

**International Conference on Advancing the Global Implementation of
Decommissioning and Environmental Remediation Programmes**

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Report by the Conference President, Mr J.J. Zaballa, on Friday, 27 May 2016

INTRODUCTION

Nuclear activities have been undertaken on a significant scale since the Second World War, initially associated with the production of atomic weapons, and then, from the 1950s, also involving facilities for the production of electricity and numerous other activities undertaken for civilian purposes. At that time little attention was paid to how these facilities should eventually be dismantled, nor how sites contaminated because of uranium mining, weapons testing, accidental releases, and indeed due to practices involving substantial amounts of naturally-occurring radioactive material, should be remediated.

The last two decades have witnessed growing efforts to deal with these liabilities, particularly in States with nuclear power programmes. It is now common practice that initial plans for the decommissioning of licensed nuclear facilities, and associated cost estimates, are developed as part of the initial licensing process, recognizing that this is normal step in the facility lifecycle. Similar considerations of the entire lifecycle of facilities are generally currently applied at the development stage for new uranium mines.

This evolution has occurred for several different reasons, including increasing interest and also pressure from society that principles of environmental sustainability are applied to all industrial activities, e.g. in line with the sustainable development agenda of the United Nations. This suggests, among other things, that sites hosting retired facilities should be made safe and be made available for other social and economic uses. This issue has strong ethical dimensions: the generations which gained benefit from the use of nuclear energy should, where reasonably practicable, not pass the burden of addressing the associated legacies to future generations.

The very large level of participation at this conference, which has been attended by 540 persons representing 54 countries and four international organizations, provides strong

evidence of current levels of awareness and interest among Member States, relevant organisations and people on the need to provide safe, environmentally sound and cost effective solutions for implementing decommissioning and environmental remediation programmes worldwide.

The conference has shed light on areas where significant achievements have taken place in recent years — particularly since the impulse provided by the last IAEA conference on decommissioning in Athens in 2006 and the 2009 conference on environmental remediation in Astana. These achievements relate to decommissioning programmes and remediation of several legacy sites associated with uranium mining and to storage of radioactive waste, particularly in those Member States that have comprehensive and integrated national arrangements comprising: legal and regulatory framework, responsibility assignment including financing, access to technology and waste management routes

The conference also served to highlight several areas where less progress than expected has been achieved, for example only about 17 of permanently-shutdown nuclear power plants have been fully decommissioned though many are undergoing decommissioning or in a safe enclosure state. Large numbers of smaller facilities remain to be decommissioned, particularly in countries which do not have power programmes and there remain a very significant number of large contaminated sites where little remediation has been implemented. Issues constraining progress were discussed and ideas offered where a concerted effort by the international community could help in overcoming the main current barriers.

Delivering decommissioning and environmental remediation requires a complex interaction of several actors, including national governments, regulatory authorities, facility and site owners, national agencies responsible for liability and waste management (where these exist), industrial organizations involved in programme implementation (the supply chain), the university and vocational training sectors and the communities who would be affected by implementation of these decisions. Much of the discussion at the conference emphasized the importance of collaboration between the concerned agencies and organizations, and the importance of finding opportunities for motivating young professionals to work in this field.

These issues are discussed in the next section of my report.

THE ROLE OF GOVERNMENT

Elements consistently highlighted as important to the success of decommissioning and environmental remediation programmes were having in place an appropriate legal and regulatory framework that, among other things, establishes responsibilities among concerned actors for funding and implementation of projects, and ensuring safety of workers, the public and the environment, and requires engagement with affected communities in decisions affecting their livelihoods. Governments also need to ensure that there are adequate facilities for management of waste, including its disposal. The

existence of a law or a clearly stated national policy on radioactive waste management is important to provide direction and legitimacy.

The conference urged governments to establish national policies and related strategies for decommissioning and environmental remediation where these did not already exist, and urged that there should be a strong presumption against passing responsibilities to future generations where the means to address them currently existed.

The responsibility of governments to provide the necessary infrastructure to ensure that decommissioning and environmental remediation programmes are advanced at a satisfactory pace was emphasised. Governments are responsible for ensuring that environmental liabilities, including facilities which have been used for activities involving the use of radioactive materials and radioactively contaminated sites, are identified and evaluated and that responsibilities for managing these liabilities are clearly assigned.

States that are parties to Joint Convention were suggested to consider to report on their arrangements for management of decommissioning and environmental liabilities as part of their reports to the Review Meetings of the Convention.

In general, the responsibility for managing liabilities concerned with radioactively contaminated facilities or sites will fall on the licensee, organisation or government entity that undertook the activities that have led to radioactive contamination, except that there are important examples where this entity no longer exists and no adequate financial provisions have been set aside. In these cases the State needs to assume responsibility and the cost of decommissioning and/or remediation. These arrangements, including the relative priority given to allocating national resources to these issues, need to be addressed in national policy and strategy and, where appropriate, reflected in national legal frameworks.

Special efforts are needed to provide financing mechanisms to support the implementation of decommissioning and environmental programmes in States lacking necessary resources

The conference participants emphasized the importance of establishing a decommissioning fund and a national strategy for decommissioning and environmental remediation at the onset of any new nuclear programme. Doing so would help ensure that such legacies are no longer passed forward to future generations. The example set by the first nuclear countries should not be followed by the newcomers to nuclear.

The conference underlined that decommissioning and remediation programmes should normally be undertaken as the earliest reasonable opportunity, once the necessary prerequisites were in place. Advance planning was recognized as an essential element to achieving decommissioning and minimizing costs. The importance of making best use of

limited financial resources was emphasised, requiring greater efforts to ensure the cost-effectiveness of proposed strategies.

It became clear from the discussions that have taken place during the Conference that one of the most important barriers to progress concerns a lack of appropriate management routes for materials, and especially radioactive waste, associated with decommissioning and environmental remediation programmes. Ensuring that such management routes are identified and developed is an important government responsibility that also should be reflected in national policy and associated planning. The waste management system in many countries often is not designed taking into account waste to be arisen from decommissioning and environmental remediation. Early coordination of these issues at national level is necessary to ensure an efficient and effective approach.

The conference recommended that States apply holistic approaches to the management of waste from decommissioning or environmental remediation, requiring an integrated approach to strategic decisions involving decommissioning and/or environmental/ remediation and the associated management of radioactive and other toxic waste and the development of waste disposal facilities.

Government involvement is important in ensuring that decision frameworks, for decisions such as desired end states from programmes, take adequate account of the different interest and views of concerned stakeholders, including communities whose livelihoods are affected by such decisions.

THE LEGAL AND REGULATORY FRAMEWORK FOR DECOMMISSIONING AND ENVIRONMENTAL REMEDIATION

A legal and regulatory framework that defines the responsibilities of all concerned parties was noted as important to the success of decommissioning programmes. It is especially important that the framework is adapted to the risks specific from decommissioning and remediation, and which establishes the standards that need to be achieved in in order to ensure the safety of people and the environment, now and in the future. The conference heard that, in the field of decommissioning, the necessary elements of this framework are generally well understood and appropriate regulations are in place in many countries facing decommissioning. There is a significant degree of harmonisation of standards for unconditional clearance of materials from decommissioning, though this does not generally extend to conditional clearance, where a range of national approaches exists.

The conference recommended that international standards and associated guidance should be developed for conditional clearance of materials from decommissioning.

In the context of the standards applicable to the release of sites from regulatory control and making them available for alternative uses (whether as the final step of a decommissioning project or as a result of environmental remediation), the situation is significantly more complex and a wide range of different approaches is being applied in different countries.

The number of nuclear installations, especially nuclear power plants, entering permanent shutdown and decommissioning is growing, increasing the need for continued improvements and enhancements in the standards and associated guidance for decommissioning. It was noted that pragmatic approaches to regulation of projects, recognising their dynamic nature, were important to achieving progress.

Regarding remediation, the conference found the international standards to be less well developed than those for decommissioning. For example, there is insufficient guidance for addressing how to establish reference levels, how to conduct planning in advance of an accident, or how to communicate what is safe. The need to establish the justification for interventions, together with rational and reasonable reference levels and to avoid reacting to public anxiety during a time of crisis or urgency, was emphasized. These areas represent opportunities at the international level to develop specific guidance and or standards.

The conference recommended that the international community needed to do more to identify what levels of radioactive contamination could generally be regarded as being sufficiently low that they did not pose a threat to the safety of people and the environment. It was suggested this issue be included in any future IAEA Plan of Action addressing these issues.

The importance of planning in advance for dealing with the aftermath of nuclear or radiological accidents was discussed. Such planning would be analogous to the emergency response plans that are now routinely prepared for dealing with the accident situation itself. The plans, which need to be developed through a process of national dialogue, should include consideration of issues such as reference levels for remediation of large areas of contamination; end states and strategies for management of large quantities of waste, including its disposal.

The Conference further recommended that additional consideration be given to establishing international guidelines for post-accident recovery: in the aftermath of an accident it is too late to begin planning and establishing levels such as reference levels, end states and strategies, waste management and disposal strategies. The existence of guidance at international level would be particularly helpful in avoiding associations with any specific national facility but would provide guidelines that could reasonably be used in any post-accident recovery scenario.

THE DECISION PROCESS AND INVOLVEMENT OF STAKEHOLDERS

There was general recognition that there is a need for early consideration and alignment of thoughtful strategies for public communication and stakeholder involvement with the overarching national decommissioning and environmental remediation framework. Alignment at the beginning of the process helps to establish effective mechanisms for dialogue, with clear allocation of roles and responsibilities.

Early inclusion of communication strategies in the development of national decommissioning and environmental remediation strategies may help bridge different risk assessments by different actors. Building and maintaining trust was generally recognized as being very important to project success. This is best built early, through open, clear and agreed lines of communication and genuine listening to specific interests, respecting different viewpoints and understanding objectives and by maintaining openness and transparency. Risk communication was also seen as a potential bridge building process. This activity includes not only scientific and factual knowledge about ionizing radiation, but also need to consider emotions, values, trust, experiences, and different perceptions of risk. This should be a continuous process of engagement, beginning from an early stage, and not just a reaction to crises.

Challenges being faced by countries with existing nuclear programmes in fostering societal engagement in decommissioning and environmental remediation projects were noted. While these countries face particular challenges, newcomers embarking on nuclear programmes have important opportunities to learn lessons and to integrate public communication strategies into their national strategies from the outset. It was highlighted that newcomers should enhance their stakeholder strategies in order to avoid some of the challenges being faced by countries with existing programmes. Newcomer and embarking countries would greatly benefit from guidance and recommendations on best practices in developing national policies and strategies for public communication and engagement in their respective countries.

The Conference recommended that States develop and implement decommissioning and environmental remediation policies and related frameworks that clearly allow and facilitate stakeholder engagement in decision making, and that the legal and regulatory framework for decommissioning and environmental remediation specifically identify key points in the process for stakeholder participation. It was suggested that the international community should develop guidance on how to engage stakeholders in such decisions.

TECHNOLOGY AND INNOVATION

The conference heard that significant advances have been made in the field of decommissioning over the last 10 years or so, particularly in the fields of characterisation and segmentation. There is growing use of robotics and drone technology, and use of virtual reality, 3D computer modelling is also becoming widespread. Many of these innovations have been taken from the automotive and transport industry as well as information technology and video gaming. It is evident that many organisations are working on similar issues, perhaps with significant duplication.

The conference recommended that greater efforts be made at international level to achieve coordination of research and development activities related to decommissioning and environmental remediation

Technology advances and associated technical solutions, from passive to active, are being applied to remediation projects across a wide range of countries. Technological solutions continue to be 'transferred' from other areas, such as oil and gas exploration and metallurgy, and the continuation of this practice should be further encouraged. Once a new technology is developed and demonstrated, it is evident that successful technology transfer is dependent upon having an understanding of the new context in which the technology will be applied and through having assurance that the recipient country has the resources to implement and follow through with the operation of the technology for the long term.

The Conference encouraged the IAEA to proceed with (and eventually enhance) existing commitments to facilitate the sharing and exchanging of knowledge and experience and to explore additional mechanisms to build capacity in its Member States to allow them to use of technologies that will facilitate implementation of remediation projects in a sustainable manner.

Innovative approaches continue to be important to decommissioning and environmental remediation while they offer an opportunity to engage with universities and research laboratories. Doing so introduces engineers and scientists to the needs of the nuclear field, and has the added benefit of expanding the pool of talent to support decommissioning and environmental remediation. In the field of decommissioning, delaying projects while waiting for technology improvements is not a recommended approach as postponing action may increase the risk.

Practical demonstration of technologies is key to gaining the confidence of stakeholders (including regulators) prior to selection and implementation. In this respect the value of pilot projects to test the effectiveness of a remediation approach in a given situation was highlighted.

The Conference recognized that international cooperation is a fundamental tool to the application of technological evolution in decommissioning. While the sharing of ideas and experiences in the commercial sector will be sometimes challenging as a consequence of market competition, international platforms supported by international organizations, open to regulators and decommissioning implementers, would provide potent opportunities to compare, discuss and find common solutions. Some initiatives already exist, but a reinforced and more systematic approach would foster this evolution, assuring safer and cheaper decommissioning projects. This issue will increase in importance in the near future, as increasing numbers of nuclear facilities are definitively shutdown.

The Conference recommended that decommissioning and remediation practitioners continue to exchange the results and experiences through forums such as this conference, and continue to look to other technical fields for relevant solutions. Publically accessible databases should be encouraged to promote lessons learned and to provide wide availability of experiences of technology application.

Successful implementation of decommissioning and environmental remediation requires the provision of facilities for management of the resulting waste and materials. In many countries the infrastructure for waste management has been dimensioned for operational needs and is not adequate for decommissioning and remediation needs. Integration of decommissioning and remediation waste into the national waste management strategies is of key importance for advancing implementation of decommissioning and remediation.

Early planning for decommissioning of facilities and national inventories of contaminated sites should facilitate the process of ensuring adequate provisions for management of waste, including its disposal, are available when needed.

THE SUPPLY CHAIN FOR PROJECT IMPLEMENTATION

The conference heard that, in general, decommissioning and environmental remediation programmes are implemented by a combination of in-house staff and contractors, to facilitate the involvement of specialist expertise in projects and to take benefit from innovation. Use of contractors brings benefit in terms of expertise but also brings organisational challenges and management needs.

In the decade since the last IAEA decommissioning conference, progress has been made, with an emphasis on prioritizing the implementation projects according to the risk they pose. In this situation it is important that project risks are understood and shared in a transparent way with contractors. It was also noted that it is beneficial to foster long-term relationships with contractors. The importance of project and contract management skills was highlighted.

The conference recommended that the international community should develop guidance on the management of project risks in decommissioning and remediation programmes, including opportunities for sharing information on good practice on this issue.

The capability and skills to perform decommissioning and environmental remediation are different from those needed to operate a nuclear facility. Decommissioning and environmental remediation presents a work environment that is changing frequently, and so may not be fully dependent upon standardization of procedures or daily work plans. While this may not be the subject of policy, it should nonetheless be recognized that transition from operators to decommissioning workers will require retraining and a different motivational approach. Skills requirements for the future were discussed, including the need to foster mobility. Continued efforts are needed in developing relationships with universities and training institutions to ensure that the necessary qualified personnel are available in future.

The conference recommended that greater efforts be made at international level to develop training opportunities for young professionals working on decommissioning and remediation projects.

CONCLUDING REMARKS

The conference confirmed that the level of activity in both decommissioning and environmental fields is increasing a consequence of the ageing of existing nuclear facilities and sites ceasing operation, as well as the continued presence of a significant number of legacy facilities and sites.

Such activities attract wide interest from a wide diversity of stakeholders and which require dedicated attention. Experience in the last years has demonstrated the strong relevance of this aspect to successful implementation and execution of decommissioning and environmental remediation programmes.

The Conference recognized that in the last decade, since the last IAEA decommissioning conference, significant progress has been achieved in this field. A large number of facilities have been completely dismantled, including some nuclear power reactors. However, as it is foreseen that a large number of nuclear installations will shutdown in the coming years, a reinforced commitment at National and International level is needed to prevent the situation arising that existing numbers of legacy facilities are increased further.

Despite the results achieved, environmental remediation of contaminated sites remains an overarching issue for a large number of Member States. The Conference encouraged such Member States to adopt adequate dispositions to enhance these situations, taking account of risk, cost effectiveness and environmental considerations. Unfortunately, a significant number of legacy sites remain in a similar situation over several decades due to lack of National capacity to address their remediation. As well as efforts being required at National level, the international organizations should explore how to better assist these Member States from a technical and financial point of view with the goal of improving existing conditions and preventing future undesirable impacts. The Conference underlined the shared need of the international community to promote the adoption of measures at National level aimed at preventing similar situations occurring in future.

The discussions suggested a broad consensus on the fundamental elements of a successful National programme: the existence of a regulatory and legal framework that guarantees safety, whilst establishing the necessary provisions with regard to the funding and effective availability of resources, access to technologies and qualified personnel in this field and the presence of logistic and management solutions for the resulting materials, particularly the spent nuclear fuel and the radioactive waste. In this regard, the Conference convened about the key roles played both by licensees and Government, involving the assumption of their respective responsibilities to support the early implementation of decommissioning and so avoid the passing of risk and associated burdens to future generations.

The conference offered an opportunity to highlight the continued efforts and successful results being achieved in the technological fields. While conventional industry remains the main source for the technology being used in decommissioning and environmental remediation activities, it is worth noting that dedicated developments have been necessary to address specific needs. The long-term nature of these activities, and the continued demand for more efficient use of resources, from safety, programme and cost perspectives, justify the need for a continued attention and activity focussed on technological innovation.

Noting the global consequences of the accidents that affect nuclear installations, the Conference recommended that additional consideration should be given to establishing international guidelines for post-accident recovery.

As I mentioned earlier, the number of ongoing decommissioning and environmental remediation projects is large, and current estimates indicate further substantial increases in the coming years. The conference emphasised the need to promote actions and programmes aimed at ensuring the availability of personnel for future activities. In this regard the need to increase ongoing activities to attract young professional to make these activities sustainable over time was strongly emphasised.

The conference recommended that a report on its outcomes should be presented to the next General Conference of the IAEA and suggested that, subject to the views of its Member States, IAEA should formulate a Plan of Action, comprising activities that are specific and achievable, aimed at addressing the identified issues.