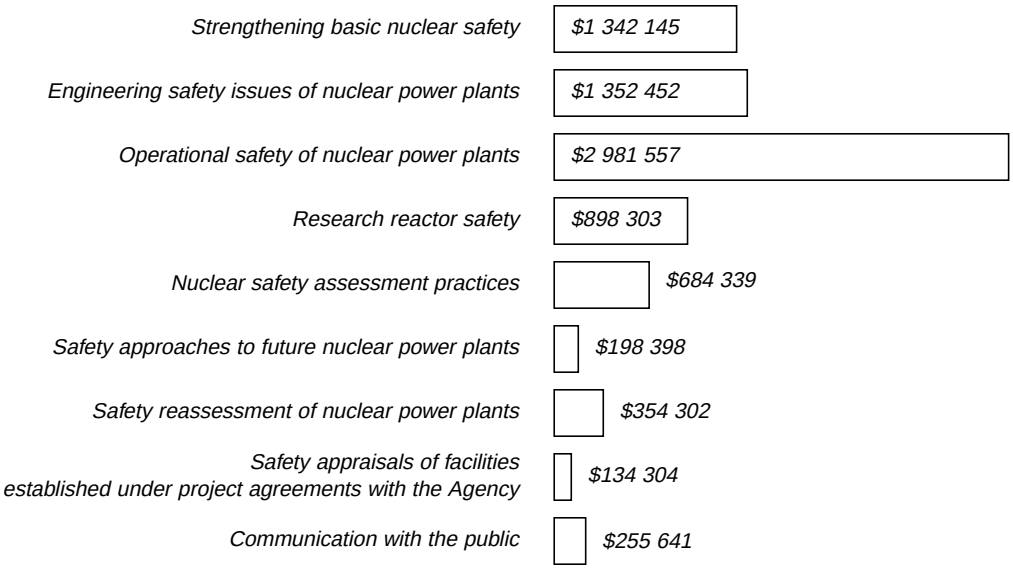
SAFETY OF NUCLEAR INSTALLATIONS

Regular Budget expenditure: $8 201 441

Expenditure by subprogramme



Extrabudgetary programme resources utilized (not included in chart): $2 888 371

A strong and dynamic global nuclear safety culture continued to evolve and develop in 1995. This process was characterized by three main components: creation of binding international legal instruments; promotion of internationally harmonized, non-binding safety standards; and extension of the acceptance of international expert review and advisory services. The Agency continued to foster this global nuclear safety culture by supporting intergovernmental collaborative efforts: it provided a forum for extensive information exchange; promoted the drafting of international legal agreements and the development of common safety standards; and organized a wide variety of expert services. These activities were complemented by the sponsoring of co-ordinated research and development and the widespread dissemination of information on safety issues.

Strengthening Basic Nuclear Safety

The Convention on Nuclear Safety, opened for signature in 1994 and signed by 62 countries by the end of 1995, binds countries to basic principles covering the regulation, management and operation of land based civil nuclear power plants. One of the fundamental obligations is to establish and maintain an effective legislative and regulatory framework. A central requirement calls for national reports demonstrating the fulfillment of the various obligations at meetings held at least every three years. Entry into force of the Convention requires ratification, acceptance or approval by 22 countries, 17 with operating nuclear power plants. By the end of 1995, 14 countries had deposited instruments of ratification, acceptance or approval. In the light of expectations of a rapid

ratification process and entry into force in 1996, two informal meetings of representatives of signatories and other interested States were convened in Vienna during 1995, focusing on the conduct of the Meeting of the Contracting Parties, the structure of national reports and procedures for review.

The International Nuclear Safety Advisory Group (INSAG), consisting of leading experts in nuclear safety, continued to serve as a forum for the exchange of information and the provision of advice on safety issues of international significance. The Agency's General Conference endorsed a proposal for a common basis on which an acceptable level of safety for all operating nuclear power plants built to earlier standards can be judged. In response, INSAG prepared report INSAG-8. Another report (INSAG-9) discusses policy aspects, safety assessments, risk considerations and probabilities, and is intended to stimulate discussion and promote practical actions to enhance safety.

The comprehensive set of 60 nuclear power plant safety standards and supporting guides under the Agency's NUSS programme was first issued in the late 1970s. Although revised standards and guides have been published since, many guides are over ten years old. During 1995, a review of NUSS publications relating to nuclear power plant design, siting and operation was carried out and recommendations on revisions were made for consideration by the relevant advisory bodies.

Efforts continued to strengthen national nuclear safety regulatory systems by identifying good practices and structures and providing assistance with their implementation. Three meetings were held, each comprising up to seven regulatory bodies, to share experience obtained from measures used to assess the safety of existing nuclear power plants and to evaluate the effectiveness of regulations aimed at enhancing safety. The need to separate the responsibilities of regulators and licensees was recognized. It was also clear that a combination of prescriptive and performance based approaches to regulation needed to be used, and that performance based regulation is simplest when there are quantifiable objectives. The provision of useful information to the public from the regulator and licensee was likely to become increasingly necessary to ensure the continuing acceptance of the operation of nuclear power plants.

The concept of 'safety culture' is not new to the nuclear community and, during the past decade, has been increasingly used in connection with nuclear power plant safety. The Agency continued to promote this concept in 1995 by issuing guidance on how to interpret and assess safety culture, and offering services in the form of missions and seminars under the Assessment of Safety Culture in Organizations Team (ASCOT) scheme. On the basis of the considerable experience accumulated over the past two years through 22 ASCOT seminars in 19 countries, the ASCOT guidelines were revised, with the emphasis shifted to self-assessment by the respective organizations. ASCOT now offers essentially three options: support for self-assessment before and after the process; support for other Agency reviews; and standard or expanded topical seminars. In 1995, one ASCOT seminar was held in Romania in March. In addition, safety culture workshops were conducted in Bulgaria, the Czech Republic and Hungary.

Engineering Safety Issues of Nuclear Power Plants

Designers, professionals from operating organizations and experts with experience in seismic safety assessment are co-operating in co-ordinated research on seismic analysis and testing of nuclear power plants in order to enhance the seismic safety of WWER-440/213 and WWER-1000 type reactors. Within the scope of these long term studies, full scale dynamic testing of a reference plant was a key activity in 1995. The test was conducted for the Paks nuclear power plant in Hungary. Explosives were blasted at a safe distance from the plant and 150 experimental records were obtained at different locations (e.g. free field, reactor building foundation, floor levels and major reactor components). A similar experiment is envisaged for a 1000 MW WWER plant. Shorter term safety considerations for existing nuclear installations in relation to external hazards and site safety of new nuclear power plants are being reviewed within the scope of the Agency's Engineering Safety Review Services (ESRS). In 1995, 25 such reviews were conducted for both WWER and other types of nuclear facilities.

With regard to the safety aspects of nuclear power plant ageing, support continued to assist Member States in maintaining the required safety margins over the plant lifetime. This took the form of detailing guidelines and assisting in their application. A significant milestone was the organization of a meeting, in co-operation with the Comisión Nacional Energía Atómica of Argentina, on the effectiveness of methods for the detection and monitoring of age related degradation in nuclear power plants, held at San Carlos de Bariloche in October. The meeting was attended by specialists and managers from nuclear power

plants, regulatory and inspection agencies, and technical support and design organizations. In conjunction with this event, Research Co-ordination meetings were held on the management of ageing of concrete containment buildings and in-containment instrumentation and control cables. The Agency's studies on concrete containment ageing are proving to be complementary, rather than overlapping, with those carried out by the OECD/NEA.

There was significant progress during the year in the preparation of guidance material on fire safety at nuclear power plants. A report on the evaluation of fire hazard analyses for nuclear power plants was published. Guidance was also prepared on: the assessment of overall fire safety arrangements; fire safety during operation; the preparation of fire hazard analyses; and on how to treat internal fires in probabilistic safety assessments (PSAs). A fire safety review was conducted at the nuclear power plant at Karachi, Pakistan, and an interregional training course on fire safety at nuclear power plants was held in India.

Finally, a CRP was started on accident analysis methodology validation and verification to provide data for the development of guidance on severe accident analysis and accident management.

Operational Safety of Nuclear Power Plants

At a conference on advances in the operational safety of nuclear power plants, held in Vienna in September, discussions centred on: managing and regulating safe operation; safety performance and the lessons learned; improving operational safety through the use of PSA; and the enhancement of safety through the dissemination of experience. Consensus was reached that nuclear power plant operational safety efforts are not stagnant but are progressing, and that two categories of tools are widely utilized: risk analysis tools, such as PSA, and multiple feedback tools including peer reviews. Safety culture is well recognized as a prerequisite for the proper use of these tools. The conference underlined the fact that learning from experience and fostering teamwork offer an opportunity for the further improvement of operational safety.

A new computerized database, stored on CD-ROMs, was developed for the Advanced Incident Reporting System (AIRS). The database contains reports of safety significant events from operating nuclear power plants around the world. The full texts of these reports, with tables and illustrations, have now been incorporated and sophisticated query features permit searches and more effective dissemination of operational safety experience. The database will be distributed regularly in electronic form to participating Member States.

The Agency continued its comprehensive, three week on-site operational safety reviews by its Operational Safety Review Teams (OSARTs), concentrating on assessing management practices and operational programmes along with the performance of plant equipment and personnel. Work began on guidelines for plant self-assessment, a process that is gaining acceptance in Member States for the evaluation of operational safety performance and the improvement of operational practices.

Within the Assessment of Safety Significant Events Team (ASSET) service, two new additional options were offered: peer reviews of self-assessment of safety performance carried out by the plant, and topical analysis missions. Peer reviews of plant self-assessment can be carried out within five days, thus significantly reducing the duration and costs of missions. The topical analysis missions focused on events reflecting safety culture issues. This is intended to provide an international perspective on the root causes of problems connected with quality control, preventive maintenance, surveillance, feedback and corrective actions.

Research Reactor Safety

Of the research reactors currently operating around the world, more than 40% are over 30 years old. This has raised some concern and recently particular emphasis was given to the management of research reactor ageing. At an international seminar hosted by Germany in May in Hamburg, information was presented on in-service inspection techniques and methods for preventing or mitigating ageing effects, as well as on ageing phenomena in reactor components and materials. Questions of ageing related safety reviews and regulatory involvement were also addressed. While the general conclusion was that good progress has been made over recent years in the management of ageing, the methods and approaches used could be improved to ensure safety and efficiency. A CRP was started in 1995 on non-destructive testing techniques, in-service inspection and the detection of ageing indicators.

Missions to assess safety at research reactors — Integrated Safety Assessments of Research Reactors

(INSARR) — visited Bangladesh and Viet Nam. Since the inception of these services in 1972, a total of 123 missions have been conducted at operating research reactors in 37 Member States. An analysis of all the findings from these missions, including good safety practices and practices that required improvement, was initiated. Within the framework of technical co-operation activities, assistance was provided to Ghana and Egypt in the licensing review of the safety of new research reactor projects.

Nuclear Safety Assessment Practices

As a result of the complexity and multidisciplinary character of a probabilistic safety assessment (PSA), and because PSA has reached the point where it affects decisions on nuclear power plant design, regulation and licensing, there is international consensus that an intensive peer review by independent and experienced PSA practitioners should be an integral part of any such programme. Since the establishment in 1988 of the International Peer Review Service (IPERS) to make international expertise available for reviewing PSAs, 35 review missions have been carried out. In 1995, IPERS missions visited three nuclear power plants: Temelin in the Czech Republic, Bohunice in Slovakia and Cernavoda in Romania.

A review of the findings of past IPERS missions was completed during 1995. The most critical issues concern difficulties in acquiring, applying or adopting present PSA methodologies and techniques, and specific areas which need further investigation, such as the use of component data, the treatment of shared equipment and physical interaction dependencies and accident sequence quantification. IPERS can have a major influence on the quality of a PSA, thereby strengthening the credibility of the PSA in making safety related plant enhancements. On the basis of the practical experience acquired over five years, the IPERS guidelines were revised, with greater attention being given, in particular, to human reliability analyses.

Safety Approaches to Future Nuclear Power Plants

A technical document on the development of safety principles for the design of future nuclear power plants was completed. The principles are modelled according to information provided in the publications INSAG-3 and INSAG-5. For future plants, explicit consideration of severe accidents and minimization of the off-site effects of severe accidents in design are stressed. The broad international response to this document revealed that the information serves as an impetus for international harmonization of explicit safety objectives and principles for future nuclear power plants.

Safety Reassessment of Nuclear Power Plants

Activities related to the safety of nuclear power plants in the countries of eastern Europe and the former USSR continued. A major milestone was the final identification of safety issues for WWER-440/213, WWER-1000/320 and the third generation RBMKs, and publication of the findings. These reports present a consolidated list of deficiencies (safety issues) ranked according to their significance, and contain corrective measures to improve safety. The judgement of safety significance is based on an evaluation of the potential degradation of defence in depth. Plant specific operational safety issues were identified without ranking. A series of topical meetings was organized to review the status of unresolved generic safety issues.

For WWER-440/213 plants, the most important improvements relate to the physical separation of systems important to safety, in-service inspection and diagnostic systems and verification of the design of bubbler condenser containment. For WWER-1000/320 plants, the issues relate to steam generator integrity, the reliability of control rod insertion, and the integrity of the reactor coolant pressure boundary. A problem common to all WWER nuclear power plants is inadequate fire protection and fire fighting capability. Reviews of safety improvement programmes were organized at Kozloduy Units 5-6 (WWER-1000), Rovno Unit 4 (WWER-1000) and Dukovany (WWER-440/213).

For RBMK plants, the most relevant issues are: the safety culture as an underlying basis for operation; void reactivity associated with the loss of coolant from the channels of the control and protection system; independent and diverse reactor shutdown; demonstration of the applicability of the leak before break concept; volume and procedures for in-service inspection; and fire safety. In the identification and ranking of the RBMK issues, the results of an international project to investigate the safety of design solutions and the operation of nuclear power plants with RBMK reactors, funded by the EC and partially completed in early 1995, were taken into account.

Communication with the Public

The International Nuclear Event Scale (INES) is a means for promptly and consistently communicating to the public the safety significance of events at nuclear power plants. It is also intended to facilitate common understanding of events by putting them into a proper perspective. Armenia, Croatia, Iceland and Kazakhstan joined the INES information system in 1995, so that 58 countries are now formally participating.

At their annual review of the system's operation, national officers of participating countries recommended the formal adoption of the INES scale for facilities other than nuclear reactors, and the preparation of information material, such as videos, to explain the scale to the general public. In 1995, a total of 62 events were communicated through the INES information system, of which 56 occurred in nuclear power plants and 6 in other facilities. None were at level 3 or higher. Efforts continued to simplify the INES rating procedure for events involving degradation of defence in depth.