
Safety of Nuclear Installations

Objective

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

Safety Standards

The site selection process can have a significant impact on the cost, safety and public acceptance of a nuclear installation over its operating lifetime. To provide guidance on the process, the Agency published *Site Survey and Site Selection for Nuclear Installations* (IAEA Safety Standards Series No. SSG-35), addressing all safety aspects to be considered during selection and evaluation of a suitable site. This Safety Guide supplements and provides recommendations on meeting the requirements for nuclear installations established in *Site Evaluation for Nuclear Installations* (IAEA Safety Standards Series No. NS-R-3 (Rev. 1)). In addition, the Agency published *Instrumentation and Control Systems and Software Important to Safety for Research Reactors* (IAEA Safety Standard Series No. SSG-37) and *Construction for Nuclear Installations* (IAEA Safety Standards Series No. SSG-38). These publications reflect current international good practices on important topics for nuclear safety.

Nuclear Safety Infrastructure

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During the year, the Agency continued to assist Member States in strengthening their governmental, legal and regulatory framework through its Integrated Regulatory Review Service (IRRS). In 2015, the Agency carried out eight initial IRRS missions — to Armenia, Croatia, Hungary, India, Indonesia, Ireland, Malta and the United Republic of Tanzania — and four IRRS follow-up missions — to Finland, Slovakia, Switzerland and the United Arab Emirates. The IRRS missions highlighted the challenges faced by many Member States regarding the legal framework needed for regulatory activities, in particular the lack of specific legal provisions necessary for discharging regulatory responsibilities. The mission results also pointed to challenges concerning core functions of the regulatory body related to the development of regulations and guidelines, and the authorization, formalization and implementation of inspection programmes.

In April, the Agency released a revised version of the Self-Assessment of Regulatory Infrastructure for Safety (SARIS) tool. SARIS is a self-assessment tool used by Member States during preparation for an IRRS mission to document, in an objective manner, the

degree of compliance with the relevant Agency safety standards. The new version includes updated question sets relating to the governmental, legal and regulatory framework for safety, based on the recent revisions to *Governmental, Legal and Regulatory Framework for Safety* (IAEA Safety Standards Series No. GSR Part 1).

The Agency conducted a course for 40 experts at the United States Nuclear Regulatory Commission, in Washington, DC, to expand the pool of experts needed to carry out the IRRS programme. The course provided training in carrying out radiation safety reviews within IRRS missions.

Assessing and addressing the competency needs of regulatory bodies in countries with emerging or expanding nuclear power programmes continue to be an important Agency priority. Throughout the year, the Agency promoted knowledge sharing through regional, thematic networks in the areas of governmental, legal and regulatory infrastructure for safety; leadership and management for safety; communication; and regulatory safety culture. It also provided training to over 600 participants from 40 Member States in some thirty workshops and training courses on regulatory topics. Among these were national and regional workshops supporting the establishment of safety infrastructure by Member States embarking on a new nuclear power programme, held in Belarus in April and November, Thailand in March and October, and Turkey in May. In particular, the Workshop on the Challenges Faced by Newcomer Countries Regarding the Establishment of an Effective National Safety Infrastructure, held in May in Turkey, provided an opportunity for Member States embarking on nuclear power programmes to discuss the challenges they face and how these might be addressed through Agency assistance. This was the second such meeting organized by the Agency, at the request of Member States, to provide a forum for discussion of the challenges of establishing and maintaining effective and independent regulatory bodies.

The Ibero-American Forum of Radiological and Nuclear Regulatory Agencies (FORO) completed a three year joint project with the Agency intended to strengthen regional regulatory capacity building. This project was developed in line with *Managing Regulatory Body Competence* (Safety Report Series No. 79) and *Methodology for the Systematic Assessment of the Regulatory Competence Needs (SARCoN) for Regulatory Bodies of Nuclear Installations* (IAEA-TECDOC-1757).

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Convention on Nuclear Safety

At the Sixth Review Meeting of the Contracting Parties to the Convention on Nuclear Safety (CNS), held in 2014, Contracting Parties decided by a two-thirds majority to submit a proposal by Switzerland to amend Article 18 of the CNS to a Diplomatic Conference to be convened within one year. The proposed amendment addressed the design and construction of both existing and new nuclear power plants. On 9 February 2015, the Diplomatic Conference was convened at the Agency’s Headquarters in Vienna and was attended by 71 Contracting Parties. The Conference thoroughly considered the Swiss proposal and concluded that it would not be possible to reach consensus on the proposed amendment. Instead, in order to achieve the same objective as the proposed amendment, the Contracting Parties unanimously adopted the Vienna Declaration on Nuclear Safety,¹ which includes “principles to guide them, as appropriate, in the implementation of the objective of the CNS to prevent accidents with radiological consequences and mitigate such consequences should they occur”.

The Organizational Meeting to prepare for the Seventh Review Meeting of Contracting Parties to the CNS took place in October in Vienna. The meeting was attended by

¹ Available at: <https://www.iaea.org/sites/default/files/infocirc872.pdf>

65 Contracting Parties, and the Nuclear Energy Agency of the Organization for Economic Co-operation and Development (OECD/NEA) as an observer. The Contracting Parties, inter alia, elected the officers for the Seventh Review Meeting, to be held in 2017, and established country groups. They also discussed the preparation and the content of the National Reports for the upcoming Review Meeting.

Safety Assessment of Nuclear Installations

The Agency continued to offer a wide range of safety assessment related services. During the year, it carried out a follow-up Safety Assessment Advisory Programme (SAAP) mission to Malaysia and conducted three technical safety reviews of Chinese reactor designs (ACP1000, ACP100 and CAP1400). The Agency carried out 25 workshops and training courses to support countries embarking on a nuclear power programme, providing training to over 300 participants through its Safety Assessment Education and Training (SAET) Programme. The activities focused on topics ranging from essential knowledge to the practical application of safety analysis software. In October, the Agency, in cooperation with the Abdus Salam International Centre for Theoretical Physics, conducted a two week essential knowledge training course in Trieste, Italy, attended by 44 participants from 17 Member States. It also provided training through two walkdowns of the never-commissioned Zwentendorf nuclear power plant near Vienna (Fig. 1).

In February, the Agency, in coordination with the OECD/NEA, held an International Experts Meeting on Strengthening Research and Development Effectiveness in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant. The meeting was attended by over 150 experts from 38 Member States and five international organizations, representing nuclear power plant operating organizations, research institutes, nuclear reactor vendors, nuclear regulatory bodies, and technical and scientific support organizations. It provided a forum for experts from Member States and international organizations to exchange information and experience related to research and development undertaken in the light of the Fukushima Daiichi accident. The experts discussed the R&D strategies in Member States following the Fukushima Daiichi accident, including those associated with severe accident analysis, technologies to prevent or mitigate severe accidents, emergency preparedness and response, and post-accident recovery.

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FIG. 1. Participants in a walkdown of the never-commissioned Zwentendorf nuclear power plant in Austria, one of two such training exercises held by the Agency in 2015.

In October, the Agency held two Technical Meetings on safety assessment of nuclear installations: a Technical Meeting on the Design and Construction of Containment Structures and Systems for New Nuclear Power Plants, held in Vienna; and a Technical Meeting on Topical Issues of Severe Accident Analysis and Management for Nuclear Power Plants, held in Moscow, Russian Federation. In December, it hosted a Consultancy Meeting on the Assessment of Defence in Depth for Nuclear Power Plants at its Headquarters in Vienna, aimed at identifying methods for assessing defence in depth and ways to strengthen it.

Site Safety and Design against Internal and External Hazards

The Agency's Site and External Events Design (SEED) review service provides guidance on evaluating potential sites for nuclear power plants to ascertain site specific external and internal hazards and the proposed plant's ability to safely withstand them. In 2015, the Agency carried out four SEED missions, to Bangladesh, Jordan, Thailand and Viet Nam, and one preparatory SEED mission to Indonesia. Such missions assist Member States by providing an independent review of each of the different stages of site selection, site evaluation and design of structures, systems and components.

The Agency also delivered four workshops and three training courses on topics related to site safety. These training events were aimed at supporting those States embarking on or expanding a nuclear power programme in acquiring the necessary competence for nuclear site and design safety. In total, around 130 participants from 7 Member States took part.

In June, the Agency issued two publications on seismic safety: *Ground Motion Simulation Based on Fault Rupture Modelling for Seismic Hazard Assessment in Site Evaluation for Nuclear Installations* (Safety Reports Series No. 85) and *The Contribution of Palaeoseismology to Seismic Hazard Assessment in Site Evaluation for Nuclear Installation* (IAEA-TECDOC-1767).

Operational Safety and Experience Feedback

In 2015, the Agency conducted six Operational Safety Review Team (OSART) missions – to Bruce B (Canada), Dampierre (France), Kashiwazaki-Kariwa Units 6 and 7 (Japan), Chashma 1 (Pakistan), Novovoronezh (Russian Federation) and Sizewell B (United Kingdom) – as well as two OSART follow-up missions – to Chooz B (France) and Clinton (United States of America). Together with reviewers from Member States, the Agency conducted a Corporate OSART follow-up mission to the ČEZ Group in the Czech Republic, the third such mission carried out to date. Corporate OSART missions are designed to review corporate functions (e.g. corporate management, human resources, communication, independent oversight) that have an impact on safety at nuclear power plants owned or operated by utilities.

The Agency conducted four Safety Aspects of Long Term Operation (SALTO) missions during the year – to Tihange (Belgium), Qinshan (China), Laguna Verde (Mexico) and Koeberg (South Africa). It also completed phase two of the International Generic Ageing Lessons Learned (IGALL) project for nuclear power plants. The results of the second phase of the IGALL project were approved by the IGALL Steering Committee in November and subsequently presented at a Technical Meeting in Vienna in November, after which the third phase of the IGALL project was launched. In May, the Agency published *Ageing Management for Nuclear Power Plants: International Generic Ageing Lessons Learned (IGALL)* (Safety Reports Series No. 82).

Safety of Research Reactor and Fuel Cycle Facilities

In 2015, the Agency carried out a number of activities to support enhanced research reactor safety that were attended by experts from more than 60 Member States. These included: the International Conference on Research Reactors: Safe Management and Effective Utilization, held in Vienna in November; regional meetings on the application of the Code of Conduct on the Safety of Research Reactors, held in Asia and Europe; Technical Meetings on research reactor ageing management, modernization and modifications, and on the safety performance indicators of research reactors under project and supply agreements; and an international workshop on managing the interface between safety and security. Among the safety issues of regional concern were regulatory inspection programmes (Africa and Asia); infrastructure for new research reactor projects (Africa and Arab regions); and safety reassessment in the light of the Fukushima Daiichi accident (Africa).

Safety missions were undertaken to research reactors in China, the Islamic Republic of Iran, Italy, Jamaica, Peru, Portugal, Slovenia, Turkey and Uzbekistan. The missions provided guidance on, and recommendations for improvements concerning, safety of utilization programmes, safety assessment, ageing management, periodic safety review, radiation protection and reactor fuel conversion from high enriched uranium to low enriched uranium. The Agency also conducted a mission to Jordan on the commissioning of that country's first research reactor, as well as missions to the Sudan, Tunisia, the United Republic of Tanzania and Viet Nam on the infrastructure of research reactor projects in those countries.

In March, the Agency held a meeting in Sofia, Bulgaria, on incident reporting to support the dissemination of operating experience and improve networking. The meeting was attended by 43 participants from 33 Member States. Also that month, it issued *Operating Experience from Events Reported to the IAEA Incident Reporting System for Research Reactors* (IAEA-TECDOC-1762) on the feedback from events of safety significance at research reactors.

In May the Agency held a Technical Meeting on Safety Analysis and Safety Documents for Fuel Cycle Facilities that was attended by 430 participants from 23 Member States, and in September, it held a Workshop on Ageing Management for Fuel Cycle Facilities, with 18 participants from 17 Member States. In November, the Agency conducted a follow-up Safety Evaluation of Fuel Cycle Facilities during Operation (SEDO) mission to Romania's Nuclear Fuel Plant to assess the progress made on implementing the recommendations from the previous SEDO mission.

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