

# International Action Plan On The Decommissioning of Nuclear Facilities

## A. Introduction

Decommissioning is defined by the International Atomic Energy Agency (the Agency) as the administrative and technical actions taken to allow the removal of some or all of the regulatory controls from a nuclear facility<sup>22</sup>. The use of the term “decommissioning” implies that no further use of the facility for its existing purpose is foreseen. The actions taken in decommissioning must be such as to ensure the protection of the work force and long-term protection of the public and the environment and typically include reducing levels of residual radionuclides so that material and buildings can be safely released and reused. Decommissioning activities also create radioactive waste which needs to be appropriately managed so that the public is protected from the associated radiation hazards. A large number of nuclear facilities worldwide will ultimately require decommissioning. They range from large nuclear power reactors and complex reprocessing plants to small research laboratories and manufacturing plants. The tasks associated with decommissioning cover a wide spectrum; for nuclear facilities they can include large-scale decontamination, and destruction of massive concrete structures while at the other extreme, for radioisotope laboratories only some modest cleaning and decontamination may be needed. The decommissioning process can present many safety challenges and before a decommissioning programme is started, these challenges must be anticipated, evaluated and satisfactory solutions found. In all cases, the decommissioning process must be well planned and arrangements must be made to ensure that sufficient resources will be available when needed. Over time, without proper arrangements being made for decommissioning, shut down facilities would deteriorate and ultimately, unless they are properly maintained, could constitute a radiological hazard to persons in their vicinity from direct exposure to radiation or as a result of radioactive material that may be released to the public environment.

From 14 to 18 October 2002, an *International Conference on Safe Decommissioning for Nuclear Activities* organized by the Agency took place in Berlin, Germany. It was hosted by the Government of Germany through its Bundesamt für Strahlenschutz (Federal Office for Radiation Protection). The objective of the Conference was to foster exchange of information on the safe and orderly termination of practices that involve the use of radioactive substances with specific attention to decommissioning. The Conference also served to promote greater international coherence as regards strategies and criteria for the safe termination of practices. The participants included senior policy-makers, technical experts and other persons from regulatory bodies, and persons responsible for the operation and decommissioning of nuclear facilities.

The presentations and conclusions of the Conference were used as the main basis for this action plan but the outcomes of some other recent international meetings either co-sponsored by the IAEA or held by other major international organizations (OECD/NEA, EC) were also taken into account in developing the plan.

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<sup>22</sup> For this document, a nuclear facility is defined as any place where radioactive materials are produced, processed, used, handled or stored, on such a scale that consideration of safety is required.

## B. Objectives

1. The primary purpose of this action plan is to enable the Agency to focus and refine its programme on decommissioning by addressing key international issues identified as being important at the International Conference on Safe Decommissioning for Nuclear Activities (the Berlin Conference) and other recent international events.

## C. Guiding Principles

2. The guiding principles of the Action Plan is that all its components should:

- (a) strengthen the systems for safety during decommissioning activities;
- (b) address key areas of importance, especially those of international importance;
- (c) to the extent possible, fit within existing Agency programmes and help prioritize the use of its resources; and
- (d) implement the most important recommendations that resulted from the Berlin Conference and other international events.

## D. Proposed Actions

**D.1. Magnitude of Decommissioning** 3. Most of the discussion during the Berlin Conference focused on the decommissioning of large nuclear facilities. However, there are many small facilities where radioactive material is being used in medical, industrial and research applications, and they will also require some form of decommissioning. An effort was made during the Conference to gauge the future magnitude of the decommissioning problem, but it became evident that a comprehensive, worldwide review is necessary. Without such a review it is difficult to assign global priorities that would allow proper resource planning in the future.

*Action 1: Develop a database and related information documents on the worldwide status of nuclear facility decommissioning to include facilities a) currently undergoing decommissioning and b) those that can be expected to be decommissioned in the future, using all currently available information including that from other international organizations.*

**Desired outcome:** Information to allow Agency and Member States planning for evaluating resource needs.

**D.2. Safety Standards** 4. The Agency has issued, as part of its Safety Standards Series, a Safety Requirements document on Pre-Disposal Management of Radioactive Waste, including Decommissioning and three Safety Guides addressing the decommissioning of various types of nuclear facility. In the summary observations, conclusions and recommendations from the Berlin Conference it was recommended that the Agency should ensure that its safety standards on decommissioning are continuously improved and kept up to date. In this context, and taking account of the high importance given to decommissioning programmes in many Member States, it is planned to strengthen the safety standards in this area by developing a separate high-level safety standard, a Safety Requirements document, specifically on the Safety of Decommissioning. In addition, the existing Safety Guides will be reviewed and updated as necessary.

*Action 2: Prepare a Safety Requirements document that establishes the basic safety requirements for the planning and implementation of all types of decommissioning activities and revise and update the existing supporting Safety Guides.*

**Desired outcome:** A uniform set of international requirements that provide a basis for safe decommissioning.

**D.3. Safety Assessment** 5. Safety assessment is an important tool for identifying possible new safety concerns and evaluating possible solutions. The sharing of national experiences of its application in the context of decommissioning would be beneficial to countries engaged in planning and implementing decommissioning projects.

6. Existing safety standards require that a safety assessment is included as an integral part of the decommissioning plan for each facility being decommissioned. The exchange of experience on how this is implemented would be useful.

7. The level of safety assessment needed for particular facilities and parts of facilities is not necessarily the same and the sharing of experience on suitably graded approaches to reflect the risks presented should also be useful to those with responsibilities in this field.

8. In summary, an international mechanism for sharing and exchanging information and experience in the application of safety assessment in the context of decommissioning would be helpful to a large number of Member States. It is noted that other intergovernmental organizations are active in this field, notably the OECD's Nuclear Energy Agency, and advantage should be taken of the work conducted in such fora so as to minimize the duplication of efforts.

*Action 3: Establish a forum for the sharing and exchange of national information and experience on the application of safety assessment in the context of decommissioning and provide a means to convey this information to other interested parties, also drawing on the work of other international organizations in this area.*

**Desired outcome:** The widespread use of safety assessment as an essential tool for ensuring that decommissioning is conducted safely.

**D.4. Decommissioning of Research Reactors** 9. Currently there are over 200 research reactors in the world that have been shut down but only a few of them have been decommissioned. Many are located in developing countries with limited resources available for decommissioning. Under these conditions, maintaining the safety of these shut down facilities may be expected to become increasingly problematic as time goes on both for technical and societal reasons. In some countries, unless proper measures are taken, the facilities may become subject to misuse. Radiation exposures of those involved in the misuse and possible releases of material to the environment could then occur. Also, decommissioning is expected to become more difficult with time because of structural deterioration and the loss of skilled workers and records. It is clearly desirable to avoid the occurrence of such developments.

10. From the above, and as recognized at the Berlin Conference, from a safety perspective, there is evident merit in proceeding with decommissioning at the earliest opportunity after the end of reactor operations and this is a particularly relevant conclusion in the context of research reactors located in countries with limited resources. The Agency should encourage and help Member States to proceed promptly with decommissioning and provide relevant technical advice and assistance. To this end, the Agency has recently issued the Code of Conduct on the Safety of Research Reactors, which includes decommissioning activities.

*Action 4: Upon request by Member States, provide advice and assistance on the decommissioning of research reactors on their territory by:*

- (a) developing technical reports and documents on the options for decommissioning, for fuel storage and disposal, and for the management of residual buildings and material in the context of countries with limited resources and nuclear infrastructures; and
- (b) establishing a demonstration project on research reactor decommissioning to serve as a basis for information exchange and training.

**Desired outcome:** Member States moving promptly towards the decommissioning of research reactors and rendering them into a sustainably safe state.

11. At the Berlin Conference it was recognized that for countries with limited resources, the entombment option might be a safe and economic solution, in certain cases, for research reactor decommissioning. However, it was also recognized that no international guidance has yet been developed on what would constitute an acceptably safe condition for an entombed reactor.

*Action 5: Develop international guidance on the safety conditions which must be complied with if the entombment option for the decommissioning of research reactors were to be implemented.*

**Desired outcome:** Established international safety criteria for the entombment of nuclear research reactors, if considered as a viable decommissioning option.

## **D.5. Waste Management**

12. Large volumes of material are produced during the decommissioning of nuclear facilities. Part of this material might be reusable or suitable for conventional disposal but some of it has to be managed as radioactive waste. The volumes of this radioactive waste are variable depending on the facility type and the available options for processing and management. This waste may not always have been anticipated in national plans for radioactive waste disposal. Some of the waste may require special predisposal arrangements in the absence of suitable disposal facilities. The nature of this waste (e.g.,

size, radionuclide content, chemical form and mobility, combustibility) may justify the development of specific processing and disposal strategies.

*Action 6: Review in a Safety Report and technical documents the options for the management and disposal of the radioactive waste from decommissioning activities, taking account of the special technical and safety problems associated with large volumes of low activity waste or waste with particular characteristics such as graphite containing long-lived radionuclides or tritium-bearing waste.*

**Desired outcome:** An improved understanding of the available approaches for managing radioactive waste originating from decommissioning activities.

**D.6. Information Exchange** 13. Many nuclear facilities of different types have now been decommissioned and considerable experience of successful and not so successful strategies and techniques has been accumulated. This was noted at the Berlin Conference and it was concluded that more benefit should be obtained from the experience accumulated to date and that the international community should consider ways of making this information more widely available. In this context, it is noted that the Agency has already established a website devoted to the exchange of information and experience on decommissioning.

*Action 7: Organize an international conference in 2006 on improving safety and efficiency through the lessons learned from experience in the decommissioning of nuclear facilities. The conference should include experiences from the decommissioning of all types of nuclear facilities and should address planning and operational strategies, effective technologies and measurement techniques, regulatory and management approaches, radioactive waste management, funding and societal aspects.*

**Desired outcome:** Improved information and experience exchange to facilitate decommissioning.

**D.7. Funding** 14. Decommissioning and the management of the associated radioactive waste cannot proceed without adequate funding and ideally such funds should be accumulated during the operating lifetime of the facility. Various arrangements for funding have been made in different countries and lessons can be learned from these experiences. It is evident that there are significant uncertainties associated with both the estimation of future costs and the performance of funds designated to meet those costs. However, a particular concern is with nuclear facilities that need to be decommissioned but for which funding is not available. This is the situation for many nuclear facilities and it is especially the case in some developing countries where research reactors that have been permanently shut down.

*Action 8: Collect and summarise in a technical document Member States' experience in providing funding for ensuring that decommissioning can be implemented when needed.*

**Desired outcome:** Funding arrangements in place in Member States to allow decommissioning activities to be carried out when needed.

**D.8. Release and Reuse of Material, Sites and Buildings** 15. During decommissioning and at the end of the decommissioning process, it is desirable to be able to release material, sites and buildings from regulatory control that present negligible health risks to the public. At present, different radiation protection criteria are being applied for this purpose in Member States. It is desirable for there to be international consistency on release criteria in order to facilitate the transboundary movement of materials and also to engender public confidence concerning these practices. The Berlin Conference identified the matter as being of high importance for decommissioning and it is therefore included here. However, since the topic is already included in another Action Plan (The Action Plan on the Safety of Radioactive Waste Management (Annex 7 to GC (47)/INF4)) it is not the subject of an action in this Action Plan. As a result, safety standards on these subjects have been prepared and are currently being reviewed by the Safety Standards Review Committees.

16. The use to which decommissioned sites can be put is a matter for consideration by site owners and other stakeholders in consultation with the relevant national authorities. Some experience of this matter has been gained in Member States and it would be valuable for that experience to be shared.

*Action 9: Provide for the exchange of information on Member States experiences in the re-use of decommissioned sites, including consideration of the opportunities, the economic aspects and the associated technical issues, and publish a technical report on the subject.*

**Desired outcome:** Improved awareness in Member States of the opportunities and issues related to the possible re-use of decommissioned sites.

### **D.9. Long term preservation of information**

17. It is important to preserve the information needed for assuring that decommissioning is conducted in a safe manner. This becomes a problem when delays in the decommissioning process are introduced after the facility is shut down and it could be a particular problem if a safe enclosure period of several decades is envisaged. It is evident that there will be delays in some decommissioning projects and there is a need to make provisions to retain the most important information to facilitate future decommissioning. Experience from completed decommissioning projects can be used to establish the key information that would be needed to support this extended decommissioning activity.

When it becomes evident that there will be significant delays between shutdown and the start of dismantling, arrangements must be put into place to ensure that the necessary information is preserved.

*Action 10: Summarize the information that is needed to ensure the safe decommissioning of nuclear facilities when there are delays between shutdown and the implementation of the final decommissioning activities and experiences of means for assuring that information relevant to decommissioning remains available in the long term and publish in technical documents.*

**Desired outcome:** Awareness in Member States of the information needed to allow the safe deferred decommissioning of facilities and of the means to preserve that information.

## **D.10. Stakeholders' and social issues**

18. Decision making, in the context of projects which have an impact on communities and their environment, is increasingly being implemented with the involvement of those affected by the project

— “the stakeholders”. It is clear that decommissioning projects fall into this category and there is already some experience of related decisions in Member States having involved stakeholders. It is important for all concerned in decommissioning projects to understand the issues that may affect decisions and therefore to be able to gain from the experiences already obtained in other countries. It is recognized, however, that all experiences may not be universally relevant and that some issues have a particular national character.

19. One particular concern of stakeholders in the local community of a facility to be decommissioned are the societal effects of plant shutdown. The decision to decommission brings uncertainties to the local workforce and to the local community and may have a de-stabilising effect on the local economy. Information on the experiences already obtained and the solutions found may be valuable to others who will be engaged in decommissioning projects in the future.

20. It is noted that work in the area of stakeholders' involvement is already being undertaken by other international organizations, notably by the OECD's Nuclear Energy Agency, and the Agency should draw on this resource in its own work.

*Action 11: Address the societal aspects of decommissioning by summarizing in information documents:*  
*a) national experiences worldwide of stakeholders' involvement in decision-making in relation to decommissioning, and b) experiences of social issues related to the shutdown and decommissioning of nuclear facilities, taking due account of the work of other international organizations.*

**Desired outcome:** Improved awareness among those about to be involved in decommissioning projects of the typical issues of concern to stakeholders and of the approaches that have been adopted to reconcile them.