Safety of Nuclear Installations

Objective

To support Member States in improving the safety of nuclear installations during site evaluation, design, construction and operation through the development and maintenance of an up to date set of safety standards and providing for their effective application. To support Member States in establishing and enhancing their safety infrastructure through review services, and in improving the safety of nuclear installations by assisting their adherence to, and facilitating implementation of, the Convention on Nuclear Safety and the Code of Conduct on the Safety of Research Reactors. To support Member States in capacity building through education and training, and by encouraging the exchange of information and operating experience and international cooperation, including enhanced coordination of research and development activities.

Regulatory Infrastructure for Safety

The Agency held a virtual Regional Workshop on Self-Assessment of Regulatory Infrastructure for Safety for Arab Network of Nuclear Regulators Member States in December 2021.

In October 2021, the Agency held a virtual Workshop on the Application of a Graded Approach to Regulating Nuclear Installations in Latin America to provide a platform for discussion and exchange of information, knowledge and lessons learned in applying a graded approach to all the functions of regulatory programmes.

The Agency developed a Technical Report on the safety–security–safeguards considerations by design of novel advanced reactors, including small modular reactors (SMRs). The report elaborates on the gaps and challenges in this area and provides input to a draft Safety Report provisionally entitled *Review of Applicability of Safety Standards to Novel Advanced Reactors*, which is currently under development.

The Agency hosted the virtual Steering Committee Meetings of the SMR Regulators' Forum in April and November 2021, enabling discussions among Member States and other stakeholders to share SMR regulatory knowledge and experience. The Forum's three working groups published multiple reports and began work on selected topics for their next phase. The Agency also held a workshop on the regulatory challenges of SMRs in Amman in December 2021.

Convention on Nuclear Safety

The Agency facilitated the Organizational Meeting for the Joint Eighth and Ninth Review Meeting of the Contracting Parties to the Convention on Nuclear Safety in October 2021, where the Contracting Parties confirmed, inter alia, the Officers for the Joint Review Meeting and the composition of Country Groups.

Press conference during the Integrated Regulatory Review Service follow-up mission to Belarus in December 2021.

Design safety and safety assessment

The Agency published *Level 1 Probabilistic Safety Assessment Practices for Nuclear Power Plants with CANDU-Type Reactors* (IAEA-TECDOC-1977) in September 2021, *Current Approaches to the Analysis of Design Extension Conditions with Core Melting for New Nuclear Power Plants* (IAEA-TECDOC-1982) in October 2021, and *Risk Aggregation for Nuclear Installations* (IAEA-TECDOC-1983) in December 2021.

The Agency held a virtual Technical Meeting on CANDU Probabilistic Safety Assessment in October 2021 to facilitate cooperation and information exchange among the members of the CANDU Probabilistic Safety Assessment Working Group. Also in October 2021, the Agency held a virtual Technical Meeting on the Licensing of Advanced Nuclear Fuels for Water Cooled Reactors.

The Agency published three Safety Guides related to design and safety assessment: *Format and Content of the Safety Analysis Report for Nuclear Power Plants* (IAEA Safety Standards Series No. SSG-61); *Protection against Internal Hazards in the Design of Nuclear Power Plants* (IAEA Safety Standards Series No. SSG-64); and *Equipment Qualification for Nuclear Installations* (IAEA Safety Standards Series No. SSG-69).

The Agency has also continued to conduct Technical Safety Reviews of new build projects and operating plants in several Member States, helping to enhance the nuclear safety justification in areas that may need improvements in accordance with Agency safety standards. The Agency has also developed guidelines for conducting Technical Safety Reviews for conceptual designs.

Safety and protection against external hazards

The Agency held four hybrid Technical Meetings in September, October and November 2021 to share experiences on site evaluation and design to protect nuclear installations against external hazards, and on evaluation of seismic safety for existing nuclear installations and innovative reactors.

Field visit by an operations reviewer during the Operational Safety Review Team mission in November 2021. (Photograph courtesy of Kalinin nuclear power plant.)

The Agency published two Safety Guides: *Seismic Design for Nuclear Installations* (IAEA Safety Standards Series No. SSG-67) and *Design on Nuclear Installations Against External Events Excluding Earthquakes* (IAEA Safety Standards Series No. SSG-68).

Operational safety of nuclear power plants

The Agency published the revised *SALTO Peer Review Guidelines* (IAEA Services Series No. 26 (Rev. 1)) in June 2021.

The Agency finalized the preparation of the Technical Report on experiences of Member States in ensuring safety, security and reliable operation of nuclear and radiation facilities and activities during the COVID-19 pandemic. This publication, prepared jointly with Member States, aims to summarize and share the actions taken by various stakeholders to manage the risks to the continued operation of facilities and activities posed by the pandemic.

The Agency revised and approved plans to publish revisions of the *IRS Guidelines* (IAEA Services Series No. 19) and the *Manual for IRS Coding* (IAEA Services Series No. 20). The Agency published *Ageing Management of Nuclear Power Plants during Delayed Construction Periods, Extended Shutdown and Permanent Shutdown Prior to Decommissioning* (IAEA-TECDOC-1957) in May 2021. The Agency also developed and approved plans to issue two publications related to ageing and long term operation of nuclear power plants provisionally entitled *Ageing Management and Long Term Operation of Nuclear Power Plants: Data Management, Scope Setting, Review of Plant Programmes and Documentation; and Regulatory Oversight of Ageing Management and Long Term Operation of Nuclear Power Plants*.

Integrated Nuclear Infrastructure Review for Research Reactors mission in Thailand in December 2021.

Safety of Research Reactor and Fuel Cycle Facilities

The Agency held a virtual Technical Meeting on the Use of a Graded Approach in the Application of the Safety Requirements for Fuel Cycle Facilities in July 2021, at which participants exchanged experience in the use of a graded approach in the application of safety requirements, including the Agency's safety standards.

The Agency held a virtual Technical Meeting on Safety Analysis and Licensing Documentation for Fuel Cycle Facilities in November 2021.

The Agency held two workshops to assist Member States in the preparation of a feasibility study and assessment of national nuclear infrastructure for new research reactor programmes.

The Agency conducted an Integrated Nuclear Infrastructure Review for Research Reactors mission to Thailand in December 2021 to assess the status of development of national infrastructure to support a new research reactor project.

The Agency provided assistance in reviewing the commissioning programme of a research reactor in the Philippines and held virtual training for the Philippines via live experimental demonstration on a subcritical assembly in the United States of America.

The Agency held four Technical Meetings aimed at assisting participating Member States to build capacity in several safety areas of research reactors. These included Technical Meetings on ageing management, refurbishment and modernization in May–June 2021; on digital instrumentation and control systems for research reactors in August 2021; on good practices for the operation and maintenance of research reactors in August 2021; and on the safety of research reactors under project and supply agreements and review of safety performance indicators in November 2021.

CASE STUDY

Agency Continues In-person Safety and Security Peer Review Services Despite COVID-19 Pandemic

"When the COVID-19 pandemic first caught the world's attention, one of our many concerns was how it would impact the Agency's commitment to supporting high levels of nuclear safety and nuclear security worldwide," said Lydie Evrard, Deputy Director General and Head of the Department of Nuclear Safety and Security. "Our activities were aimed in particular at supporting Member States in their efforts to ensure the safety of nuclear power plants under these unprecedented pandemic conditions. Equally important during this period was to provide support to Member States for them to ensure that radioactive sources and nuclear material were protected against malicious acts."

The Agency's 17 types of peer review and advisory services in nuclear safety and security include the International Physical Protection Advisory Service (IPPAS), which provides advice on how to establish, enhance and maintain the security of nuclear and other radioactive material and associated facilities and activities, using the Nuclear Security Series as the basis; and the Operational Safety Review Team (OSART) service, which helps strengthen the safety of nuclear power plants during both commissioning and operation, based on the Agency's safety standards.

Both services, which require in-person reviews on site, have faced huge challenges owing to the COVID-19 pandemic and related travel restrictions, making the review activities extremely difficult to plan and implement.

Despite these challenges, in 2021, the Agency conducted six IPPAS peer review missions in Belarus, Burkina Faso, the Czech Republic, the Niger, Senegal and Türkiye. This was alongside seven face to face OSART reviews in Belarus, France, the Russian Federation and Slovakia.

As the world continues to grapple with the COVID-19 pandemic, the Agency has ensured its nuclear review services are carried out with minimal disruptions.

IPPAS contributes to nuclear security for a quarter of a century

As part of IPPAS missions, an international team of experts reviews a country's nuclear security regime and compares it with international guidelines and best practices. Over the past 25 years, 96 IPPAS reviews, including 22 follow-up missions, have been conducted in 57 countries.

As a large amount of nuclear and other radioactive material is used globally for peaceful purposes, the Agency is continuing to support the protection of nuclear facilities and material by working closely with national authorities and continuously enhancing IPPAS.

"We need to make stakeholders and policymakers aware of the national security measures needed to keep radioactive material safe and secure. The IPPAS mission has been a good platform and opportunity for us to gain peer reviews and input so we can upgrade our security measures," said Delwende Nabayaogo, Nuclear Security Officer at the National Radiation Protection and Nuclear Safety Authority in Burkina Faso.

OSART observes strong commitment and improvements

Countries can seek independent, international perspective and advice by requesting OSART missions to identify opportunities to further improve the operational safety performance of their nuclear power plants.

"Continuous improvement, openness and transparency were the reasons why we invited this mission. I am very pleased that Agency experts noted significant positive progress compared to the pre-OSART mission in 2019," said Branislav Strycek, General Director of Slovenské elektrárne, the operator of Mochovce nuclear power plant in Slovakia, where an OSART follow-up mission took place in September 2021.

OSART missions provide operators with insights on how to improve safety further and have led to enhanced safety performance worldwide — with over 95% of OSART recommendations and suggestions resolved or addressed satisfactorily by operators during the OSART follow-up mission. Over the past 39 years, 368 OSART missions, including 155 follow-up missions, have been conducted in 37 Member States.