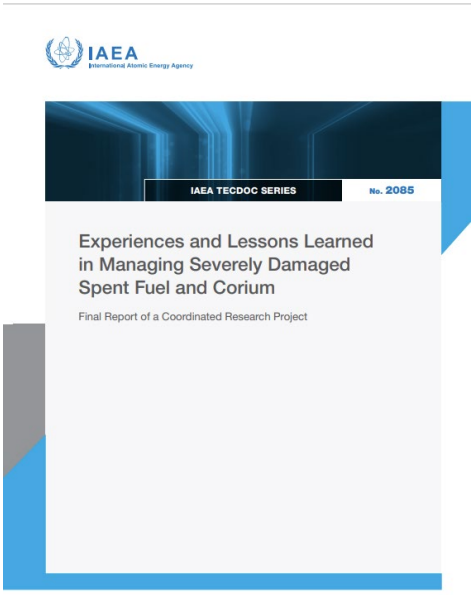
22. The Agency continues to organize technical training workshops to assist Member States in addressing the technical challenges associated with the characterization of radioactively contaminated land. Following the third workshop held in Harwell, UK in 2024, the fourth workshop, focused on techniques and technologies in support of environmental remediation, will be held at the Agency's Headquarters in Vienna in August 2025.

23. In July, the Agency will host a Workshop on Molten Salt Reactor Fuels: Recent Developments and Future Challenges. The event will allow information exchange on the latest cutting-edge research and perspectives in the field of molten salt reactor fuel development, with the aim of supporting Member States in the development of advanced reactors utilizing this reactor technology.

24. The Agency organized the Workshop on Technological Readiness for Deep Borehole Disposal Options in Vienna in November 2024, attended by 31 participants from 16 Member States. The workshop established a first draft of the system breakdown structure for a generic deep borehole disposal concept and discussed the specificities of evaluating long term passive safety of this disposal concept.

25. In March 2025, the Agency organized a webinar on the Results of the Coordinated Research Project entitled "Testing and Simulation for Advanced Technology and Accident Tolerant Fuels (ATF-TS)", attended by 82 participants from 35 Member States.

26. The Agency began developing a Smart Retrieval Knowledge Management Tool in 2024, with ongoing work throughout 2025, to enhance the management of decommissioning information and data. This tool will facilitate more effective searching and retrieval of decommissioning data through the expanded use of semantic technologies. A Technical Meeting, focusing on innovations in data analysis and retrieval for nuclear decommissioning, is planned for August 2025. The objective of the meeting is to foster the exchange of experiences, lessons learned and innovative approaches to improving the access, organization and use of decommissioning data.



27. In April 2025, the Agency published *Experiences and Lessons Learned in Managing Severely Damaged Spent Fuel and Corium* (IAEA-TECDOC-2085), which examines the efforts of participating Member States in the characterization, recovery and management of fuel containing materials (fuel assemblies, fuel debris, corium and melted corium-concrete interaction products) to support future decommissioning and environmental remediation activities.

28. In May 2025, the Agency hosted the First Coordination Research Meeting on Fuel Modelling Exercises for Coated Particle Fuel for Advanced Reactors Including Small Modular Reactors, attended by attended by 18 experts from 9 countries, who discussed their research proposals (list of irradiation data sets and tests for benchmarks) and developed the CRP work plan.

29. In June 2025, the Agency hosted a Technical Meeting on the Behaviour of Spent Fuel and Cladding During Storage and the Performance of Spent Fuel Storage Systems, attended by 49

participants from 21 Member States who presented their ongoing research on spent fuel and associated storage systems behaviour.

30. In June 2025, the Agency launched a CRP on Deployment of Innovative Digital Technologies for Efficient Decommissioning of Nuclear Facilities (DEDICATE). This CRP focuses on harnessing new and emerging digital technologies to enhance the efficiency and effectiveness of decommissioning activities.

31. In June 2025, the Agency also initiated a CRP focusing on developing low-cost solutions for environmental remediation. This initiative aims to support Member States in exploring and applying cost effective technologies for the remediation of contaminated water.

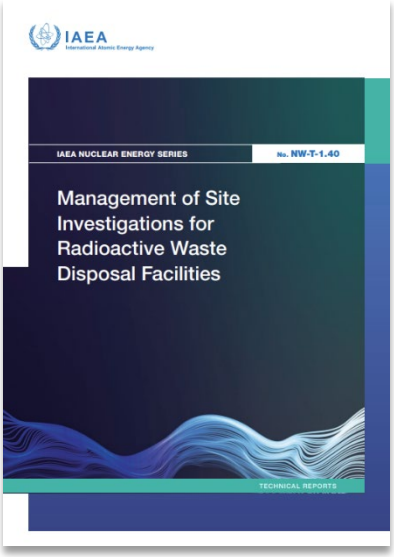
32. The Secretariat continued to promote information sharing to better integrate approaches to the back end of the fuel cycle. A new webinar series on Global Progress Towards Sustainable Endpoint Solutions for High Level Waste and Spent Nuclear Fuel was launched in November 2024. The topics lined up for 2025 include the development and progress of geological disposal in Canada, France, Sweden and Switzerland, and related issues concerning deep geological disposal facility projects, such as siting, governance and long term liabilities. For example, the webinar held in January 2025, featuring progress with the geological disposal programme in Sweden, had 283 registered participants from 54 Member States.

33. Professional networks, such as the International Low Level Waste Disposal Network (DISPONET) and the Underground Research Facilities Network (URF), continue to be the focal platform for cooperation and transfer of knowledge on waste disposal. The DISPONET Technical Meeting held in November 2024 in Canada, was attended by 71 participants from 42 Member States and focused on lessons learned from the disposal of low-level waste in near surface disposal facilities.

FIG. B.2. A technical visit during the DISPONET Technical Meeting to the site where a near surface disposal facility will be constructed in Canada (Source: CNL, Canada).

34. In June 2025, Slovenia hosted an IAEA Training Workshop on Considerations in the Planning and Construction of Near Surface Disposal Facilities. The meeting brought together 78 participants from 42 Member States and provided a forum for and training in the planning and construction of disposal facilities for low level waste to members of the International Low Level Waste Disposal Network.

35. In February 2025, the URF Network held its annual virtual meeting where Member States shared updates on the progress of geological disposal programmes worldwide. Presentations from all programmes at the advanced stages of a deep geological repository programme provided updates to the audience. Further discussions dwelt on activities and training opportunities at their facilities, including opportunities for international collaboration. Ninety-two URF Network members participated in this virtual event.



36. A Technical Meeting, held in Bure, France in June 2025 focused on the topic of high level waste package designs and emplacement schemes where 49 participants from 33 Member States discussed and shared information on waste package design for high level waste disposal.

37. To further guide and assist Member States, two publications have been released: *Roadmap for Implementing a Geological Disposal Programme* (IAEA Nuclear Energy Series No. NW-T-1.43), which provides a roadmap for the disposal of spent nuclear fuel declared as waste, high level and intermediate level waste; and *Management of Site Investigations for Radioactive Waste Disposal Facilities* (IAEA Nuclear Energy Series No. NW-T-1.40), which offers guidance on requirements-driven management of a site investigation programme for disposal and presents a broad range of tried-and-tested technologies used to conduct investigations and obtain required site data.

FIG. B.3. The IAEA Underground Research Facility (URF) Network visited the National Radioactive Waste Management Agency's (ANDRA) on the occasion of a Technical Meeting week of June 9, 2025, at the Underground laboratory at Bure in France, which supports the development of the Cigéo deep geological repository project (Source: ANDRA, France).

38. In August 2025, the Agency will organize a virtual Training Workshop on the Spent Fuel and Radioactive Waste Information Tool (SWIFT) and the Spent Fuel and Radioactive Waste Information System (SRIS) with the aim of providing continuous technical support to users of SRIS and SWIFT, collecting feedback to enhance user experience, and demonstrating the linkages between SWIFT and SRIS and the Agency's other databases. Recent updates and revision of SRIS were conducted in close cooperation with the European Commission.

39. To support Member States in the decommissioning of research reactors, the Agency published *Considerations on Decommissioning in the Design and Operation of Research Reactors* (Technical Reports Series No. 494) in 2024, which provides practical guidance on how to incorporate decommissioning considerations early in the design and operational phases, helping Member States reduce future decommissioning costs, improve safety outcomes and streamline project planning and execution.

40. In December 2024, the Agency organized a Technical Meeting on Decommissioning Heavy Water Reactors. The meeting reviewed experiences and lessons learned in the preparation and implementation of decommissioning for both industrial and research heavy water reactors, with a particular focus on the management of tritiated waste. The meeting, attended by 39 participants, fostered international exchange among specialists on heavy water reactor decommissioning, highlighting shared challenges and opportunities for collaboration on tritiated waste management, improved treatment methods and strategic planning, with outcomes aimed at supporting Member States in advancing their decommissioning efforts.

41. To promote safe and efficient decommissioning, the Agency launched the second phase of the Global Status of Decommissioning (GSD) project in 2024, building on the completion of the first phase in 2023. This phase dives deeper to provide a more in-depth assessment of Member States' decommissioning strategies, practical techniques and trends in managing decommissioning activities. It also focuses on refining data collection methodologies and facilitating the exchange of national experiences. The Technical Meeting in June 2025 further evaluated the current status of national decommissioning programmes, identified emerging trends, and explored their future evolution. These efforts support Member States in benchmarking practices and enhancing the planning and execution of their decommissioning activities.

42. In 2024, following the outcomes of a Technical Meeting to be held in July 2024, the Agency advanced its work on strategic stakeholder engagement and communication related to determining the end-state of decommissioned nuclear sites. This effort also incorporated the consideration of circular economy principles in the context of decommissioning planning and implementation. Building on this work, the Agency is now developing a Nuclear Energy Series report on Stakeholder Engagement in Decommissioning, aimed at improving practices for nuclear site repurposing.

43. The Biennial Forum of the Network on Environmental Management and Remediation (ENVIRONET) was held at the Agency's Headquarters in December 2024, marking the 15th anniversary of the Network. This hybrid meeting brought together approximately 110 participants and highlighted the importance of addressing legacy issues to ensure public confidence in nuclear energy. The participants emphasized that broad acceptance of nuclear energy is closely tied to the sector's ability to effectively manage past environmental liabilities, while also proactively applying holistic, life cycle approaches in new projects to support sustainable development and prevent the creation of future legacy sites.

44. To support Member States in strengthening their environmental remediation activities, the Agency published Integrated *Approaches for the Management of Environmental Site Remediation Processes: A Baseline Report* (IAEA-TECDOC-2064) in late 2024 as part of the Management Systems Supporting Environmental Remediation (MAESTRI) project. The report provides an overview of the frameworks, approaches and tools currently employed in decision making processes related to environmental remediation projects. It also identifies gaps in existing knowledge and tools, allowing the MAESTRI project to contribute to the enhancement of decision making mechanisms and promote more effective, informed planning and implementation of remediation efforts.

45. The Agency participated in the Waste Management Conference 2025, a key international event focused on radioactive waste management, including decommissioning and other back end nuclear activities. The conference took place in Phoenix, USA in March 2025. As part of its engagement, the Agency organized two special sessions: one on Integrating Sustainability and Circularity in Environmental Remediation: Bridging the Gap Between Implementers and Regulators, and another on A Holistic Approach to Naturally Occurring Radioactive Material (NORM) Management. These sessions fostered dialogue, shared best practices, and promoted innovative approaches among stakeholders from across the sector.

46. The Uranium Mining and Remediation Exchange Group (UMREG) aims to promote best practices in the remediation of legacy uranium production sites, support sustainable approaches in new uranium mining projects, and foster international cooperation through knowledge exchange. The UMREG Technical Meeting, that will be held in Vienna in July 2025 aims to facilitate the sharing of experiences and lessons learned from remediation projects, and ensure that these insights are transferred to new mining initiatives to enhance sustainability and contribute to the green economy.

47. The publication of the *Holistic Approach to Management of Naturally Occurring Material (NORM)* (IAEA-TECDOC-2071) presents an analysis of how this framework can be systematically applied to scope the way in which a given country can deal with management of NORM residues within a circular economy transition.

48. A series of webinars have been organized in a partnership between the IAEA-ENVIRONET network and the Center for the Remediation of Complex Sites, a Pacific Northwest National Laboratory. These included dedicated events that analysed the three dimensions of sustainability as applied to remediation, such as economic, social and environmental, and discussed key performance indicators and metrics to assess the sustainability of such projects. They also discussed progress and challenges associated with the remediation of groundwater. A key highlight was the webinar held in April 2025 on Groundwater Investigation in Complex Nuclear Legacy Sites, which attracted over 200 participants, underscoring strong international interest in this critical topic.

49. The Global Radium-226 Management initiative entered the fourth year of its implementation. The Technical Meeting on Implementation of the Global Radium-226 Management held in Vienna in December 2024, and attended by 88 participants from 56 Member States, shared inventory information and discussed gaps and challenges in its implementation. Field missions were conducted in Barbados, Jordan and the Philippines to assist in finalizing radium inventory, as well as conditioning and pre-packaging of radium sources.

50. Two technical meetings related to DSRS management were held, each with a different focus. In October 2024, 84 participants from 48 Member States discussed Tools and Equipment for the Management of Disused Sealed Radioactive Sources. The conditioning of Category 3–5 sources was discussed at a meeting held in August 2024 where 56 Member States attending the Technical Meeting on International Experiences in the Conditioning of Category 3–5 Disused Sealed Radioactive Sources reviewed the final draft of “Conditioning of Category 3-5 Disused Sealed Radioactive Sources”.

51. The second DSRS network (DSRSNet) meeting will be organized in August 2025 to discuss current practices and developments in the management of disused sealed radioactive sources in Member States, and to identify further technical support that the Agency could provide to address Member States’ needs and gaps.

52. The Agency successfully conducted the Disused Sealed Radioactive Sources Technical Centre Peer Review Mission in Slovenia in September 2024. The review, which was focused on operational processes and procedures for managing DSRS, concluded that Slovenia demonstrated a high level of operational standards and quality management system in the management of DSRS.

53. The Agency organized the first ever Technical Meeting on Disposal Options of DSRS in Near Surface Disposal Facilities, which was held in Vienna in April 2025 and attracted 90 participants from 52 Member States. Case studies from four countries detailing the successful disposal of DSRS in near surface disposal facilities were shared. Participants further discussed the concept and associated requirements to further understand the feasibility of disposing DSRS in near surface disposal facilities.

Research Reactors

A. Background

1. In resolution GC(68)/RES/11.B.4, the General Conference requested the Secretariat to continue assisting interested Member States in their efforts to utilize existing research reactors for nuclear science and technology, including nuclear power applications, with a view to strengthening infrastructure, including safety and security, and fostering science, technology, engineering and capacity building.

2. The General Conference encouraged the Secretariat to inform Member States considering the development or installation of their first research reactor of the issues related to utilization, cost-effectiveness, environmental protection, safety and security, emergency preparedness and response, nuclear liability, proliferation resistance, the application of comprehensive safeguards, and radioactive waste management associated with such reactors, and, on request, to assist Member States that are pursuing new reactor projects following the Agency-developed Specific Considerations and Milestones for a Research Reactor Project, including systematic, comprehensive and appropriately graded infrastructure development.

3. The General Conference urged the Secretariat to continue to provide guidance on all aspects of the research reactor life cycle, including the development of ageing management programmes at all research reactors, to ensure continuous improvements in safety and reliability, sustainable long term operation, the sustainability of fuel supply, exploration of efficient and effective disposition options for spent fuel and radioactive waste management, and the development of a knowledgeable customer capability in Member States decommissioning research reactors.

4. The General Conference acknowledged the implementation of an Operation and Maintenance Assessment for Research Reactors (OMARR) mission in Brazil and Iran, as well as the Agency missions in support of in-service inspections of research reactors in the Democratic Republic of the Congo, Indonesia and Iran, and encouraged Member States to make further use of these IAEA services.

5. The General Conference requested the Secretariat to foster regional and international efforts in ensuring wide access to existing multipurpose research reactors to increase research reactor operations and utilization, through regional research reactor coalitions and ICERRs.

6. The General Conference acknowledged the expansion of the IAEA Internet Reactor Laboratory project in Asia-Pacific, Europe and Africa regions, and encouraged the Secretariat to further strengthen its efforts to support capacity building based on research reactors.

7. The General Conference called on the Secretariat to continue to support international programmes working to minimize the civilian use of HEU, for example through the development and qualification of LEU high density fuel for research reactors, where such minimization is technically and economically feasible.

B. Progress Since the 68th Regular Session of the General Conference

8. A Training Workshop on Technical Requirements in the Bidding Process for a New Research Reactor was conducted in Vienna in October 2024. The event was attended by 47 participants from 21 Member States who were provided with practical information and knowledge on developing the technical requirements for the bidding of a new research reactor, taking into account operation, utilization and safety requirements, as well as guidance on the criteria for bid evaluation. The workshop also provided a forum at which participants shared experiences, challenges and lessons learned in the preparation and implementation of the bidding process for a new research reactor.

9. In April 2025, the Agency held a Training Workshop on Assessment of the National Nuclear Infrastructure to Support a New Research Reactor Programme in Vienna. The event was attended by 55 participants representing 23 countries. The workshop provided participating Member States with practical information on the application of Specific Considerations in the Assessment of the Status of the National Nuclear Infrastructure for a New Research Reactor Programme (IAEA Nuclear Energy Series No. NR-T-5.9), relevant Agency safety standards and other related Agency publications, and also provided a forum to discuss experiences and lessons learned in the development and implementation of new research reactor projects.

10. A Training Workshop on Milestones for a New Research Reactor Project will be conducted in Vienna in July 2025. The workshop will provide participating Member States with practical information on the application of Specific Considerations and Milestones for a Research Reactor Project (IAEA Nuclear Energy Series No. NP-T-5.1), relevant Agency safety standards and other related Agency publications. The participants will also share their experiences in the development and implementation of new research reactor projects.

11. To assist Member States in planning human resources for their research reactor programmes, the Agency conducted national training workshops on human resources development modelling in Nairobi in March 2025 and in Riyadh in June 2025. The objective of these workshops was to train Member States' staff in the use of the dedicated human resources development modelling software tool developed by the Agency.

12. A Technical Meeting on Good Practices in Operation and Maintenance and Ageing Management Programmes for Research Reactors held in Vienna in September 2024 was attended by 40 participants from 22 Member States who exchanged their experiences, good practices and lessons learned in the operation, use and ageing management of their research reactors. The participants also worked in discussion groups on evaluating and developing inputs for the Agency's research reactor ageing management database.

13. A National Workshop on the Training of the Inspection on Welding and Concrete Testing during Construction of SUT-RR was conducted at Suranaree University of Technology (SUT), Nakhon Ratchasima, Thailand in September 2024. The workshop was attended by 23 local participants. Classroom lectures and practical demonstration of testing methods were conducted to enhance national capabilities in the inspection of welding and concrete testing, which are expected to have a direct positive effect on quality assurance in the construction of the new miniature neutron source reactor SUT-RR in Thailand.

14. A new publication issued in September 2024 and entitled *Optimization of Research Reactor Availability and Reliability: Recommended Practices* (Nuclear Energy Series NR-T-5.4 Rev 1) provides guidance on key activities aimed at increasing availability and reliability, and improving operation and

maintenance practices of research reactors, as well as examples of good practices. The publication is targeting research reactor designers, operators, regulators and other stakeholders.

15. In November 2024, the Agency published the *Considerations on Decommissioning in the Design and Operation of Research Reactors* (IAEA Technical Report Series No. 494), which provides guidance on decommissioning considerations to be applied during various phases of the research reactor life cycle, from the design to permanent shutdown, and managing the transition from operation to decommissioning. This publication provides research reactor designers, operators and regulators with good practices and lessons learned on how to plan and prepare for decommissioning, as well as information on regulatory and management aspects related to these topics.

16. A Technical Meeting on Safety and Operational Considerations in the Use of Advanced Technologies at Research Reactors was conducted in Vienna in September and October 2024. The meeting provided 29 participants from 18 Member States with a forum to discuss experience in technological developments, design and operational safety, and regulatory oversight in the use of advanced technology, including digital control systems, robotics and artificial intelligence at research reactors.

17. A Training Workshop on Non-Destructive Examination, In-Service Inspection and On-line Monitoring for Research Reactors was conducted in Vienna in November 2024. The workshop was attended by 29 participants from 22 Member States and included, in addition to country presentations and expert lectures, practical sessions for the participants on non-destructive examination techniques at the research reactor in Vienna University of Technology.

FIG. B.1. Practical exercises during Training Workshop on Non-Destructive Examination, In-Service Inspection and On-line Monitoring for Research Reactors at Vienna University of Technology, November 2024 (Source: IAEA).

18. A Regional Training Course on Ageing Management for Research Reactors, conducted in Tashkent in December 2024, was attended by 21 participants from 12 Member States. The purpose of the training course was to enhance Member States' capacities in ageing management by providing guidance on establishing, implementing and improving ageing management, as well as refurbishment and modernization programmes for a research reactor that is planned, under construction, in operation or resuming operations after a temporary or extended shutdown.

19. The Agency launched a new CRP aimed at developing methodology and criteria for applying time-limited ageing analysis to ensure the continuous safe operation of research reactors. This project included 13 participants from 11 Member States. Participants of the first Research Coordination Meeting held in January 2025 reviewed the individual proposals and established collaborative actions among participants with common topics.

20. In April 2025, the Agency held a Workshop on the Research Reactor Database for Facility Data Providers in Vienna. The meeting was offered to Research Reactor Database (RRDB) Facility Data Providers officially designated by Member States. Twenty-six participants representing 22 Member States were provided guidance on updating facility and fuel cycle data within the RRDB. A significant part of the workshop was practical work on updating RRDB information.

21. A Technical Meeting on Preparation for Decommissioning of Research Reactors conducted in Vienna in April 2025 was attended by 29 participants from 25 Member States. The meeting brought together designers, operators, decommissioning experts and regulators of research reactors to discuss

issues related to the preparation for decommissioning of such facilities, ensuring a safe and effective transition from operation to decommissioning.

22. A Technical Meeting on the Fuel Supply, Operation and Utilization of TRIGA Research Reactors was held at the University of Pavia in Italy in May 2025, with 23 participants from 14 Member States. The main focus of the meeting was on the status, issues and options available for TRIGA fuel supply, including the purchasing process, transportation issues and timelines. Participants also shared their experience in the operation, maintenance and utilization of TRIGA reactors.

23. In June 2025, the Agency organized the Technical Meeting on Integrated Management Systems for the Sustainable Safe Operation and Effective Utilization of Research Reactors, hosted by the Japan Atomic Energy Agency in Mito, Japan, and attended by 21 participants from 18 Member States. The event was combined with a meeting of the International Group on Research Reactors. Operators, regulators and users of research reactors shared updates on recent developments and exchanged good practices and lessons learned in utilization, operation and safety aspects of research reactors.

24. In October 2024, the Agency conducted a mission in support of in-service inspection of the RECH-1 research reactor in Santiago, Chile. The mission team supported the reactor operating organization, Chilean Nuclear Energy Commission (CCHEN), in a visual inspection of the reactor pool, auxiliary pool and reactor internals (core support structure, neutron beam tubes, flap valves, control rods, etc.). The report provided to CCHEN contained observations and recommendations aimed at improving the reactor availability and mitigating the consequences of ageing.

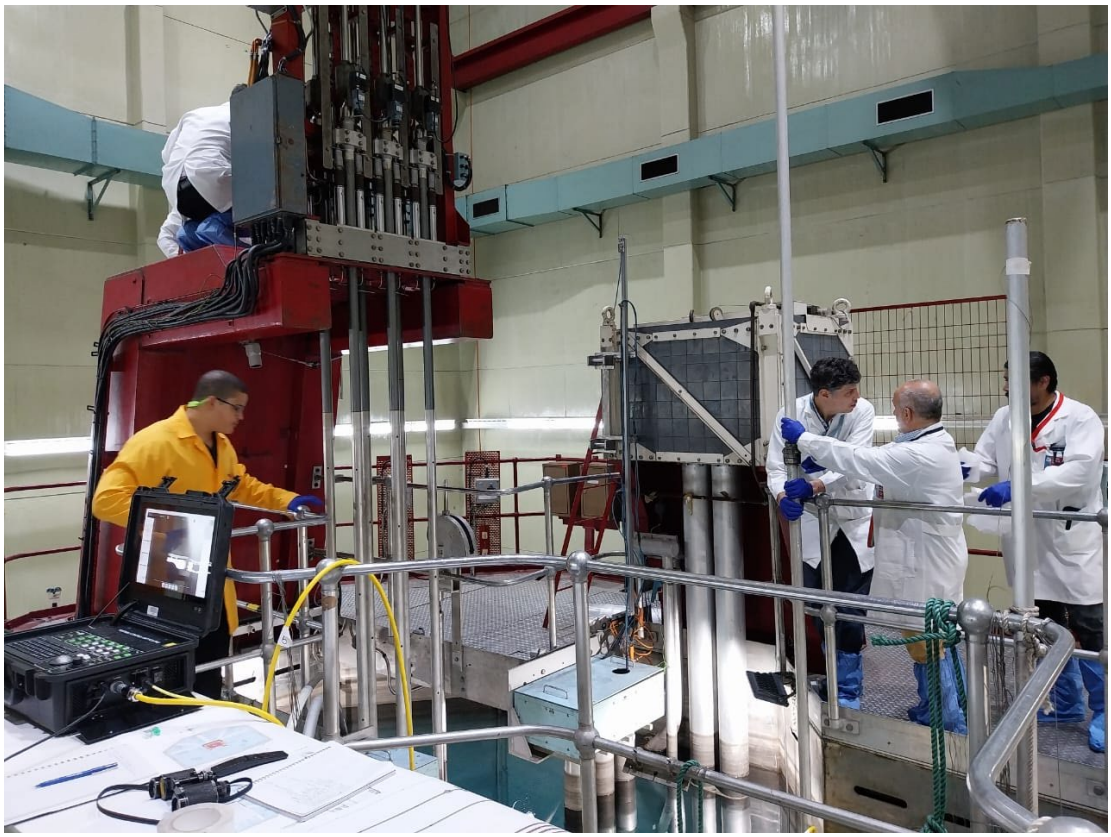


FIG. B.2. IAEA mission supporting in-service inspection of RECH-1 research reactor in Santiago, Chile. (Photo: Chilean Nuclear Energy Commission)

25. An OMARR mission to the JM-1 research reactor, located in the Mona Campus of the University of the West Indies, Kingston was undertaken in March 2025. The mission provided advice and assistance to the International Centre for Environmental & Nuclear Science to improve the operation and maintenance performance of the JM-1 research reactor, thereby enhancing its availability, reliability and utilization time.

26. In April 2025, following a request made by the Agencia Boliviana de Energía Nuclear, the Agency conducted an expert mission to advise on the development and implementation of the operational and maintenance plan for the research reactor RB-1 under construction in El Alto, Bolivia. The Agency reviewed preparations and provisions made for the next stages, i.e. commissioning and operation, and provided advice on future managerial and operational activities referenced on key practices widely adopted by the Agency's Member States.

FIG. B.3. IAEA mission at RB-01 research reactor under construction in El Alto, Bolivia, to support preparations for commissioning and operation of the reactor (Photo: Bolivian Nuclear Energy Agency)

27. The Agency continued to foster regional and international efforts in ensuring wide access to existing multipurpose research reactors to increase research reactor operations and utilization, through regional research reactor coalitions and the IAEA-designated International Centres based on Research Reactor (ICERR) scheme. In 2025, the National Atomic Energy Commission of Argentina became an ICERR, providing access to its research reactors, associated laboratories and training facilities for Agency Member States in Latin America and beyond.

28. For the further expansion of Internet Reactor Laboratories, potential participation in the project was discussed with counterparts in Rwanda, Senegal, Tanzania and Uganda. Draft agreements were designed and sent to counterparts for their review.

29. The first Regional Research Reactor School in France, conducted in November 2024, provided an opportunity for hands-on training at unique facilities in Cadarache, Grenoble and Saclay to 12 young research reactor professionals from 12 countries.

30. A Regional Research Reactor School for Africa, held in Rabat, Morocco in May 2025, introduced basic aspects of nuclear reactors to 16 participants from 16 countries and enabled them to develop the necessary technical skills for safe operation and utilization of research reactors.

31. The second Regional Research Reactor School in the Spanish language will be hosted by the National Atomic Energy Commission of Argentina at Bariloche and Ezeiza Atomic Centres in July 2025. The event will assist Member States in Latin America and Caribbean in building nuclear competence, particularly related to the operation and utilization of research reactors.

32. A Technical Meeting on Treatment and Conditioning Options for Research Related Spent Fissile Materials was held in Vienna in December 2024. This meeting was focused on available and emerging solutions for managing fissile materials, particularly HEU, other than reprocessing or direct disposal. Forty-five participants from 25 Member States shared information related to innovative treatment and conditioning options, including down-blending powder materials, melt and dilute technologies, controlled oxidation of metallic uranium residues and spark plasma sintering. The Agency's continued support and the opportunity for information exchange were highly appreciated.

33. The Agency cooperated in organizing the International Meeting on Reduced Enrichment for Research and Test Reactors (RERTR-2024) held in Lyon, France, in October 2024, which was attended by 211 participants representing 22 countries and 73 unique organizations, who discussed a broad range of topics related to the conversion of research reactors and radioisotope production facilities from the use of HEU to LEU.

34. The Agency continued to support preparations for the disposition of two different types of spent HEU fuel from the IVG.1M and IGR research reactors in Kazakhstan. This support included expert assistance and a series of consultancy meetings to coordinate development of HEU down-blending and immobilization technologies, the construction of dedicated facilities, and the addressing of related nuclear safeguards issues.

Operating Nuclear Power Plants

A. Background

1. In resolution GC(68)/RES/11.B.5, the General Conference requested the Secretariat to promote collaboration among interested Member States to strengthen excellence for the safe, secure, efficient and sustainable operation of nuclear power plants.

2. The General Conference requested the Secretariat to strengthen support for interested Member States to improve nuclear power plant performance reliability.

3. The General Conference encouraged the Secretariat to continue information sharing and promotion of best practices on non-baseload operation of nuclear power plants to support their flexible operation and their integration into different energy systems.

4. The General Conference requested the Secretariat to develop, in close consultation with Member States, a Nuclear Energy Series Guide on policies and strategies for nuclear power plant long term operation or lifetime extension.

5. The General Conference requested the Secretariat to continue this work through experience sharing and identification and promotion of best practices, and taking into account quality assurance and control activities related to nuclear construction, component manufacturing and modifications, with respect to fitness for service issues and independent nuclear training accreditation.

6. The General Conference also requested the Secretariat to continue its support to interested Member States, in particular through strengthening their knowledge, experience and capacity in the management of ageing and plant life management and encouraged it to promote international cooperation through the IAEA International Network on Nuclear Power Plant Lifetime Management (LM-NPP).

7. The General Conference encouraged the Secretariat to promote international cooperation through the International Network on Innovation to Support Operating Nuclear Power Plants (ISOP).

8. The General Conference also encouraged the Secretariat to support interested Member States in their activities to improve the safe, secure and economical operation of existing nuclear power plants throughout their operational lifetime.

9. The General Conference acknowledged the growing interest in the application of advanced instrumentation and control (I&C) systems. It encouraged the Agency to further support interested Member States by sharing best practices and strategies to justify commercial industrial I&C equipment for nuclear power plant applications and I&C aspects of human factors engineering. In addition, the conference discussed the challenges and issues that need to be resolved in this area.

10. The General Conference recognized the need to enhance the support for grid and nuclear power plant interfaces, grid reliability and cooling water usage, and recommended that the Secretariat collaborate on these matters with Member States that have operating nuclear power plants.

11. The General Conference encouraged the Secretariat to share best practices and lessons learned with respect to procurement, supply chain, engineering and related issues in the delivery of large, capital-intensive nuclear engineering projects, to promote and disseminate them through publications, training courses and web-based tools with respect to supply chain management, and to identify opportunities that may exist to enhance supply chain resilience.

12. The General Conference encouraged the nuclear owner/operating organizations of Member States to share their experience and knowledge related to fuel performance and technology.

13. The General Conference encouraged the Secretariat to analyse the status and future challenges of human resources in the nuclear power industry and to support operating organizations in their development of human resources.

14. The General Conference encouraged the Secretariat to support interested Member States in their activities to utilize nuclear power plants for non-electrical applications, including gathering and quantifying data, and to identify best practices and lessons learned.

B. Progress Since the 68th Regular Session of the General Conference

15. The Agency continued to organize annual training workshops on the IAEA Severe Accident Management Guideline Development toolkit to support Member States in developing severe accident management guidelines, incorporating lessons learned from the Fukushima Daiichi accident. The Training Workshop on the Development of Severe Accident Management Guidelines Using the IAEA's Severe Accident Management Guideline Development Toolkit was held in Vienna in December 2024 with 32 participants from 19 Member States and 1 international organization.

16. In November 2024, the Agency held a Technical Meeting on Decision Making for Sustaining Operational Excellence in Nuclear Power Plant Operating Organizations with the aim of developing a technical publication on the topic. The meeting was held in Vienna and was attended by 22 representatives from 17 Member States. Several good practices related to decision making were collected from Member States and incorporated into the publication's appendices.

17. In response to requests and recommendations from Member States, Agency created developmental training that fosters learning through applied practice. This training immerses personnel in shifting contexts to test and strengthen their awareness, adaptability and effective decision making or action. There are four sessions planned/implemented in 2025: two in Vienna (April and October respectively) and two in Canada (in late September), along with train the trainers events in the UAE (FANR in early September). Each session will invite 25 participants, 8 facilitators and up to 8 observers.

18. In November 2024, a Technical Meeting on Advances in Fuel Design, Manufacturing and Examinations for Pressurized Heavy Water Reactors (PHWRs) was held in Buenos Aires. It was attended by 80 experts from 7 Member States operating PHWRs, who exchanged current knowledge and experience on PHWR fuels, progress in advanced fuels, and usage of advanced methods for fuel manufacturing and testing.

19. In February 2025, the Agency organized a webinar on Nuclear Fuel Reliability and Performance in Water Cooled Reactors, attended by 135 participants from 46 Member States.

20. In September 2024, a Technical Meeting on the Equipment Reliability Programme in Nuclear Power Plants: Guidelines, Good Practices and Lessons Learned was held in Shanghai, China. It was attended by 49 experts from 21 Member States operating NPPs, who explored organizational, human and technical factors essential for ensuring excellence in equipment reliability and sustaining plant performance.

21. In August 2025, a Technical Meeting on the Water Chemistry of Water-Water Energetic Reactors (WWER) will be held in Vienna. The meeting is aimed at sharing approaches and improvement projects to support excellence in water chemistry and achieve high plant performance.

22. In October 2024, the Agency organized a similar Training Course on Nuclear Supply Chain and Procurement Management in the Republic of Korea directed at newcomer Member States. It was attended by 22 participants from 15 Member States who learned about the newest trends in the nuclear supply chain and how to proactively manage the supply chain, and procure safety and non-safety items.

23. In June 2025, the Agency also organized a Training Course on Nuclear Supply Chain and Procurement Management at its Headquarters in Vienna. The course was aimed at Member States with operating NPPs and was attended by 28 participants from 18 Member States.

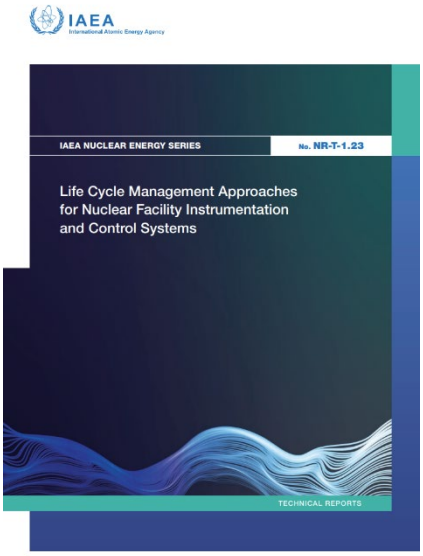
24. In June 2025, the Agency organized a webinar “Experience and Developments in Using Commercial Grade Items – What is New?”, which was attended by 245 participants from 45 Member States. It was communicated during the webinar that the increased use of commercial grade items is unavoidable for expanding and maintaining the existing NPP fleet, as original suppliers may no longer be available.

25. The IAEA International Network on Life Management of Nuclear Power Plants (LMNPP) continued to serve as a vital platform for international collaboration, and knowledge and experience sharing, to enhance the life management of NPPs for Member States. In 2024, it facilitated 13 events and supported 10 working groups focused on key aspects of NPP life management. Outputs included Agency publications and a training course.

26. In June 2025, the Agency organized a Workshop on Condition-based Qualification of Equipment for Nuclear Power Plants in Vienna, attended by 70 participants from 24 countries. The participants discussed the method of condition-based qualification in establishing a process for evaluating the remaining useful life of equipment, based on the use of specific condition monitoring methods. The recent experiences and case studies on condition-based qualification in NPPs were also shared.

27. In April 2025, the Agency organized a Regional Workshop on Flow Accelerated Corrosion and Dissimilar Metal Welds in Vienna, attended by 11 participants from 7 countries. The participants discussed the relevant information on flow accelerated corrosion and dissimilar metal welds in NPPs, including scientific basis, practical measures, operating experience feedback, managerial issues and regulatory aspects.

28. The Agency will organize pilot training on NPP life management for long term operation in the Republic of Korea for July 2025. It is aimed at enhancing the technical capabilities in ageing management and long term operation of NPPs for stakeholders in the country, based on the methodologies developed by the Agency.



29. The Agency released a publication on *Life Cycle Management Approaches for Nuclear Facility Instrumentation and Control Systems* (IAEA Nuclear Energy Series No. NR-T-1.23), which provides an overview on the current knowledge, up-to-date best practices, experiences, benefits and challenges related to the subject approaches on I&C systems life cycle management.

30. In March 2025, the Agency held a Technical Meeting on Progress in Performance Assessment and Regulation of Passive Safety Systems in Advanced Nuclear Power Plant Designs in Vienna. The meeting, attended by 96 participants from 26 Member States and 1 international organization (OECD/NEA), provided a dedicated forum for designers, researchers and regulators to share experiences and best practices in evaluating and licensing passive safety features in advanced reactor concepts — including SMRs — fostering harmonized assessment methodologies and regulatory approaches.

31. In June 2025, the Agency organized a Technical Meeting to present and discuss the findings of CRP on in-vessel melt retention, a severe accident mitigation strategy that aims to keep molten core material confined within the reactor pressure vessel by flooding and cooling its outer surface. The meeting brought together 60 researchers, policy makers and industry representatives from 29 Member States and 1 international organization (OECD) to explore the thermal hydraulic phenomena, vessel structural integrity considerations and cooling system requirements underpinning this approach, ensuring the broadest possible impact and practical application of the project's outcomes.

32. The Agency continued to provide further support to interested Member States in the application of advanced I&C systems. In October 2024, the Agency implemented a Technical Meeting on Systems Engineering: Requirement Engineering and Management to finalize the Agency's new publication, entitled Requirements Engineering in the Life Cycle of Instrumentation and Control Systems in Nuclear Facilities, and to strengthen the ability of Member States to perform requirements engineering during the life cycle of I&C systems. The event was attended by 68 experts from 26 countries.

33. In November 2024, the Agency implemented a Technical Meeting on On-line Monitoring of Plant Process and Instrumentation and Control Systems and Components to update the existing publication entitled On-line Monitoring for Improving Performance of Nuclear Power Plants Part 2: Process and Component Condition Monitoring and Diagnostics (IAEA Nuclear Energy Series No. NP-T-1.2), and to assist Member States in understanding several aspects of on-line monitoring of plant process and I&C systems and components. The meeting gathered 78 experts from 21 countries and 2 international organizations.

34. The Agency continued to support Member States' electrical grid infrastructure development by delivering training courses and workshops, and conducting missions. In November 2024, the Agency organized the Interregional Training Course on Electrical Grid Considerations and Interactions with the Nuclear Power Plant, including SMRs, in the USA. The course was attended by 18 international representatives from 15 Member States and allowed the participants to understand the Agency's technical guidance and learn from practical experience regarding NPP integration into the grid.

35. In December 2024, the Agency conducted a national workshop in Mongolia on site selection and electrical grid considerations to prepare a comprehensive report for a nuclear power programme. Forty-eight participants from 27 key organizations involved in the country's nuclear power programme

discussed the aspects needed for the electrical grid and fundamentals of site survey and selection during the development of a nuclear power programme.

36. In February 2025, the Agency organized a national workshop in Poland on integrating the first nuclear units within the Polish power system. The event, attended by 51 participants from Polskie Sieci Elektroenergetyczne S.A. (PSE), Polskie Elektrownie Jądrowe (PEJ), the National Atomic Energy Agency and the Ministry of Industry, discussed conditions for the successful integration of the first NPP into the grid as well as the approaches to the development of the nuclear safety culture in the grid control organizations.

37. In May 2025, the Agency held a national workshop on the integration of a large NPP and economic considerations for the stakeholders of the electricity sector in Saudi Arabia. Around 60 participants from relevant stakeholders attended the event, where they discussed the importance of a dependable electrical grid in supporting the safe and reliable operation of NPPs. It also highlighted the positive contribution of NPPs to grid reliability and resilience. Special emphasis was placed on the flexible operation of NPPs and their integration into electrical grids with a high share of renewable energy sources.

38. In June 2025, the Agency organized a national workshop on electrical grid studies and upgrades for NPPs, held in Egypt, with 30 local participants discussing the impact of the electrical grid operation on nuclear safety and the necessary studies needed before connecting an NPP to the electrical grid. The preprint version of the IAEA Nuclear Energy Series Publication Reliability and Resilience of Electrical Grid for and with Nuclear Power Plant (IAEA Nuclear Energy Series No. NR-T-3.36) was made available to Member States in January 2025. It discusses the design and operation, and the coordination and control requirements for a reliable and resilient electrical grid to support the safe and reliable operation of NPPs.

39. In November 2024, the Agency organized a Technical Meeting on Electric Grid Reliability and Interface with Small Modular Reactors and Renewable Energy Sources in Vienna, with 57 participants from 32 countries attending the meeting, which discussed the operating experiences and design considerations related to electrical grid reliability and the interface with SMRs and renewable energy sources. The Secretariat continued to share best practices and lessons learned with respect to procurement, the supply chain, engineering and related issues in the delivery of large, capital-intensive nuclear engineering projects. In June 2025, the Agency organized a Training Course on Nuclear Supply Chain and Procurement Management in Vienna, directed at Member States with operating NPPs with 28 participants from 21 Member States.

40. In October 2024, the Agency held a Technical Meeting on Transitioning from On-site Spent Fuel Storage to Off-site Spent Fuel Storage at Permanently Shut Down Reactor Sites in Vienna, which was attended by 11 experts from 10 countries, who exchanged their national experiences in such transitions.

41. The Agency recognizes that leadership capability at all levels, complemented by strong technical skills, is beneficial and arguably essential at all levels of the organization, in particular as the nuclear industry rapidly evolves and expands. In response, the Agency developed and implemented leadership and professional development modules at the Stakeholder Engagement School (Trieste, Italy, November 2024, 34 participants), the Nuclear Energy Management Schools (Ghana, April 2025, 50 participants; Brazil, June 2025, 30 participants) and the Lise Meitner Programme (Argentina, May 2025, 15 participants; Japan, June 2025, 15 participants; Canada, July 2025, 15 participants), which had positive responses. In addition, intensive, immersive week-long training programmes seek to embed these leadership behaviours into the DNA of nuclear personnel as a means of strengthening the resilience of the nuclear organization and industry.

42. The Secretariat continued to support interested Member States in their activities to utilize NPPs for non-electrical applications. In November 2024, the Agency held a Technical Meeting on Recent Developments in Cogeneration Processes in Member States in Vienna, facilitating the collection of best practices and lessons learned, along with a discussion of the most recent developments and the status of cogeneration processes in Member States. The event was attended by 30 participants from 18 Member States and 2 international organizations.

Agency Activities in the Development of Innovative Nuclear Power Technology

A. Background

1. In resolution GC(68)/RES/11.B.6, the General Conference encouraged the Secretariat to consider further opportunities to develop and coordinate the services it provides on these subjects, focusing on transition to sustainable nuclear energy systems using, inter alia, the analytical approaches, tools and services developed by INPRO.

2. The General Conference also encouraged the Secretariat to consider further use of web-based tools for implementing the INPRO Collaborative Projects, including the recently developed nuclear energy system simulators and the INPRO Wikipages, to support Member States in applying the INPRO methodology for NESAs.

3. The General Conference encouraged interested Member States and the Secretariat to apply the INPRO ROADMAPS templates to national case studies, including case studies based on cooperation between technology holder and technology user countries, as well as for national and regional long term energy planning to enhance the sustainability of nuclear energy systems.

4. The General Conference requested the Secretariat to promote collaboration among interested Member States in developing innovative, globally sustainable nuclear energy systems and to support the establishment of effective collaboration mechanisms to exchange information on relevant experiences, lessons learned and good practices.

5. The General Conference also requested the Secretariat to further promote application of multi-criteria decision analysis methods for the comparative evaluation of plausible nuclear energy system options by interested INPRO Member States, aiming to support decision analysis and prioritization in national nuclear energy programmes.

6. The General Conference encouraged the Secretariat to study cooperative approaches to the back end of the nuclear fuel cycle, with a focus on the drivers and institutional, economic and legal impediments to ensure effective cooperation among countries towards the long term, sustainable use of nuclear energy.

7. The General Conference requested the Secretariat to facilitate discussion among developers of advanced reactors on the challenges and technologies related to decommissioning, and radioactive waste and spent fuel management at the earliest stage of their design thinking.

8. The General Conference requested the Secretariat to continue providing assistance on strategic planning for sustainable nuclear energy development and deployment, including through capacity building, INPRO Schools and the consolidation of the INPRO Advisory Service to advise interested Member States. It was recommended that these activities be conducted in all UN official languages to enhance the effectiveness of knowledge transfer.

9. The General Conference encouraged the Secretariat to strengthen its efforts on distance learning/training on development and evaluation of innovative nuclear technology for qualified professionals and students, and to further develop tools that support effective and efficient delivery of services to Member States.

10. The General Conference encouraged interested Member States to explore non-electric applications of nuclear power, in full conformity with their national priorities, policies, laws and regulations, and called upon the Secretariat to strengthen its efforts in promoting the benefits of non-electric application of nuclear power, including through international cooperation.

11. The General Conference encouraged the Secretariat and interested Member States to complete the revision of the INPRO methodology and to publish its overview.

12. The General Conference also encouraged the Secretariat to continue exchanging knowledge and experience in the area of innovative, globally sustainable nuclear energy systems through activities focused on innovative nuclear technologies and their underlying science and technology.

13. The General Conference encouraged the Secretariat to continue providing assistance to interested Member States and promoting knowledge exchange in this field, including through the organization of international conferences on fast reactors and related fuel cycles.

14. The General Conference encouraged the Secretariat to support interested Member States to initiate or accelerate research, development, demonstration and to facilitate deployment of safe and sustainable fusion energy, in line with national priorities, as well as to continue sharing knowledge and experience, including across all relevant Agency initiatives, on fusion energy.

15. The General Conference encouraged the Secretariat to continue studying the legal and institutional aspects of fusion energy deployment, including through a cross-departmental approach, and to keep Member States informed on its work related to fusion energy development and deployment, and to strengthen activities in this area.

B. Progress Since the 68th Regular Session of the General Conference

16. The Secretariat further provided assistance focusing on transition to sustainable nuclear energy systems using, inter alia, the analytical approaches, tools and services developed by INPRO. In 2024, the Agency’s INPRO project accepted three new Member States, namely Mongolia, Rwanda and Sri Lanka, bringing the total number of INPRO members to 47 (46 Member States and the European Union).

17. In May 2025, the Agency launched the new INPRO Collaborative Project “Developing Competency in Strategic Planning for Sustainable Nuclear Energy through Educational Programmes”, which aims to support the educational community in facilitating and contributing to the development and implementation of university-level courses based on the INPRO Model Curriculum. By developing the coursework, the project helps to build national expertise in Member States for sustainable nuclear energy planning.

18. The Secretariat implemented further web-based tools for implementing the INPRO Collaborative Projects. In May 2025, the Agency promoted the use of NES Simulators for collaborative project participants and in training that took place in Paks, Hungary, attracting 22 participants from 14 Member

States. During the training, the participants learned how to model nuclear material flows in nuclear energy systems and to calculate the economic parameters.

19. The Agency enhanced the INPRO Wiki pages to support Member States in applying the INPRO methodology to a nuclear energy systems assessment, by providing templates and checklists for the assessments.

20. In November 2024, the Agency conducted an assist visit to Indonesia to review a draft document prepared using an INPRO ROADMAPS template. This visit aimed to establish Indonesia's national implementation strategy for nuclear power development by 2060.

21. The Republic of Korea modified one nuclear energy system (NES) simulator and is now using the enhanced version for the development of their nuclear energy scenarios. The modified simulator covers new scenarios, and the Republic of Korea offered it for use to INPRO members.

22. In September 2024, the Agency conducted a Technical Meeting of the Analysis Support for Enhanced Nuclear Energy Sustainability Pilot Study "Sustainable Deployment Scenarios for Small Modular Reactors" (ASENES SMR) in Yerevan. The meeting was attended by 51 participants from 20 Member States, as well as 6 SMR developers, to provide relevant information and discuss results pertaining to the case studies. The project accepted a new joint case study involving user and technology holder countries.

23. In November 2024, the Agency conducted a Hybrid-Technical Meeting of the ASENES Pilot Study "Potential of innovative nuclear installations to support multi-recycling of fuel in a nuclear energy system" (STEP FORWARD) in Vienna as part of the ASENES service, with 42 participants from 28 Member States. Nine Member States are utilizing tools for multi-criteria decision analysis methods to comparatively evaluate plausible nuclear energy system options in collaborative projects, such as ASENES SMR and STEP FORWARD.

FIG. B.1. Participants at the Joint ICTP–IAEA INPRO School on Strategic Planning for Sustainable Nuclear Energy working in small groups on their group projects, in Trieste, Italy, July 2024. (Source: IAEA)

24. In February 2025, the Agency hosted a Technical Meeting on Operating Experience and Lessons Learned on Managing Non-Standard Legacy Spent Fuels from Power and Research Reactors. The meeting was attended by 26 participants from 13 Member States and 2 International Organizations, who shared their operating experience and lessons learned on managing non-standard legacy spent fuels from power and research reactors to support the management of spent fuels generated by small modular reactor technologies.

25. In July 2025, the Agency will host a Technical Meeting on the Management of Spent Fuel (Pebbles and Compacts) from High Temperature Reactors. The objective of the meeting is to collect global information on experiences in managing spent fuels from high temperature reactors (HTRs) in order to anticipate the challenges of managing spent fuels from future HTR-small modular reactors, and to conduct a gap analysis of R&D and innovation needs in order to identify collaborative research and development opportunities that may be supported by the Agency.

26. The Agency conducted Indonesia's nuclear energy system assessment in November 2024. The assessment covers all INPRO sustainability areas (economics, infrastructure, waste management, proliferation resistance, physical protection, environment and safety of one SMR technology).

27. In January 2025, the Agency provided a national awareness session on INPRO methods and tools to Mongolia, via Webex, specifically to support the country's engagement as a new INPRO member.

28. In June 2025, the Agency supported train the trainers' capacity building through regional INPRO schools in Paks, Hungary, where 23 participants from 14 Member States (including 1 local participant)

were trained on Strategic Planning for Sustainable Nuclear Energy and the use of INPRO tools — the Nuclear Energy System Assessment Economics Support Tool (NEST) and MESSAGE — along with demonstrations of other INPRO tools. In July 2025, another Regional INPRO School programme will be held in Daejeon, Republic of Korea through the Korea Nuclear International Cooperation Foundation.

29. The Agency continued pursuing the implementation of new NPP simulators supporting efficient delivery of services to Member States. In August 2025, the Agency plans to expand its educational simulator suite with the new Educational Severe Accident Simulator, designed to support training on hypothetical severe accident scenarios in light water reactors.

30. In April 2025, the Agency organized a webinar on the Results of the Coordinated Research Project on Fuel Materials for Fast Reactors, attended by 41 participants from 23 Member States.

31. In June - July 2025, the Agency hosted a Workshop on Fuel Performance Assessment and Behaviour for Liquid Metal Cooled Fast Reactors where 37 participants from 9 Member States shared updates on the current status of fuel behaviour in liquid metal-cooled fast reactors, reviewed the outcomes of the completed Coordinated Research Project “Fuel Materials for Fast Reactors” and discussed the scope of new Coordinated Research Project on Testing and Performance Simulation of Advanced Fuels for Liquid Metal-Cooled Fast Reactors.

32. In August 2025, the Agency will host the Technical Meeting on Proliferation Resistance Features of Fast Reactors and Associated Fuel Cycles. The event aimed to review the current status, international progress and recent innovations in the field of proliferation resistance of fast reactors and associated fuel cycles.

33. In November 2024, the Agency, jointly with the Abdus Salam International Centre for Theoretical Physics (ICTP), conducted the fourth Joint ICTP–IAEA Workshop on Physics and Technology of Innovative Nuclear Energy Systems, which was attended by 21 participants in-person and 51 online from 35 Member States. The event reviewed the latest advancements in nuclear reactor design and fuel cycle options, with a particular emphasis on the design and technological features of next generation reactors.

34. In 2024, the Agency completed a CRP entitled “Neutronics Benchmark of CEFR Start-up Tests” with a sixth Research Coordination Meeting conducted in November 2024. A benchmark analysis of China Experimental Fast Reactor (CEFR) physics start-up tests included an evaluation of the criticality, control rod worth, reactivity effects and neutron spectral characteristics. The recorded experimental data from the CEFR start-up have provided an excellent opportunity for validation of the physical models and neutronics simulation codes.

FIG. B.2. CRP "Neutronics Benchmark of CEFR Start-up Tests" begins with a Reactor Site Visit to the China Institute of Atomic Energy Headquarters in Beijing, China. (Source: IAEA)

35. In 2025, the Agency started a new CRP entitled "Benchmark Analysis of Transient Experiments Performed at the Gas Cooled Test Facility S-ALLEGRO" aimed at the numerical simulation and analysis of tests performed at the helium experimental facility, operated by the Research Centre Rež (CVR) in Pilsen, Czech Republic. Simulating these S-ALLEGRO experiments offers an excellent opportunity to validate the physical and mathematical models and to verify numerical simulation codes developed for system and thermal hydraulic analysis of innovative gas cooled reactors, operating both in fast and thermal neutron spectra.

36. In 2025, the Agency published Sodium Coolant Handbook: Thermal Hydraulic Correlations (non-serial publication), which was the output of the CRP entitled "Sodium Properties and Safe Operation of Experimental Facilities in Support of the Development and Deployment of Sodium Cooled Fast Reactors (NAPRO)".

37. A Technical Meeting on Reactor Physics, Thermal Hydraulics and Plant Design of Molten Salt Reactors, held in Vienna in April 2025, attracted 20 participants from 11 Member States and provided a forum to exchange information on the subject and receive feedback from the participants on further research and development required to facilitate the licensing of designs and fuel, as well as a deployment roadmap of molten salt reactors.

38. The Seventh International Workshop on Models and Data for Plasma-Material Interactions in Fusion Devices took place in Vienna in May 2025. This event brought together researchers and scientists from the areas of fusion energy and materials science, who reviewed advances in the modelling of processes relevant to plasma-wall interactions (PWIs) and plasma-material interactions (PMIs) in fusion devices.

39. In November 2024, the Agency released the *IAEA World Fusion Outlook 2024*. This publication is intended to be the global reference for authoritative information and updates on fusion energy, and outlines achievements in fusion energy — its safety, security, safeguards, nuclear law and liability challenges — and the role of the Agency and its ongoing efforts in this area.

40. The Agency continued its work with ITER on fusion, specifically on the INPRO Collaborative Project on Legal and Institutional Issues of Prospective Deployment of Fusion Plants (the INPRO Fusion Study). During the reporting period, ITER provided input and a review of the study.

41. A Joint ICTP–IAEA Fusion Energy School was held in May 2025 in Trieste, Italy was attended by 16 in-person participants from 12 Member States. The two week-long intensive school, featuring lectures by experts from academia and the private sector, helped broaden participants' understanding of fusion energy and provide them with opportunities to connect with leading researchers and other stakeholders.

42. The ninth IAEA DEMO Programme Workshop was held in Aomori, Japan in June 2025, hosted by the National Institutes for Quantum Science and Technology. The event attracted 50 participants from 9 Member States. During the event, fusion scientists, engineers, policy makers, regulators and entrepreneurs reviewed recent developments in topics such as magnets, the tritium fuel cycle, neutronics and special topics including non-proliferation, DT spherical tokamaks and national strategies.

43. Through the MOU between the Agency and the ITER Organization and Practical Arrangements with the Fusion Industry Association signed in November 2024, the Agency strengthened cooperation on promotion and outreach, public awareness and engagement, information sharing, education and training and other key areas for fusion energy. The Agency also continued to work with interested Member States and international organizations on fusion energy technology development

Approaches to Supporting Nuclear Power Infrastructure Development

A. Background

1. In resolution GC(68)/RES/11.B.7, the General Conference encouraged the Secretariat to pursue its assistance activities in the area of nuclear infrastructure development provided to Member States embarking on or expanding nuclear power programmes.

2. The General Conference requested the Secretariat to continue to incorporate lessons learned from INIR missions and to enhance the effectiveness of such INIR service, through periodic reviews similar to previous reviews (IAEA-TECDOC Series No. 1779 and No. 1947).

3. The General Conference encouraged the Secretariat to be prepared to perform INIR missions in all UN official languages, to allow the highest level of information exchange during the missions, and to expand the panel of related experts, especially in countries using one of these languages other than English as a working language, while ensuring that the use of such experts does not constitute a conflict of interest or convey commercial advantage.

4. The General Conference requested the Secretariat to continue to update the nuclear infrastructure bibliography, as useful tools to help Member States plan technical cooperation and other assistance for the development of their national nuclear power programmes such as training needs for capacity building.

5. The General Conference encouraged the Secretariat to facilitate, where possible, international coordination, including through consultations with Member States that are providing financial support for nuclear infrastructure development activities, to improve efficiency and reduce overlap and duplication of multilateral and bilateral assistance to Member States, provided it avoids all conflicts of interest and excludes areas which are commercially sensitive.

6. The General Conference encouraged the Agency to review and adapt the evaluation methodology, taking into account the work being coordinated and carried out under the Agency-wide Platform on SMRs and their Applications (IAEA SMR Platform) and the activities being undertaken under the SMR Regulators' Forum and the Nuclear Harmonization and Standardization Initiative (NHSI).

7. The General Conference encouraged the Agency to continue to organize workshops on management systems and the leadership roles and responsibilities of senior management in the context of a new nuclear power programme.

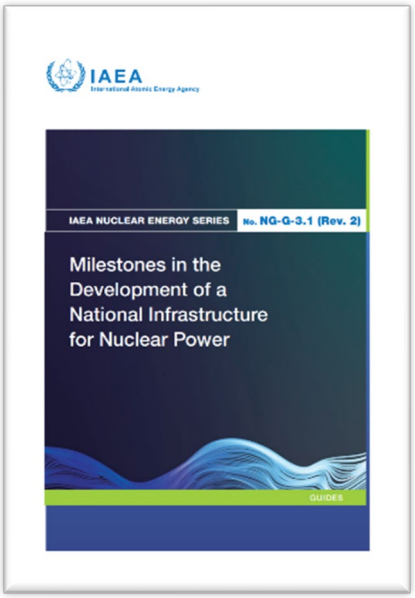
B. Progress Since the 68th Regular Session of the General Conference

8. The Agency continued to deliver Interregional Nuclear Infrastructure Training Courses to increase awareness and understanding of the Milestones Approach. Training was provided for 797 participants from 52 Member States in 23 interregional training courses. Six interregional training courses will be provided to 150 participants from around 25 Member States.

FIG. B.1. Interregional Workshop on Self-Evaluation of Infrastructure Development for Nuclear Power Programmes, Jakarta, Indonesia, 23–27 September 2024. (Source: BRIN)

9. The Agency continued the revision and development of infrastructure-related publications. Notably, the second revision of *Milestones in the Development of a National Infrastructure for Nuclear Power* (IAEA Nuclear Energy Series No. NG-G-3.1 (Rev. 2)), which was published with an annex on infrastructure considerations for SMRs. The Nuclear Infrastructure Development e-Book (NeB) was made available to Member States in September 2024 and provides an interactive version of the Milestones Approach with an immersive experience and links to more than 120 publications or resources.

10. The Agency continued to provide capacity building and training in the area of funding and financing of nuclear power projects, through expert missions and workshops. At the Interregional Training Course on Nuclear Power Plant Financing and Risk Allocation, organized in cooperation with Argonne National Laboratories in September/October 2024, 24 participants from 21 Member States learned about the financing of NPPs, including contracting and ownership approaches. In November 2024, the Agency also held the Interregional Training Course on Funding, Financing and other Economic Aspects in Nuclear Infrastructure Development in cooperation with Électricité de France, during which 24 participants from 20 Member States learned about nuclear economics and the costs and benefits of a nuclear power programme to help them build a national position.



11. The Secretariat continued its efforts to provide integrated Agency assistance to Member States embarking on or expanding nuclear power programmes based on the *Agency's Milestones Approach* (IAEA Nuclear Energy Series No. NG-G-3.1, Rev. 2, 2024).

12. In addition, Member State specific 'core teams' include representatives from all relevant Departments to plan and tailor Agency assistance to the current needs of each Member State and to monitor the progress of national infrastructure development following an INIR mission. Assistance to Member States in the earlier phase of their programmes, and to those who have not yet had an INIR mission, continues to be coordinated. The Agency also delivers activities to ensure Member States have the necessary tools to further develop their decision making capabilities.

13. The Agency continued to incorporate feedback from INIR missions in its interactions with Member States to enhance the effectiveness of the INIR service. The Agency developed further explanatory guidance to support the self-evaluation of infrastructure development in Member States and shared during national workshops, in particular in Singapore in January 2024 and in Vietnam in March 2025 — both Member States are planning to host INIR missions. This guidance will also be reflected and consolidated in a new web-based tool currently under development for the Member States to facilitate effective self-evaluation of their infrastructure development.

14. The Agency continued to conduct INIR missions and, where appropriate, will include a combination of English and one of the UN official languages to facilitate the highest level of information exchange. While self-evaluation reports are expected to be submitted in English, supporting documents can be provided in other official languages. The main INIR mission report is published in English.

15. The Agency continued to promote the nuclear infrastructure development competency framework database, whereby its online publication facilitates access by and increases information sharing with interested parties in the Agency and Member States. The Agency continues to promote the use of the database during Agency meetings and uses feedback to further refine its content and structure.

16. Supported by external experts, the Secretariat continued to undertake regular systematic reviews of the Nuclear Infrastructure Bibliography to identify areas not covered by existing Agency publications and those in need of revision. The regularly updated infrastructure bibliography is published on the Agency website, structured according to the 19 infrastructure issues of the Milestones Approach, and has proven to be a useful tool for supporting embarking countries in building competence.

17. Through two Technical Meetings — one on the Experience of Countries Embarking on a Nuclear Programme in April 2025 and another on the Specifics of Countries Expanding their Nuclear Programme in June 2025 — the Agency provided Member States with a forum to share experiences and information. This included exchanges between Member States that had recently considered nuclear as an option and those currently developing their infrastructure, as well as between Member States that already had NPPs and were contemplating expansion in the near future.

18. The Agency delivered 10 workshops on the development of infrastructure to Azerbaijan (2), Côte d'Ivoire, Kenya, Mongolia (2), Rwanda, Sri Lanka, Tanzania and Viet Nam, raising awareness and providing the necessary tools to pursue the development of their programme. Over 350 officials and staff from different organizations in the host countries participated in these workshops.

19. The 18th annual Technical Meeting on Topical Issues in the Development of Nuclear Power Infrastructure, which took place in Vienna in March 2025, was attended by 92 participants representing 47 Member States and international organizations. The meeting continued to be the main forum for representatives from countries expanding, introducing or considering a new nuclear power programme to provide updates on their progress, share good practices and offer lessons learned from implementing the Agency's Milestones Approach, to establish the infrastructure required for a safe and successful nuclear power programme, and prioritize and sequence the activities needed.

FIG. B.2. 18th Technical Meeting on Topical Issues in the Development of Nuclear Power Infrastructure, Vienna, 11–14 March 2025. (Source: IAEA)

20. To disseminate information to Member States, the Agency organized a webinar in January 2025 on navigating phase 1 of the Milestones Approach in Estonia and on the updated Milestones Approach publication in June 2025. To reach out to Latin American countries, a webinar in Spanish in August 2025 will cover the Approach. Webinars provide a wide platform to disseminate information, with around 400 registrations from approximately 70 Member States for each webinar.

21. The Secretariat continued to facilitate the incorporation of multilateral and bilateral assistance into the IWP, where possible and permitted by the Member State. Member States are encouraged to share information about infrastructure development activities conducted in cooperation with other international organizations, donors and vendors. This aims to maximize the benefits of Agency support and avoid overlap with third party support.

22. As part of the ongoing Peaceful Uses Initiative project on "Supporting the Development of Management Systems and Nuclear Safety Culture in Countries Introducing Nuclear Power Programmes (Phase 2)", the Agency continued to offer tailored assistance in the area of management systems to Member States embarking on new nuclear power programmes or expanding existing ones. Activities under this project supported the development and review of management system documentation in the key organizations and also enhanced the understanding by senior managers about the role of management systems to help ensure safety, security, effectiveness and sustainability. The Agency conducted six activities in Bulgaria, Egypt, Kazakhstan and Poland (3) to support the development of management systems and safety culture.

Small and Medium-Sized Reactors or Small Modular Reactors – Development and Deployment

A. Background

1. In resolution GC(68)/RES/11.B.8, the General Conference encouraged the Secretariat to continue its efforts to facilitate support to Member States in a consistent and coordinated manner, including through the tools and activities developed in the framework of the IAEA SMR Platform, and encouraged Member States to use those tools as well as INPRO tools and services for assessment of SMR deployment sustainability.

2. The General Conference requested that the Secretariat ensure coordination between the IAEA SMR Platform and the NHSI and report back to Member States.

3. The General Conference requested the Secretariat to report to Member States on its strategic vision, programmatic objectives and expected outcomes from the NHSI activities beyond 2024 at the NHSI plenary meeting held in Vienna on 21 October 2024.

4. The General Conference encouraged the Secretariat to continue taking appropriate measures to assist Member States, particularly embarking countries, engaged in the process of preparatory actions with regard to demonstration projects, and encouraging the development of safe, secure, economically viable SMRs with proliferation resistance and comprehensive strategies for decommissioning and radioactive waste and spent fuel management.

5. The General Conference called upon the Secretariat to continue to promote effective international exchange of information on SMRs by organizing technical meetings and workshops, as appropriate, and to produce relevant status and technical reports.

6. The General Conference encouraged the Secretariat to continue working on defining indicators of safety performance, operability, maintainability and constructability so as to assist countries in assessing advanced SMR technologies and developing guidance for SMR technology implementation.

7. The General Conference looked forward to the IAEA International Conference on Small Modular Reactors and their Applications held in Vienna from 21 to 25 October 2024.

8. The General Conference encouraged the Secretariat to continue developing generic user requirements and criteria, sharing information on codes and standards, and experiments and validation of simulation computer codes for SMRs, accelerating the implementation of a nuclear infrastructure for SMRs in the framework of the workstreams of the NHSI and in cooperation with Member States and relevant stakeholders

9. The General Conference invited the Director General to raise appropriate funding from extrabudgetary sources in order to support the activities under the IAEA SMR Platform and to contribute to the implementation of Agency activities relating to the sharing of experience and lessons learned from the development and deployment of SMRs.

10. The General Conference requested the Director General to continue to report on: the activities coordinated and carried out by the IAEA SMR Platform; progress made on NHSI; and progress made in the research, development, demonstration and deployment of SMRs in interested Member States intending to introduce them.

B. Progress Since the 68th Regular Session of the General Conference

11. The Secretariat continued its efforts to facilitate support to Member States in a consistent and coordinated manner, including through the tools and activities developed in the framework of the IAEA SMR Platform. A Special Task Force was established in the framework of the IAEA SMR Platform to ensure full internal coordination and consistency of the NHSI with all the other Agency's activities in the area of SMRs.

12. The publication Small Modular Reactors: Advances in SMR Developments 2024 (non-serial publications) provides Member States with a concise overview of the latest developments regarding SMR technology worldwide. It ranked as the third most downloaded Agency publication in 2024.

13. In October 2024, 60 regulators, 70 industry representatives and 28 members of international organizations or Permanent Missions gathered at the second NHSI plenary, held in Vienna. The Agency's long term view is to advance the development of a global framework for regulatory reviews of advanced reactors and prepare the industry, the end users and the Member States for a large scale deployment of SMRs. Activities supporting this goal have been presented and approved for 2025–2026.

14. The outcomes of NHSI Phase 1 were reported during the third NHSI plenary on 21 October 2024, gathering 60 regulators, 70 industry representatives and 28 members of international organizations or Permanent Missions. NHSI Phase 2 for 2025–2026 was launched during this meeting. The Progress of Phase 2 will be discussed at the next NHSI plenary in December 2025.

15. The Agency's NHSI Industry Track Topic Group 1 completed draft generic high-level user recommendations and considerations and its publication is in progress. Activities planned for the second phase include developing technology-specific user recommendations and considerations, starting with high temperature gas-cooled reactors.

16. The Agency's NHSI Industrial Track Topical Group 2 issued two working papers related to codes and standards: "Potential for Harmonization and Standardization in the Approval Processes for High Integrity Long-Lead Items" and "Why a consistent approach to nuclear codes and standards is crucial for the serial deployment of standardized SMRs".

17. The Agency continued its work on developing common approaches on codes and standards under the NHSI Industry Track Topic Group 2. It established a database in the context of NHSI Industry Track Topical Group 2 and made it available to Member States as part of the NUCLEUS CONNECT MSCQ

network. The database maps internationally used standards in quality and management systems, engineering (mechanical, I&C, in-service inspection and civil), equipment qualification and advanced manufacturing. Similar work took place with regard to approvals of safety related components in the Member States, approval processes for industrial grade items in safety systems, and non-nuclear codes and standards leading to large design changes in new NPPs.

18. Under NHSI Industry Track Topical Group 3, the Agency launched a web interface in April 2025 to support the Network for Experiments and Code Validation Sharing (NEXSHARE), which fosters the exchange of information on experiments and code validation. This web interface hosts a database of experiment facilities applicable to Advanced Reactors and SMRs. Along with the modernization of the interface, the Agency plans to integrate and update existing databases within NEXSHARE during the second phase of NHSI. In addition, technology-specific activities are being initiated.

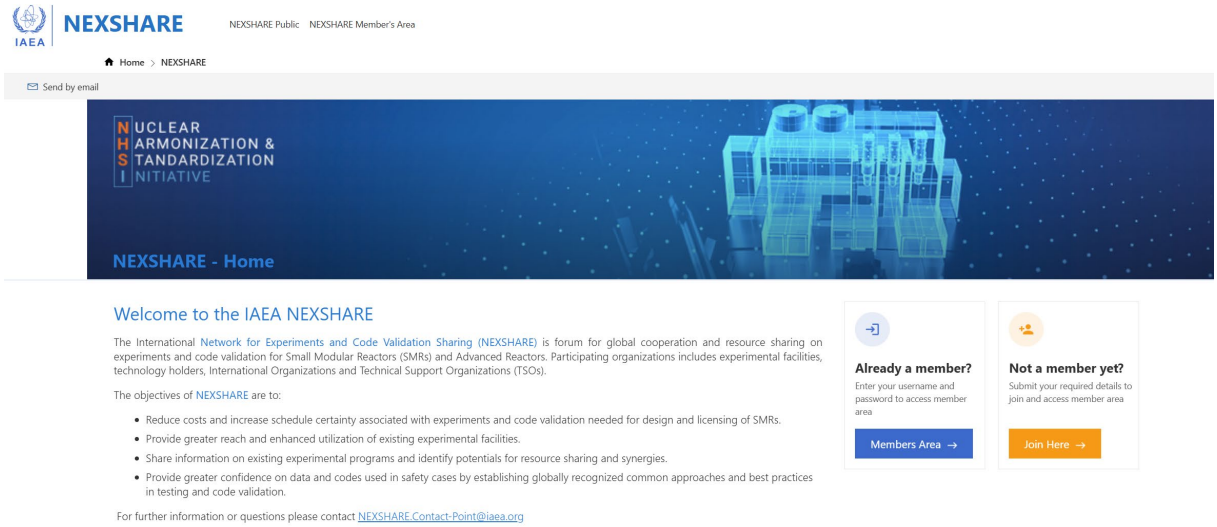


FIG. B.1. The Agency has worked with the OECD-NEA and the Generation IV International Forum to establish the NEXSHARE web interface, hosted by the Agency and linking to relevant information owned by the OECD-NEA. The Agency works closely with the OECD-NEA for further synergies on experiments and code validation for SMRs. (Source: IAEA)

19. The current version of the Milestones Approach publication contains an annex that discusses specific considerations related to the infrastructure requirements for SMRs. In order to supplement the annex, a specific publication was initiated under NHSI Industry Track Topic Group 4 to further assess infrastructure development issues for a nuclear power programme and accelerate the deployment of SMRs.

20. In addition, a draft publication on high-level Generic User Recommendations and Considerations was discussed under NHSI Industry Track Topic Group 4.

21. In December 2024, the Agency organized a Technical Meeting on the Harmonization and Use of Industrial Codes and Standards for Small Modular Reactors in Vienna, with 104 participants from 34 Member States who discussed concrete application cases and further harmonization activities.

22. In March 2025, the Agency organized a webinar on the Achievements and Work of NHSI Industrial Track TG2: Common Approaches on Codes and Standards with 245 participants. During the

webinar, speakers showcased the importance of harmonization in their field of expertise and how they are using NHSI outcomes.

23. The Agency launched a new SMR School and held the first SMR School in Kenya in May 2025, and will conduct two more SMR Schools in Thailand in July 2025 and Argentina in August 2025 for about 90 government officials from the regions. The SMR School is intended to raise awareness about key aspects of SMR development and deployment among the participants.

24. The Secretariat also completed a four-year CRP (2021–2024) entitled "Economic Appraisal of SMR Projects: Methodologies and Applications" and started the development of the final report that will be published in due course. The CRP discusses technical-economic assessment approaches for advanced reactor concepts currently under development for near-term deployment. It includes methodologies for planning and cost analysis, project structuring, financial valuation, business case demonstration, and economic appraisal.

25. The First Research Coordination Meeting on the Standardization of Subsized Samples for Post-Irradiation Examination and Advanced Characterization of Fuel and Structural Materials for Small Modular Reactor and Advanced Reactor Applications was held in October 2024. It was attended by 19 experts from 10 Member States, who discussed the plans of individual research proposals.

26. The First Research Coordination Meeting on Challenges, Gaps and Opportunities for Managing Spent Fuel from Small Modular Reactors was held in November 2024. It was attended by 44 experts from 21 Member States and 1 international organization, who presented the content of their proposals, identified main areas of potential collaboration among partners, drafted action plans to track the implementation of the identified tasks, agreed on deliverables to be issued in the CRP and started the discussion and development of back end roadmaps for the different SMR technologies envisaged.

27. In May 2025, a Technical Meeting on Technology Assessment and the Procurement Process of a Nuclear Power Plant was held in Vienna, providing a forum for exchange on state of the art approaches to technology assessment methods for NPPs, including small modular reactors, with a focus on the engineering procurement process. It was attended by 23 participants from 15 Member States.

28. A Technical Meeting on Approaches for Design and System Readiness Evaluation of Small Modular Reactors for Near-term Deployment, planned to be held in Vienna in July 2025, will provide a forum for the exchange of information and feedback from Member States on state of the art approaches or methodologies currently being implemented, or being developed, to evaluate technology readiness levels of advanced nuclear systems, focusing on SMRs.

IAEA
International Atomic Energy Agency
Atoms for Peace and Development

www.iaea.org

International Atomic Energy Agency
PO Box 100, Vienna International Centre
1400 Vienna, Austria
Tel.: (+43-1) 2600-0
Fax: (+43-1) 2600-7
Email: Official.Mail@iaea.org

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