

# Safety of Nuclear Installations

## Objective

To achieve and maintain appropriate levels of safety in nuclear installations during their design, construction and total life cycle through promulgating safety standards for all types of nuclear installations; and to assess the application of these safety standards throughout the world.

## Expert Mission to the Kashiwazaki-Kariwa Nuclear Power Plant

Over the years, the seismic safety of nuclear installations has received increasing attention from the Agency in light of the number of severe earthquakes that have affected nuclear installations. A major extrabudgetary programme on the seismic safety of existing nuclear power plants was formally established and initiated in September 2007.

In the aftermath of the earthquake in Niigataken Chuetsu-oki, Japan, on 16 July 2007, and upon a request from the Government of Japan, the Agency conducted an Engineering Safety Review Service mission to the Kashiwazaki-Kariwa nuclear power

plant (Fig. 1) in August 2007. The objective was to gather information and identify the lessons that might have implications for nuclear safety, and share them with the international nuclear community. Although the earthquake significantly exceeded the level of the seismic input considered in its original design, the installation remained safe during and after the earthquake. In particular, the automatic shutdown of Units 3, 4 and 7, which were operating at full power, and Unit 2, which was in the start-up state, was performed successfully. Safety related structures, systems and components seemed to be in a much better general condition than might be expected, with no visible significant damage. This is certainly due to the safety margins

introduced at different stages of the design process. However, many important components, such as the reactor vessels, the core internals and the fuel elements,

which could not be examined during the mission, will warrant further assessments.

To address the complex multidisciplinary issues involved in a major seismic event, and to take into consideration the experience gained and lessons learned from the expert mission to the Kashiwazaki-Kariwa nuclear power plant, the Agency initiated

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FIG. 1. The Kashiwazaki-Kariwa nuclear power plant.

work on establishing an International Seismic Safety Centre to consolidate past efforts and achievements and share this information with the international community. The centre will be the focal point on:

- Enhancement of the seismic safety of nuclear installations worldwide, utilizing the knowledge and expertise of specialists in all relevant scientific fields;
- Support to Member States by providing assistance in relation to seismic hazard, seismic design and seismic re-evaluation issues for existing and new nuclear installations, with particular emphasis on assistance to those with little experience in the subject;
- Sharing of experience and lessons learned with the international nuclear community in order to mitigate the consequences of such extreme natural events and to reflect the latest knowledge in the safety standards at the national and international level.

## Learning the Lessons from Events

In response to an event at Forsmark Unit 1 on 25 July 2006, the Agency, in cooperation with the Swedish Nuclear Power Inspectorate and the OECD/NEA, held an international workshop on defence in depth aspects in electrical systems of importance to safety. At the meeting, held in Stockholm in September, regulators, operators, technical support organizations, international organizations and nuclear industry vendors discussed the lessons learned from the Forsmark and similar events. Recommendations from the workshop will be taken into account during the updating of the IAEA safety standards. Moreover, the Agency was requested to evaluate the operational safety of all Swedish nuclear power plants, starting with Forsmark in February 2008, Oskarshamn in 2009 and Ringhals in 2010.

Weaknesses in the sharing of information on events affecting the safe performance of reactivity control systems during power change and shutdown in nuclear power plants have recently been identified. Events have taken place in several Member States, and in the light of the complex and profound implications of these events for both regulators and operators, the Agency organized a technical meeting in Tokyo in October to exchange the lessons learned and identify possible further corrective actions and the necessary technical support. Participants recommended that the Agency encourage Member States to report and use

operating experience, revise Agency publications related to reactivity management, develop accident analyses for nuclear power plants with BWRs, GCRs and FBRs, review the Agency's Operational Safety Review Team guidelines on reactivity management, and build on existing best international practices, such as those identified by the World Association of Nuclear Operators and the Institute of Nuclear Power Operations, when revising the IAEA safety standards.

## Integrated Management System

The Agency supported a new project in China using the safety culture attributes defined in *Application of the Management System for Facilities and Activities* (IAEA Safety Standards Series No. GS-G-3.1). These attributes were used as a framework to identify and define the content of a safety culture learning exchange between a new Chinese operating company that is building a power plant and a US company having experience in operating the same type of facility. The Agency also conducted a Safety Culture Assessment Review Team (SCART) mission, the first to a nuclear power plant, to the Santa María de Garona nuclear power plant in Spain.

## Research Reactor Safety Enhancement

A technical cooperation regional workshop on the Promotion of Safety Culture in Research Reactor Operating Organizations of the South East Asia, Pacific and Far East Countries was held in China in October. The workshop provided decision makers with practical information on developing, enhancing and assessing safety culture. Lessons learned from incidents and from deficiencies in safety management and safety culture were discussed. The participating countries were assisted to develop a realistic action plan to enhance safety culture in their organizations and were provided with guidance on safety culture assessment through the use of SCART missions.

An international conference on 'Research Reactors: Safe Management and Effective Utilization' was held by the Agency in Sydney in November. The conference addressed issues related to safety, utilization and fuel management. Among the results of the conference are that international exchanges and regional networking appear to be key elements for enhancing the safety of research reactors worldwide, through sharing of best practices

and lessons learned from their operation. The recommendations of the conference support actions launched by the Agency, in particular the promotion of the application of the Code of Conduct on the Safety of Research Reactors, and pointed the way to further action in this area.

A technical meeting on safety management and verification for research reactor safety committees, held in Vienna in December, provided a forum for senior members of the safety committees in 25 Member States to discuss their national practices on the safety management of research reactors and to exchange experience and information on issues of common interest.

### **Generic Review of New Reactor Safety against Agency Safety Assessment Requirements**

As a response to renewed interest in the development of nuclear energy capacity worldwide, vendors are designing new reactors to meet the growing

demand for safer and more economical nuclear power generation, and governmental regulatory bodies have initiated evaluations of these designs to support licensing decisions. To support Member State activities in this area, the Agency has developed a tailored project framework on early harmonized appraisal of safety cases made by vendors. This review of a new nuclear power plant safety case against the Agency's safety standards offers interested Member States an opportunity to assess the scope of the safety case made by vendors

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and highlights issues important to safety by identifying potential gaps or weaknesses in documentation. It provides a focus and foundation for the subsequent, more detailed, evaluation or licensing process of the concerned Member States. Such safety evaluations provide for early screening of safety cases and contribute to a better focus for subsequent licensing activities, as well as to a more harmonized approach to safety worldwide. In 2007, the Agency reviewed four new reactor designs at the request of the United Kingdom regulatory body.