packaging design meets the requirements, inspections to avoid human error in assembling packages, checks of radiation and contamination levels, verification tests on randomly distributed individual packagings, and full-scale tests in staged accidents.

Thermal tests which simulate the damage caused by severe fires were dealt with specifically in papers from the Federal Republic of Germany, Japan and the United Kingdom.

A group of papers described actual experience over a period of years in the transport of radioactive materials, including spent fuel. Grella (USA) reviewed the period 1971–1975. Of 32 000 reported incidents involving hazardous materials, only 144 have involved radioactive materials. In only 36 cases was there any release of contents or radiation levels above prescribed limits. Most of these releases were from LSA or Type A packages. Two incidents involving release or excessive radiation levels from Type B packages were attributable to human failure in following the packaging requirements. In two severe road accidents no release occured from Type B packages. At present about 2 1/2 million packages of radioactive materials are transported annually in the USA.

Musialowicz (Poland) reported that in the period 1971–1975 eighteen transport incidents involving radioactive materials occurred in Poland; none of these has had any consequences from a radiological safety point of view. In this same period, measured doses to transport workers have not exceeded three-tenths of the maximum permissible dose for occupationally exposed persons.

Experience over one-and-a-half years in the use of the Nuclear Assurance Corporation second-generation casks for the transport of spent fuel assemblies was provided by Rollins (USA). More than 300,000 cask-miles of travel by road have been recorded and the casks have been handled at 10 different nuclear facilities.

Two panel meetings were organized to discuss questions related to the assessment and approval of package design, and the future development of environmental tests for packaging. In both discussions some prominence was given to the necessity to reassure the public that the present regulatory requirements provide an acceptable level of safety. More might also be done to bring home to the public the benefits that have been obtained as a result of the world-wide transport of radioactive materials in comparison with the small risk of damage in transport. Suggestions were made that the IAEA should issue explanatory documents, in addition to the present advisory material, which would outline the intentions of the regulations and show clearly the comparative levels of safety that they provide.

REPORT ON AN INTERNATIONAL SEMINAR, OSLO, 24–27 MAY 1976

The seminar was attended by 137 participants from 25 countries and 2 international organizations.

Nuclear Fuel Quality Assurance

The objectives of the seminar were to provide educational lectures on the basic concept of quality assurance and quality control as applied to nuclear fuels and to review current applications.

Quality assurance is used extensively in the design, construction and operation of nuclear power plants. This methodology is applied to all activities affecting the quality of a nuclear power plant in order to obtain confidence that an item or a facility will perform satisfactorily in service.

Although the achievement of quality is the responsibility of all parties participating in a nuclear power project, establishment and implementation of the quality assurance programme for the whole plant is a main responsibility of the plant owner.

For the plant owner, the main concern is to achieve control over the quality of purchased products or services through contractual arrangements with the vendors. In the case of purchase of nuclear fuel, the application of quality assurance might be faced with several difficulties because of the lack of standardization in nuclear fuel and the proprietary information of the fuel manufacturers on fuel design specifications and fuel manufacturing procedures.

The problems of quality assurance for purchase of nuclear fuel were discussed in detail during the seminar. Due to the lack of generally acceptable standards, the successful application of the quality assurance concept to the procurement of fuel depends on how much information can be provided by the fuel manufacturer to the utility which is purchasing fuel, and in what form and how early this information can be provided.

The extent of information transfer is basically set out in the individual vendor-utility contracts, with some indirect influence from the requirements of regulatory bodies. Any conflict that exists appears to come from utilities which desire more extensive control over the product they are buying. There is a reluctance on the part of vendors to permit close insight of the purchasers into their design and manufacturing procedures, but there nevertheless seems to be an increasing trend towards release of more information to the purchasers. It appears that the full application of the quality assurance concept in the purchase of fuel and fuel manufacturing services will depend to a large extent on the availability of fuel specification data.

On the part of fuel purchasers, there is an obvious interest in getting as many details of fuel specification as possible in order to be able to establish a proper level of control over the quality of their purchases. On the other hand, if such specifications are set up in advance by the purchasers, there are often complaints by the manufacturers that the specifications were set up without proper regard for the latest technical information on fuel performance and for the realities of manufacturing processes and technical capabilities. This problem may be resolved when fuel design activities are properly meshed with a full quality assurance system.

Discussions during the seminar showed that the operation of acceptable quality assurance systems is a well-established practice at most of the fuel manufacturers. The fuel purchaser may monitor such a system through quality assurance programme auditing as agreed to in the individual vendor-purchaser contracts. In this way confidence may be obtained in the quality of the purchased product. However, it is considered that the further improvement of the relations between fuel manufacturers and purchasers could be achieved through the following actions undertaken at the international level: (1) standardization of fuel specifications and testing procedures; (2) dissemination of information on fuel specifications and their connections with observed fuel failure rate; (3) establishment of a standardized quality assurance programme for fuel fabrication; (4) establishment of a central information service to assist utility groups in preparing documents and procedures to be used in quality assurance activities.

REPORT ON AN INTERNATIONAL SYMPOSIUM, OTANIEMI, FINLAND, 2–6 AUGUST 1976

The Symposium was attended by 140 participants from 32 countries and 3 international organizations. Forty-five papers were presented during 8 technical sessions.

The Design of Hot Laboratories

The need for specialized laboratories to handle radioactive substances of high activity has increased greatly due to the expansion of the nuclear power industry and the widespread use of radioisotopes in scientific research and technology.

Such laboratories, which are called hot laboratories, are specially designed and equipped to handle radioactive materials of high activity, including plutonium and transplutonium elements. The handling of plutonium and transplutonium elements presents special radiation-protection and safety problems because of their high specific activity and high radiotoxicity. Therefore, the planning, design, construction and operation of hot laboratories must meet the stringent safety, containment, ventilation, shielding, criticality control and fire-protection requirements.

The IAEA has published two manuals in its Safety Series, one on the safety aspects of design and equipment of hot laboratories (SS No.30) and the other on the safe handling of plutonium (SS No.39).

The purpose of the symposium in Otaniemi was to collect information on recent developments in the safety features of hot laboratories and to review the present state of knowledge. A number of new developments have taken place as the result of growing sophistication in the philosophy of radiation protection as given in the ICRP recommendations (Report No.22) and in the Agency's basic safety standards (No.9). The topics discussed were safety features of planning and design, air cleaning, transfer and transport systems, criticality control, fire protection, radiological protection, waste management, administrative arrangements and operating experience.

Four of the eight sessions of the programme were devoted to the planning, design and construction of the hot laboratory buildings, hot cells, glove boxes, fume hoods and systems of ventilation, fire protection, transfer, transport and criticality control and other ancilliary systems, together with the discussion of safety features in each case.

The effects of earthquakes, tornadoes and even the impact of light aircraft on the laboratory buildings were discussed. It was stressed that the design of laboratory buildings should ensure that all internal facilities would remain functional in the event of such catastrophes. The advantages of compartmentalization of hot facilities in order to isolate high risk areas to minimize productivity and financial loss in case of accidents were also discussed.

The requirements of safety-analysis reports on hot laboratories were reviewed. Safety-analysis reports should contain the safety principles, detailed description of technical, organizational and operational matters, critical analysis of the safety principles and other related matters, and should be examined and approved by competent authorities.