

# TOPICAL ISSUE 4: SAFETY OF RESEARCH REACTORS

## Session Chairpersons' Summary

### Current Status

Research reactors throughout the world represent an extremely diverse set of facilities. This diversity applies to aspects such as design features, suppliers, age, power level, fuel enrichment, safety culture, utilization programme and regulatory supervision. Most research reactors are in need of effective ageing management. Among the population of research reactors are some which are heavily utilized, well funded, well regulated, well maintained, well staffed with well trained operators and operated within a strong safety culture. Many research reactors are under-utilized but well regulated or operated within a strong safety culture, giving due attention to ageing management and long term staffing. While most research reactors are believed to be in one of these two categories, the Issue Paper concentrates on the relatively small number of exceptions. There is evidence that some facilities are inadequately funded, are operating with inadequate regulatory supervision, lack effective programmes for managing ageing, or have no strategic plan for the replacement of ageing staff. The Agency's database is not sufficient to identify the exact number of research reactors in this category or the extent of the deficiencies. However, it is recognized that the paper focuses on a small segment of the population of research reactors.

Research reactor safety is gaining in importance within the general scope of nuclear installation safety worldwide. The Agency has developed and offers various programmes to assist Member States in enhancing the safety of research reactors, such as the Integrated Safety Assessment of Research Reactors (INSARR) and International Regulatory Review Team (IRRT) services and the Incident Reporting System for Research Reactors (IRSRR).

INSARR and IRRT missions provide recommendations, which the requesting Member State may consider and may implement. However, there is no mechanism to ensure that recommendations are being implemented. The IRSRR is now operational but the level of participation by Member States is not extensive.

The Agency bases its activities in part on survey results but its database on research reactors does not contain sufficiently detailed information on aspects relevant to the safety of facilities in extended shutdown.

The status of more than two-thirds of the 370 or so research reactors that have been shutdown is unclear, pending decisions on their future. Decisions need to be made whether a reactor will return to power at some time, or whether it should be decommissioned. Indecision may result from factors such as the lack of a clearly defined utilization programme, insufficient funds for continued operation or the perceived high cost of decommissioning.

While there is regional co-operation and regional centres exist among the large research reactors, there is very little regional sharing among the smaller research reactors. If a country cannot provide sufficient funding for continued operation of its reactor, this may be an option to consider. If a country has a reactor in extended shutdown, the decision to decommission may be easier if a regional centre is available to provide the limited utilization that the country

requires. However, in view of the complexity of some issues — particularly issues of funding — more information on the regional centre concept is needed.

Historically there has been an interdependence between research reactors and power reactors. In the past, research reactors have been used to generate technical data and to test materials critical to the design and operation of power reactors, and research reactors are still widely used in the education and training of new personnel. Today, power reactors have resources that would be of value to research reactors, such as expertise in quality assurance and safety culture. Research reactors can also benefit from observing good practices in effect at other research reactors.

The conference was in general agreement with the assessment made in the Issue Paper and the conclusions drawn.

### **Findings And Conclusions**

1. Statements characterizing the problems being experienced at some research reactors should not be generalized as being applicable to all facilities.
2. In parallel with actions pursuant to items 3–7 below, since a convention on research reactor safety is not acceptable to all Member States, at least a code of conduct should be established to serve as a model against which all research reactors might evaluate their safety programmes.
3. The IAEA should especially focus its assistance activities on areas such as quality assurance programmes, enhancement of safety culture, ageing management and safety management.
4. The IAEA should conduct a survey, requesting information from Member States to better characterize the safety aspects of their research reactor facilities.
5. Member States and reactor manufacturers should be encouraged to share information about known safety problems with facilities of similar design throughout the world which could be subject to the same problems.
6. Member States are encouraged to request INSARR and IRRT services from the IAEA, and to take action on the recommendations provided by these services.
7. Member States are encouraged to participate in the IRSRR.
8. Operating organizations should be encouraged to develop strategic plans on the future utilization of their reactors which will help Member States with facilities in extended shutdown in making decisions on whether or not to terminate operations. The plans should examine the options that are realistically available for the reactor's future, determine whether anticipated utilization justifies restarting the reactor, and look at the sources and availability of necessary funds. Reactors that might return to power must be adequately maintained in accordance with their licences and operational limits and conditions, and an adequate pool of expertise must be retained.
9. Member States should assure that effective regulatory supervision exists for their research reactor facilities.

10. The concept of regional centres should be investigated further with a view to providing an alternative for Member States desiring research reactor utilization services but not the burdens of meeting all of the facility's operating costs and maintaining a regulatory supervision programme.
11. The IAEA should provide guidelines for research reactors on extended shutdown requirements, criteria for restart from extended shutdown, radioactive waste treatment and disposal and decommissioning planning.
12. In deciding on the timing for decommissioning, Member States should note the limited opportunity for acceptance of irradiated fuel by the USA and, possibly, the Russian Federation.
13. Research reactor management should take advantage of good practices developed and implemented at other research reactors or at power reactors through observation, peer exchange programmes and training. The IAEA should continue to offer its safety review services for research reactors and build in its experience from the nuclear power plant review services.