
Safety of Nuclear Installations

Objective

To continuously improve the safety of nuclear installations during site evaluation, design, construction and operation through the availability of safety standards and their application. To support Member States in developing and implementing the appropriate safety infrastructure. To assist adherence to, and implementation of, the Convention on Nuclear Safety (CNS) and the Code of Conduct on the Safety of Research Reactors and to strengthen international cooperation.

Regulatory Infrastructure for Nuclear Safety

In 2017, the Agency conducted 32 expert missions, workshops and training activities to provide Member States with guidance and information on establishing an effective regulatory infrastructure on the basis of the Agency's safety standards, in particular the Safety Guide *Establishing the Safety Infrastructure for a Nuclear Power Programme* (IAEA Safety Standards Series No. SSG-16). Expert missions addressed areas such as the development of safety regulations; human resource development; establishment of a management system at the regulatory body; and identification and planning of actions to strengthen national safety infrastructure. The Agency also held two Hands-on Regulatory Inspector Training Workshops to help Member States embarking on a nuclear power programme to prepare for inspections of plant construction sites. The workshops were held at the nuclear power plant in Zwentendorf, Austria, which was completed but never entered service.

The Agency assisted Member States in strengthening their national regulatory infrastructure for nuclear and radiation safety through its Integrated Regulatory Review Service (IRRS). During the year, it conducted follow-up IRRS missions to four Member States with operating nuclear power plants: Belgium, the Czech Republic, France and Romania. It also continued to promote and conduct IRRS missions to embarking countries. IRRS follow-up missions were conducted to Poland in June and to Jordan in October. In July, Nigeria hosted a full scope IRRS mission that included a module tailored to assist embarking countries in reviewing progress against actions set out in SSG-16.

The Agency organized the second International High Level Meeting on the Challenges Faced by Newcomer Countries Regarding the Establishment of an Effective Regulatory Framework and Infrastructure for Safety, held in Jakarta, Indonesia, in November. Fourteen high level representatives of nine countries took part. The meeting participants developed a report summarizing the challenges identified and the experience, information and recommendations shared during the meeting.

In 2017, the Regulatory Cooperation Forum (RCF) organized meetings with four of its active recipient countries — Belarus, Jordan, Poland and Viet Nam — to coordinate support plans for building regulatory capability. In June, Ghana and Morocco became active recipient countries of the RCF, bringing the total number to six. The RCF organized

a workshop, in collaboration with the Arab Network of Nuclear Regulators and the Forum of Nuclear Regulatory Bodies in Africa, on regulatory control for all recipient countries. The workshop, held in Rabat, Morocco, in November, was attended by 3 experts and 18 trainees from 10 countries.

Convention on Nuclear Safety

The Agency hosted the Seventh Review Meeting of the Contracting Parties to the Convention on Nuclear Safety at the Agency's Headquarters from 27 March to 7 April (Fig. 1). More than 900 participants from 77 Contracting Parties took part. For the first time, countries that have signed the CNS but that have not yet adhered to it were invited to attend the opening plenary, the part of the final plenary when the summary report was adopted and the concluding press conference. Representatives of the media were also invited to the same sessions, which were webcast for the first time. All National Reports were made publicly available on the Agency's web site after the Review Meeting.



FIG. 1. Opening of the plenary session of the Seventh Review Meeting of the Contracting Parties to the Convention on Nuclear Safety, held at the Agency's Headquarters in Vienna, Austria.

The Review Meeting included a peer review of the incorporation of appropriate technical criteria and standards used by Contracting Parties for addressing the principles of the Vienna Declaration on Nuclear Safety into national requirements and regulations. The peer review was carried out in accordance with a decision of the Contracting Parties to the CNS contained in the aforementioned Declaration adopted in 2015. A special session was held to discuss the challenges faced by countries not operating nuclear power plants and by embarking countries in meeting the obligations of the CNS. The Contracting Parties highlighted the need for the Agency to consider coordinating and hosting regional educational workshops for countries with no nuclear power reactors to encourage participation and provide information and assistance in meeting the obligations of the Convention.

Design Safety and Safety Assessment

In June, the Agency convened an International Conference on Topical Issues in Nuclear Installation Safety: Safety Demonstration of Advanced Water Cooled Nuclear Power Plants in Vienna, attended by over 300 participants from 48 Member States and 5 international

organizations. The participants discussed the latest approaches, advances and other matters regarding demonstration of the safety of nuclear power plants planned to be licensed and constructed in the near future. During the conference, the Agency conducted a workshop providing an introduction to and further explanation of design extension conditions, and another workshop on the Agency's technical safety review services.

The Agency supported Member States in sharing information and experience through Technical Meetings on: Challenges in the Application of the Design Safety Requirements for Nuclear Power Plants to Small and Medium Sized Reactors; the Development of the IAEA Technical Document on Developing Design Criteria for a Diverse Actuation System for Nuclear Power Plants; the Development of the Safety Report on Human Reliability Assessment for Nuclear Installations; and Implementation and Integration of Accident Management Guidelines and Interface with Emergency Preparedness and Response.

During the year, the Agency continued coordinating a study that reviewed Member States' application of the Agency's design related Safety Requirements to small and medium sized or modular reactor (SMR) designs and technologies intended for near term deployment. The study indicated that the requirements established in *Safety of Nuclear Power Plants: Design* (IAEA Safety Standards Series No. SSR-2/1 (Rev. 1)) are in principle applicable to water cooled SMR designs, with engineering judgement required for certain aspects. The Agency also supported a similar study conducted by the SMR Regulators' Forum by facilitating discussions on safety and licensing for regulators who are now, or will soon be, reviewing license applications for SMRs. To encourage sharing of information and experience related to nuclear regulation, the Agency organized two workshops for Member States embarking on a nuclear programme that includes SMRs.

Safety and Protection against External Hazards

The Agency provides independent reviews of the site evaluation and designed safety of nuclear installations through its Site and External Events Design (SEED) review service. In 2017, it conducted three preparatory missions for SEED reviews to the Republic of Korea, Thailand and Turkey, and five SEED review missions to Belarus, Indonesia, the Republic of Korea, Turkey and Uganda. It also conducted 13 expert missions, capacity building activities and training workshops under the framework of SEED.

Operational Safety of Nuclear Power Plants

The Operational Safety Review Team (OSART) programme has provided advice and assistance to Member States for 35 years to enhance the safety of nuclear power plants during construction, commissioning and operation. In 2017, the Agency conducted seven OSART missions to China, Finland, France, the Russian Federation, Slovenia, the United Arab Emirates and the United States of America. It also conducted seven follow-up OSART missions to Canada, France, Japan, the Netherlands, Pakistan, the Russian Federation and the United Kingdom.

Safety Aspects of Long Term Operation (SALTO) peer reviews specifically address safe long term operation of nuclear power plants. In 2017, the Agency conducted three SALTO missions to Belgium, China and Sweden, and one follow-up SALTO mission to Mexico. It also carried out one expert mission based on the SALTO methodology to Mexico. The large quantity of data collected during these missions was analysed by the Agency and recorded in a database that provides an overview of findings from SALTO and SALTO follow-up missions from 2005 to 2017. The database was made available to Member States during the year.

The Agency's Peer Review of Operational Safety Performance Experience (PROSPER) service aims at enhancing safety through improved use of operating experience. The Agency conducted two PROSPER missions to the Russian Federation in 2017. It also organized three Technical Meetings aimed at sharing good practices and lessons learned in the use of operating experience: in Argentina, with 35 participants from 6 Member States; in Austria, with 20 participants from 13 Member States; and in France, with 37 participants from 34 Member States.

Through peer review missions and related activities, the Agency assisted Member States, on request, in assessing and improving safety culture at all levels in nuclear regulatory bodies, at nuclear facilities and in other organizations. Leadership and management processes, and the interfaces between human, technological and organizational performance were assessed as part of the seven OSART missions conducted during the year. The Agency conducted an Independent Safety Culture Assessment mission to the research reactor and isotope facility in Petten, the Netherlands, as part of its services to assess leadership and management processes in nuclear facilities other than nuclear power plants. In October, the Agency, in cooperation with the World Association of Nuclear Operators, held a workshop aimed at developing guidance on applying a harmonized safety culture framework; and in November, it conducted a workshop for senior managers on the topic of leadership and safety culture, in Helsinki, Finland.

From 30 October to 3 November, the Agency held its first Pilot International School of Nuclear and Radiological Leadership for Safety, in Nice, France. Twenty junior and middle managers from operators and regulators took part in the School, which uses case studies, presentations, keynote addresses, exercises and discussions to illustrate nuclear and radiological safety leadership concepts in real-life situations (Fig. 2).

The Agency organized the Fourth International Conference on Nuclear Power Plant Life Management in Lyon, France, in October, hosted by France in cooperation with the European Commission's Joint Research Centre and the Electric Power Research Institute. Over 350 participants representing 32 Member States and 4 international organizations discussed the importance of plant life management programmes in ensuring safe and reliable operation of nuclear power plants; the role of configuration management in safety enhancement; and good practices related to the safety aspects of ageing management.



FIG. 2. Junior and mid-career professionals take part in the first Pilot International School of Nuclear and Radiological Leadership for Safety, held in Nice, France.

Safety of Research Reactors and Fuel Cycle Facilities

In 2017, the Agency conducted three Integrated Safety Assessment of Research Reactors (INSARR) missions to Jamaica (Fig. 3), Kazakhstan and Norway, and two follow-up INSARR missions to Poland and Turkey. These missions reviewed the facilities' operational safety and provided guidance and recommendations for safety improvements.



FIG. 3. The INSARR mission team at the JM-1 research reactor in Kingston, Jamaica, in June.

In May, the Agency held the fourth International Meeting on Application of the Code of Conduct on the Safety of Research Reactors, in Vienna. The meeting participants, from 40 Member States, reviewed Member States' self-assessments of the application of the Code to identify areas where it was being satisfactorily applied and areas where further improvements were necessary. They noted that Member States increasingly recognize the Code as a primary guidance document for the safe management of research reactors. They also provided recommendations for improvements in areas identified from safety reassessments, including regulatory supervision, ageing management, planning for decommissioning and implementation of safety upgrades.

The Agency held three workshops on the safety of nuclear fuel cycle facilities during the year: 'Operational Radiation Protection and Waste Management', held in March; 'Regulatory Supervision', held in July; and 'Safety Reassessment in the Light of the Fukushima Daiichi Accident', held in November. The workshops were attended by 72 experts from 29 Member States. Participants shared information, experience and good practices related to establishing and supervising safety and protection programmes based on the Agency's safety standards.