

CONCLUSIONS OF THE CONFERENCE PRESIDENT¹

The scope of this conference was broadened, as compared to the previous conferences on spent fuel organized by the IAEA, to include in its scope the policy, safety and security aspects of spent fuel management. This is a reflection of the increasing importance of spent fuel management and of the recognition of its fundamental place in the future development of nuclear power.

Now is the right time to discuss the strategic aspects of spent fuel management as there is currently ample evidence of a renaissance of nuclear power. For reasons concerned with ensuring secure national energy supplies, limiting the increase of energy costs and avoiding possible global warming by reducing carbon emissions, there are movements in several countries towards a regeneration of nuclear power.

The third generation of reactors will be based mainly on LWRs, but with improved safety and economics. The same back end fuel cycle issues as with current power plants can therefore be expected. This implies that the already large amount of spent fuel in storage will increase dramatically if no choices are made on spent fuel management strategies.

Spent fuel is still differently regarded by countries - as a resource by some and as a waste by others - and the strategies for its management vary, ranging from reprocessing to direct disposal. However, in both cases a final disposition solution is needed and it is generally agreed that disposal deep in geological formations is the most appropriate solution.

In all countries, the spent fuel or the high level waste from reprocessing are currently being stored, usually above ground, awaiting the development of geological repositories. And while the arrangements for storage have proved to be satisfactory and have been operated without major problems, it is generally agreed that these arrangements are interim, that is they do not represent a final solution.

Although the current arrangements for storage are working satisfactorily, it is becoming increasingly important to have final disposal arrangements available so as to be able to demonstrate that nuclear power is sustainable and that it does not lead to an unsolved waste problem. The conference was updated on the good progress in several countries towards the development of geological repositories expected to become available after about 2020.

Recent fuel cycle initiatives by the USA and the Russian Federation point in similar directions and have similar overall goals:

- (a) Improving control over the increasing amounts of spent fuel;
- (b) Helping to reduce proliferation and security risks;
- (c) Assisting new countries to develop nuclear power.

They rely on reprocessing and recycling, but with advanced technologies to reduce the proliferation risks and to minimize the generation of radioactive waste.

In 2003, IAEA Director General M. ElBaradei set up an international expert group to take a fresh look at multilateral approaches. While many larger countries may wish to continue to solve the problems of

¹ The views and recommendations expressed in this summary are those of the President of the Conference and the participants, and do not express those of the IAEA

the nuclear fuel cycle, including waste disposal, themselves, multilateral solutions may make economic sense to smaller countries. The multilateral approaches also promise better assurances of security and proliferation resistance. It was proposed that the international agencies should continue to be involved and to evaluate these approaches further and it was also suggested that the IAEA could be a monitoring agency to oversee the safety and other aspects of any multilateral initiatives that may be implemented.

The concept of an international safety regime has developed over the last decade mainly as a result of the coming into force of the legally binding nuclear related conventions prompted by the Chernobyl Accident in 1986. In particular, the Joint Convention (the Joint Convention on the Safety of Spent

Fuel Management and on the Safety of Radioactive Waste Management), together with the International Safety Standards may be seen as providing a framework for safety at the international level in the area of spent fuel management. The Joint Convention is legally binding on its 41 contracting parties and requires that spent fuel and radioactive waste management are conducted with regard to accepted norms of safety. The safety norms are derived from the recommendations of the international safety standards, which establish best safety practices based on worldwide experience in the field.

The conference noted that the Joint Convention is an incentive convention and that, at the time of the Second Review Meeting of the Joint Convention, the contracting parties were not yet prepared to go in the direction of a more mandatory mechanism.

The transport of radioactive material, including spent fuel, represents a particularly good example of the international safety regime. The regulations for safety in transport in each country and by each international mode of transport are drawn directly from the IAEA Transport Regulations. The safety record in the transport area has been exemplary as evidenced by the entirely positive results of spent fuel transports over several decades. An additional element of the safety regime is an international appraisal mechanism. Several countries have invited IAEA teams to conduct peer reviews of their arrangements for transport of radioactive materials on the basis of the IAEA Transport Regulations and guidance. Within the international safety regime, the transport area is an exception, with all countries following common international regulations. This example demonstrates how countries can move towards an international safety regime when all agree on the policy and on the various safety aspects of the application.

There is an obvious linkage between the proposed multilateral fuel cycle initiatives and the international safety regime, that is, any multilateral fuel cycle activities that may be conducted would be expected to comply with the requirements of the Joint Convention and with the recommendations of the international safety standards.

It was noted that the international safety standards in the area of spent fuel management are in the process of being updated and elaborated to cover a wider scope and, during the conference, proposals were made on topics that warrant the development of new safety standards.

Many technical aspects of spent fuel storage were also reviewed during the conference.

At a time when there is much interest in saving space in storage facilities by denser packing, the discussions on the advantages of burnup credit were very topical. Burnup credit means making use of the change in the isotopic composition of fuel, and hence its reactivity, due to irradiation. The presentations at the conference pointed out the substantial benefits that can be obtained from the application of burnup credit. However, much of the assessment and development work on this subject has been done in relation to PWR and BWR fuels and it was clear from the discussions that there is a

need for the work to be extended to WWER and RBMK fuels. It was suggested that the IAEA might be able to help in this area.

Most spent fuel storage systems were designed for short term application pending reprocessing or disposal. The time period requirements for storage systems have been extended in most countries because of the unavailability of disposal facilities. In some countries, new facilities have been built for this purpose; in others, the use of existing facilities is being extended for longer periods. An important safety issue is how to establish the safety of the facilities for long term storage. There must be confidence in the continued integrity of the fuel, its container, the structure of the waste store, the maintenance of subcriticality, etc. How can this be achieved? It must be through a combination of monitoring, inspection and research. There was much discussion on this subject and it is clearly an area where more research and regulatory work has to be done.

There is a trend towards dry storage which was clearly illustrated by the presentations at the conference. While the specialists expressed confidence in the technical development of storage facilities and containers in order to satisfy long term needs, it is clearly necessary for more research and development on fuel behaviour in dry storage. In particular, it was mentioned that high burnup fuels and MOX fuels will need to be carefully assessed in the context of ensuring long term storage safety.

Looking to the future, the presentations at the conference show some clear tendencies, which can provide a basis for more international cooperation:

- (1) The need for geological repositories for radioactive waste;
- (2) The development of advanced reprocessing;
- (3) The burning of actinides in fast reactors;
- (4) The necessity to increase the duration of interim storage;
- (5) The unavoidable increase of transport of both spent fuel and radioactive waste

There is an expectation that there will be a follow-up to this conference by the international agencies. In my opinion it should be in the form of a greater international cooperation on research and development related to the trends indicated above and it should also be in continuing progress towards an international safety regime or at least harmonized safety regulations. It should also be by promoting and monitoring future multilateral initiatives related to fuel cycle activities.