

Measures to Strengthen International Cooperation in Nuclear, Radiation and Transport Safety and Waste Management

Revision of the International Action Plan on the Decommissioning of Nuclear Facilities

A. Introduction

1. As the number of facilities reaching the end of their lifetime is continuously increasing, regulators, operators and other interested parties increasingly recognize the need for adequate planning for the safe decommissioning of such facilities, the management of associated waste, and the release of such sites from regulatory control. In the past 40 years, decommissioning has evolved from a small scale activity to a large scale industry covering a broad range of facilities — nuclear power plants (NPPs), fuel cycle facilities, mining and mineral processing facilities, research reactors, laboratories, etc.
2. In June 2004, the Board of Governors approved the International Action Plan on the Decommissioning of Nuclear Facilities (document GOV/2004/40 (Corrected)).

B. Current Status of Implementation of the International Action Plan

1. The **worldwide status of decommissioning** of nuclear facilities was evaluated and presented in a report, *Worldwide Status of Decommissioning of Nuclear Facilities* (2004), and databases on shutdown NPPs and research reactors were also developed.
2. New **Safety Requirements on decommissioning** of facilities using radioactive material (WS-R-5) and a new Safety Guide on release of sites from regulatory control on termination of practices (WS-G-5.1) were developed and published in 2006. On the basis of the new Safety Requirements, revision of the existing Safety Guides on decommissioning (WS-G-2.1, WS-G-2.2 and WS-G-2.4) was initiated and a new Safety Guide on safety assessment for decommissioning of facilities using radioactive material (DS376) is in preparation.

3. An international forum for sharing and exchanging information and experience on the application of the methodology for **safety assessment for decommissioning** was established in 2004 through the new International Project on Evaluation and Demonstration of Safety during Decommissioning of Nuclear Facilities (DeSa). The recommendations are expected to be published in a Safety Report in 2008.
4. Assistance to Member States in **decommissioning of research reactors** has been provided through (i) recommendations on safety and technology aspects of decommissioning of research reactors presented in Safety Report No. 50, *Decommissioning Strategies for Facilities Using Radioactive Material* (2007), Technical Report No. 446, *Decommissioning of Research Reactors: Evolution, State of the Art, Open Issues* (2006), and *Decommissioning of Research Reactors and other Small Nuclear Facilities by making Optimal Use of Limited Resources* (in print); and (ii) the launch of R²D²P (Research Reactor Decommissioning Demonstration Project).
5. Recommendations on **management and disposal of decommissioning waste** have been developed and presented in Technical Report No. 441, *Management of Problematic Waste and Material Generated During the Decommissioning of Nuclear Facilities* (2006), and *Managing Low Activity Decommissioning Material* (in print).
6. **Information exchange on decommissioning** has been fostered through various Agency mechanisms (development of standards and supporting documents, training, technical cooperation, etc.) and in particular through the International Conference on Lessons Learned from the Decommissioning of Nuclear Facilities and the Safe Termination of Nuclear Activities.
7. Advice to Member States on a **funding mechanism for decommissioning** was provided through the publication of IAEA Technical Document (TECDOC) No. 1476, *Financial Aspects of Decommissioning* (2005), supported by advice on cost estimation for decommissioning, organized through the regional technical cooperation projects RER/3/005 and RER/9/058;
8. Experience of Member States in the **release and reuse of materials and sites** after decommissioning was collected and presented in Technical Report No. 444, *Redevelopment of Nuclear Facilities after Decommissioning* (2006), and two Safety Reports planned to be published in 2007 — *Monitoring for Compliance with Clearance Values* and *Monitoring for Compliance with Site Remediation Criteria*.
9. Experience, good practice and advice related to the **long term preservation of decommissioning information** has been summarized and presented in a new Technical Report, *Long Term Preservation of Information in Decommissioning Projects*, expected to be published in 2007.
10. Recommendations on addressing **social aspects during decommissioning** have been developed and presented in a Technical Report, *Managing the Socio-Economic Impact of the Decommissioning of Nuclear Facilities*, planned to be published in 2007.

C. Background to the proposed actions

3. The outcomes of the Athens Conference¹, and the increasing number of requests from Member States for Agency support to regulators and operators in decommissioning planning and implementation demonstrate the need for continuation of Agency assistance, in particular in the application of the safety standards and in the transfer of experience and good practice from advanced decommissioning projects to countries with less experience in this field. Accordingly, the Action Plan has been reviewed to ensure the right priorities for the 2008/2009 programme cycle in the following areas:

- (i) Development of an international safety regime for the management of radioactive waste (Programme 3.4.1);
- (ii) Facilitating exchange of information on radioactive waste management (Programme 3.4.1.2);
- (iii) Developing and implementing guidance on the safe termination of nuclear activities (Programme 3.4.4.1);
- (iv) Facilitating the transfer of sustainable technologies for decommissioning of facilities (Programme 3.4.4.3).

4. The primary objectives of the revision of the Action Plan are to:

- (a) Enable the Agency to focus its future activities on decommissioning by addressing key areas identified at the Athens Conference and other relevant international events and to develop the international safety regime in the field of decommissioning;
- (b) Establish the Agency as the international focal point to assist Member States with planning, undertaking and termination of decommissioning in accordance with the relevant internationally agreed safety standards and state-of-the-art recommendations, in particular in the case of the decommissioning of small facilities.

D. Proposed Actions

D.1. Development of an international safety regime for the management of radioactive waste

Governmental roles and responsibilities for decommissioning

5. The Athens Conference concluded that it was important to increase the awareness of governments and interested parties of the need for early planning, adequate governmental funding and other support and long term strategies for decommissioning, waste and spent fuel management.

¹ For the main outcomes see GOV/INF/2007/1; the conference proceedings are expected to be published in 2007.

6. The aim of this action is to assist Member States in achieving this task through existing international mechanisms.

Action 1: Technical support and advice to Member State governments in establishing adequate legal and regulatory frameworks, strategies, and financial and human resources for decommissioning through (i) the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management and its peer review mechanism; (ii) regional cooperation and technical assistance to decision makers on legal, regulatory and technical aspects.

Desired outcomes: (i) Legal and regulatory frameworks in place in Member States relevant to decommissioning and the management of decommissioning waste; (ii) decommissioning and waste management strategies and plans in place for all facilities; and (iii) financial mechanisms for decommissioning in place and resources available.

Decommissioning strategies

7. The discussions at the Athens Conference demonstrated that for many facilities, and in particular small facilities, the preferred option is immediate dismantling. However, deferred dismantling may be a justified option for some facilities. In this connection, more clarity is needed on the concept of entombment, considered in some Member States to be a storage rather than a disposal option.

8. The aim of this action is to provide specific recommendations on application of the entombment strategy and the liabilities associated with decommissioning activities.

Action 2: (i) Review of international experience and development of specific recommendations for planning and implementation of an entombment strategy; (ii) update international financial liabilities of decommissioning of different facilities worldwide (including facilities using naturally occurring radioactive materials); and (iii) develop recommendations on the legal liabilities upon termination of practices (i.e. for unrestricted and restricted use of sites).

Desired outcome: Increased awareness by Member States of factors and considerations relevant to the selection of adequate decommissioning strategies and release of sites from regulatory control.

D.2. Facilitating exchange of information on radioactive waste management

Maintaining competence in decommissioning

9. The Athens Conference highlighted the need for national and international mechanisms to preserve and maintain the operational knowledge and decommissioning experience that is important to the safety of decommissioning. It also recognized the important challenges experienced in many countries to retain and maintain the necessary levels of knowledge (including long term maintenance of records) and skilled personnel during decommissioning, in particular, in the case of long term projects.

10. The aim of this action is to establish mechanisms to assist Member States in developing and maintaining adequate competence and qualified personnel for decommissioning (particularly relevant for small countries with limited resources or no experience). It also aims to establish the Agency as an international focal point for operators and regulators regarding exchange of information on

decommissioning to discuss specific technical and regulatory aspects of planning, authorization, performance of decommissioning, and site release.

Action 3: Facilitating regular exchange of knowledge and lessons learned between Member States through establishment and implementation of: (i) an international network of decommissioning centres based on ongoing decommissioning projects for different facilities and technologies used; and (ii) an international training mechanism and forum for preparation and qualification of decommissioning experts from regulatory bodies, operators, etc.

Desired outcomes: (i) Decommissioning centres in place in every region and for different types of facilities; (ii) specialized training centres and programmes for experts in decommissioning using the safety standards and Agency training tools; and (iii) regular updates on the progress of decommissioning projects around the world, and feedback for safety standards and supporting technical documents relevant to decommissioning.

Independent review of decommissioning of facilities

11. During the past few years, the number of requests for the Agency to provide technical assistance in planning or undertaking decommissioning of various nuclear facilities has increased. This assistance has been mainly provided on a case by case basis through national or regional technical cooperation projects.

12. The aim of this action is to set up and offer advice to Member States on adequacy and compliance of the planning and implementation of decommissioning of the facilities with the international safety standards and good practice in this field. It aims to assist regulators and operators from Member States in their work to decommission nuclear facilities in accordance with the internationally agreed safety standards..

Action 4: Establishment of an international peer review and advice mechanism (including self assessment) that will complement the Agency's services (e.g. Operational Safety Review Teams (OSARTs), Waste Management Assessment and Technical Review Programme (WATRP)) for different types of facilities (e.g. NPPs, fuel cycle facilities, research reactors) at the request of Member States.

Desired outcomes: Exchange of good practice between Member States, and improvement of the safety and efficiency of decommissioning of facilities worldwide.

Lessons learned from decommissioning in the design of new facilities

13. With the recent increase in interest in the development of nuclear facilities worldwide, the Athens Conference recommended that the lessons learned from decommissioning to date be used as an input in the design, operation and maintenance of all new nuclear facilities.

14. The aim of this action is to transfer up-to-date knowledge and lessons learned from decommissioning that can be beneficial for new facilities and their future decommissioning.

Action 5: Consolidate the experience to date from decommissioning projects that can be used in the design and operation of planned and new facilities in order to facilitate their operation and decommissioning; minimize waste generation and improve protection of the public, workers and the environment and facilitate the release of material and sites from regulatory control.

Desired outcomes: Main recommendations for different facilities based on international decommissioning experience to be applied in the planning of decommissioning of new facilities.

D.3. Developing and implementing guidance on the safe termination of nuclear activities

Decommissioning of small facilities

15. International support for decommissioning of small facilities (e.g. research reactors, research laboratories) in countries with limited human and financial resources through further elaboration of international centres in the different regions, complementing the experience of R²D²P (Research Reactor Decommissioning Demonstration Project) was strongly encouraged at the Athens Conference.

16. The aim of this action is to have mechanisms in place to facilitate the safe decommissioning of small facilities on a national or regional basis.

Action 6: Organization of Member State support on safety and technology aspects and development of regional projects for demonstration of decommissioning of small facilities (following the experience of R²D²P) in Africa, Europe, and Latin America.

Desired outcomes: Decommissioning plans developed and being implemented; knowledge and experience at a regional level regularly exchanged.

Establishment and application of safety standards for decommissioning

17. With the approval of the new Safety Requirements WS-R-5, *Decommissioning of Facilities Using Radioactive Material*, the suite of international safety standards for decommissioning of facilities using radioactive material now covers all relevant areas. However, there is significant experience worldwide that needs to be utilized and reflected in the revision of the existing Safety Guides. The importance of establishing clear regulatory policy, safety requirements and criteria, record keeping mechanisms, approaches and criteria for review of safety cases and interaction mechanisms between regulators and operators was clearly recognized at the Athens Conference. The differences between operational and decommissioning activities and the need for flexible and graded approaches to the application of regulatory frameworks were also recognized there.

18. The aim of this action is to revise the Safety Guides on decommissioning taking into consideration lessons learned and experience in Member States and the outcomes of the Athens Conference, and to recommend mechanisms for demonstrating safety during decommissioning.

Action 7: (i) Revision of the Safety Guides on decommissioning with specific recommendations on the entombment option, preliminary decommissioning plans and environmental impact assessment for decommissioning;

(ii) Establishment of a forum for the exchange of experience and harmonization of approaches to development and review of safety cases (decommissioning plan) for decommissioning (follow-up to the International Project on Evaluation and Demonstration of Safety during Decommissioning of Nuclear Facilities (DeSa)), including recommendations for the application of the graded approach; and

Desired outcomes: Comprehensive set of up-to-date safety guides on decommissioning; consolidation of experience from Member States and recommendations on the development and review of safety cases for decommissioning.

Management of material and sites during decommissioning

19. Early planning together with clear waste management and spent fuel strategies are vital for the success of decommissioning projects. There was agreement at the Athens Conference that a lack of waste disposal facilities is not a reason for delaying decommissioning, particularly in the case of facilities that represent a legacy and small facilities.

20. There is international consensus on the values for the clearance of material and sites from regulatory control contained in the Agency safety standards. However further work is required at a national level to implement these values in order to ensure harmonization at the international level and to develop strategies and mechanisms for monitoring compliance with them. The release of sites for restricted use may become a preferred endpoint of decommissioning in some cases, particularly in countries where new nuclear facilities are contemplated. Developing new, viable activities for decommissioned sites is a new trend offering a large potential for workforce redeployment and local revitalization.

21. Early involvement of relevant stakeholders in planning for decommissioning and in the definition of a clear endpoint of decommissioning are important, in particular in relation to the release of material from control and the reuse of sites. Such involvement contributes to the building of public confidence, staff motivation and the consideration of the social aspects relating to decommissioning.

22. The aim of this action is to (i) assist Member States, without available waste disposal routes, on measures to optimize waste generation and manage decommissioning waste in a safe and cost effective manner (e.g. through clearance, adequate decommissioning technologies, and restricted use of material and sites); (ii) assist Member States in application of the reference values for clearance of bulk material (see Safety Guide RS-G-1.7) and site release (see Safety Guide WS-G-5.1).

Action 8: (i) Cooperation with regulators, operators, and international organizations and entities (e.g. World Trade Organization (WTO), United Nations Economic Commission for Europe (UNECE), West European Nuclear Regulators' Association (WENRA)), for the harmonized application of the reference values given in Safety Guide RS-G-1.7;

(ii) Use the proposed forums to exchange experience to raise awareness of the importance of socio-economic factors and the development of clear strategies for the management of decommissioning wastes.

Desired outcome: Broad practical application of the international safety standards on release of material and sites from regulatory control and application of adequate strategies for the management of decommissioning waste.

Funding and cost estimation

23. The establishment and management of funding mechanisms supported by realistic cost estimates are of high importance in the majority of countries. Governmental support and funding is particularly important for the successful and safe decommissioning of small state owned facilities and cleanup of sites that represent a legacy.

24. The aim of this action is to provide (i) tools to assist operators and regulators in Member States to develop and review costs estimates for decommissioning, and (ii) detailed guidance on other significant components of management of decommissioning projects.

Action 9: (i) Development of detailed recommendations on the application of the cost estimation methodology for the different types of facilities with difference hazard potential and complexities; and (ii) development of recommendations for regulatory review of cost estimates and funding mechanisms.

Desired outcomes: Improved cost estimation for decommissioning and funding mechanisms for ongoing and planned decommissioning projects, as well as improved project management in compliance with planned resources.

D.4. Facilitating the transfer of sustainable technologies for decommissioning of facilities

Decommissioning technologies

25. The Athens Conference demonstrated that straightforward, proven and available decommissioning technologies are generally preferable to new and innovative technologies. Where new technologies are foreseen, provisions for their testing and demonstration of their suitability need consideration in planning for decommissioning. It is also important to involve the operational workforce in the application and, as appropriate, in the development of the decommissioning technologies.

26. The aim of this action is to establish mechanisms to assist Member States in the selection of adequate and simple technology solutions (particularly for countries with limited resources).

Action 10: Development of recommendations for (i) selection and implementation of technologies and (ii) adequate and economic solutions for developing countries.

Desired outcomes: Decommissioning plans in preparation or implementation in Member States with appropriate decommissioning technologies, based on the selected decommissioning strategy, availability of resources, skills and other relevant factors.