NEA activities in safety and regulation

by K.B. Stadie*

The Nuclear Energy Agency (NEA) is a specialized body of the 24-country** Organisation for Economic Co-operation and Development (OECD). It was established a little over 25 years ago with the objective of furthering the development of nuclear energy for peaceful purposes through co-operation between Member countries. Initially, the Agency concentrated its efforts on the creation of joint undertakings. Of the three which were established at that time (European Company for the Chemical Processing of Irradiated Fuels [Eurochemic, in Belgium], the OECD High Temperature Reactor Project [Dragon, in the United Kingdom], and the OECD Halden Reactor Project [in Norway]), the last one continues to produce useful results and recently celebrated its 25th anniversary.

Since then, nuclear energy and the NEA itself have evolved considerably, and the important issues have moved on from the study of different reactor concepts to the supply and demand problems faced by a growing nuclear power industry and, in particular, to the major challenge posed by the protection of man and his environment from radiation which is associated with nuclear fission. Today the NEA's work comprises two main programme areas: Nuclear Science and Development, and Nuclear Safety and Regulation. Some two-thirds of the programme is devoted to the latter area, owing to the public concern about the problems of nuclear safety and radioactive waste management which are facing Member governments.

The Safety and Regulation programme encompasses four main areas – nuclear safety technology; nuclear licensing; radiation protection; and waste management – with three principal objectives:

- To promote exchanges of technical information in order to enlarge the data base for national decision-making.
- To improve co-ordination of national R&D activities, with emphasis on international standard problem exercises (ISPs), and to promote international projects.
- To develop common technical, administrative, and legal approaches to improve compatibility of safety and regulatory practices.

As regards safety technology and licensing, the NEA co-operative programme has been directed since 1973 by the international Committee on the Safety of Nuclear Installations (CSNI), which is made up of scientists and engineers with responsibilities in this field.

The greater part of the CSNI co-operative programme is concerned with safety technology for water reactors. The principal areas covered are: operating experience and the human factor; reactor system response during abnormal transients; various aspects of primary circuit integrity; the phenomenology of radioactive releases in reactor accidents; and risk assessment. The Committee also studies the safety of the fuel cycle, conducts periodic surveys of reactor safety research programmes and operates an international mechanism for exchanging reports on nuclear power plant incidents. The NEA Incident Reporting System (IRS) began operations some three years ago; about 500 incident reports have already been exchanged and jointly analysed in the cause of improved nuclear plant safety.

The Committee has set up a sub-Committee on Licensing which provides a forum for the discussion of regulatory questions. In recent years the sub-Committee has conducted special reviews of nuclear plant siting practices, emergency planning, backfitting and the role of quantitative risk assessment in nuclear regulation.

The international standard problem exercises were pioneered by CSNI. Their objective is to assess the highly specialized tools used for analysing the safety of nuclear installations, for example computer codes, measurement techniques, methods of testing materials and components, and so on. These tools may vary to some extent from country to country and many of them are extremely complex and costly to use. In international standard problem exercises they are gauged against one another or against an agreed standard.

The first ISPs conducted by CSNI in 1975 were designed to compare different computer codes used in Member countries for predicting thermohydraulic behaviour in a water reactor after a loss-of-coolant accident (LOCA), and the performance of the emergency core cooling system. Participants in the exercise attempt, for example, to calculate the results of given reactor experiments using standard input data. These exercises have led to a number of improvements in codes and in their use. Altogether some 30 exercises have been carried out in this area as well as for fuel behaviour and containment response during postulated accidents, fracture mechanics test methods, criticality

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** Australia, Austria, Belgium, Canada, Denmark, Finland, France, the Fed. Rep. of Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States of America.

in spent-fuel transport containers, and the evaluation of the off-site consequences of a reactor accident. For such an evaluation, mathematical models are used in an attempt to describe the dispersion mode of any radioactive material released and to predict its impact on the environment. In recent years several new models have been developed and are used to give guidance in risk assessment and in site modelling. The comparative study of these models has clarified several uncertainties and led to improvements in consequence-estimating techniques.

In another kind of standard problem known as the PISC (Programme of Inspection of Steel Components) programme, the participants work in sequence in a so-called round-robin exercise. The second PISC exercise began in January 1982. Four thick-section steel plates containing welds are being shipped in sequence for inspection by some 50 teams in 15 countries, who will use ultrasonic methods in an attempt to locate and characterize flaws implanted in the steel. This project is intended to evaluate the effectiveness of current and emerging non-destructive evaluation techniques and will end in 1984.

International research continues at the OECD Halden Reactor Project in two major areas: fuel behaviour, especially in abnormal conditions, and man-machine communication. A more recent joint undertaking is the OECD LOFT (Loss of Fluid Test) Project. The main objectives of its current three-year programme are to validate computer codes covering a wide range of accident phenomena, and to provide information useful for man-machine interface studies. During the three years a series of nine experiments involving plant transients, loss of coolant, and fission product behaviour will be performed.

An increasing effort is being made to try to prevent divergences between national regulatory policies; a meeting of heads of regulatory authorities in the major nuclear OECD countries was held recently in an attempt to align more closely different approaches to the question of severe accidents.

The NEA Radioactive Waste Management Committee, which was set up in 1975, directs the Agency's activities in this field. They focus essentially on issues such as the disposal of low-level radioactive waste into the sea, and of high-level and long-lived wastes into geological media. Some pioneering work on sea dumping was done in the late 1960s. The NEA now implements a Multilateral Consultation and Surveillance Mechanism, approved by the OECD Council in 1977, which provides a further level of international control in addition to the provisions of the London Dumping Convention* and IAEA recommendations. As part of the OECD mechanism, an Environmental Research and Surveillance Programme was set up in 1981 to collect scientific data from the dumping site used in the North-East Atlantic.

In the field of deep geological disposal of high-level wastes, the NEA has set up two international projects: the International Sorption Information Retrieval System (ISIRS) project, which is a data bank of information on radionuclide sorption in geological media; and the International Stripa Project in Sweden, on geological and hydrological studies, rock mechanics and engineering aspects of waste emplacement and isolation in granite formations.

In addition, the Seabed Working Group co-ordinates the work done by Member countries on the assessment of the feasibility of isolating long-lived wastes in sub-seabed sediments.

On a broader issue, the NEA was recently requested to prepare a definition of what would constitute a valid "demonstration" programme in the management of radioactive waste. This request was motivated by the desire on the part of some political authorities to perform such a demonstration prior to proceeding further with nuclear power development. The NEA has produced a definition explaining what should be understood by this term, indicating that a demonstration should be partly direct and partly based on experimental work and experience supporting predictive analysis.

In the radiation protection area, the Radiation Protection and Public Health Committee – which is the longest-standing committee in safety and regulation – sponsors work on the interpretation and practical application of ICRP recommendations, in particular those concerning protection of workers in nuclear facilities, the assessment and recording of their exposure levels, and the impact of nuclear safety measures and maintenance work on these levels. The radiation protection aspects of radioactive waste management are also a significant part of the NEA programme in this field, which includes various studies on the application of the optimization concept of the ICRP to the long-term management of long-lived radioactive waste such as uranium mill tailings or high-level and alpha-bearing wastes. The committee also follows developments in the field of emergency planning and radiation protection aspects of sources of radiation exposure other than nuclear energy.

* The *Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter* was adopted in London in 1972 and entered into force in 1975. See *IAEA Bulletin* Vol.24, No.2, page 11 (June 1982).