

International Symposium on Low Activity Radioactive Waste, Cordoba, Spain, 13-17 December 2004

Introduction

This symposium was organized by the International Atomic Energy Agency (IAEA) in co-sponsorship with the French Agence nationale pour la gestion des déchets radioactifs (ANDRA) and in co-operation with the OECD's Nuclear Energy Agency (NEA). It was hosted by the Government of Spain through the Empresa Nacional de Residuos Radiactivos, S.A. (ENRESA) and the Consejo de Seguridad Nuclear (CSN). The Symposium was attended by 280 participants from 61 countries and 5 international organizations.

The term "Low activity radioactive waste" used in the title of the Symposium is not one of the defined international waste categories but was used to describe a wide range of waste types, many of which are not currently categorized in international and national radioactive waste classification schemes.

The titles of the sessions of the Symposium were as follows:

- Policies and Strategies for Low Activity Radioactive Waste
- Very Low Activity Radioactive Waste
- Low Activity Radioactive Waste from Decommissioning
- Long Lived Low Activity Radioactive Waste/Other Materials
- Unique Low Activity Radioactive Waste

The Proceedings of the Symposium will be published, in due course, by the IAEA. They will include Introductory and Closing Statements, Invited Papers and a Record of the Panel Discussions and of the Discussions at the end of each of the Sessions. The Proceedings will also include a CD containing the Contributed Papers.

The following text comprises Summaries of the five Topical Sessions of the Symposium and the Symposium Chairman's Summary.

Summaries of the Topical Sessions

Summary of Topical Session 1

Policies and Strategies for Low Activity Radioactive Waste Management and Disposal

The first session of the Symposium started with a “scene setting” paper from the IAEA outlining the aims of the symposium and describing the activities of the IAEA most relevant to the topics of the Symposium.

It was followed by national presentations from Spain, USA, France, Japan, the Russian Federation and Portugal outlining their national policies and strategies for low activity radioactive waste management.

From these national presentations it was clear that several countries have well-established arrangements for managing the low level waste from the normal operation of their regulated facilities. The presentations revealed that new additional low level waste streams have been identified that require the development of innovative management approaches. They include the large volume low level waste from decommissioning (for example, graphite waste and large metal and concrete components) and the large volume long lived waste from industries using natural materials and from the former processing and use of radium. Progress has been made in some countries towards developing and implementing appropriate disposal solutions for these waste streams.. It is evident that there is a need for further consideration of this subject, at the international level, so that generally accepted and scientifically justified solutions can be agreed upon, and applied worldwide, where needed.

These new additional low level waste streams are generally not yet included in existing waste classification schemes. In this context, it is clear that it would be appropriate for the IAEA to revise its radioactive waste classification scheme and other relevant safety standards so as to take account of the additional waste streams, indicating preferred disposal solutions and giving consideration to security concerns. The category “very low level radioactive waste” should be included in the revised scheme.

A report on the relevance of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (the Joint Convention) to the safety of low activity radioactive waste management was presented. The Joint Convention is recognized as an important mechanism for promoting the safety of radioactive waste management in the world. The benefits for countries that are Contracting Parties to the Convention were elaborated. However, many countries with significant quantities of radioactive waste have yet to become Contracting Parties.

The session was concluded with a panel of experts discussing the question “How can existing radioactive waste management strategies better address the needs of countries with limited resources?”. The following is a summary of the main points of the discussion.

Developing countries usually have comparatively small amounts of radioactive waste making the normal methods used for waste management in countries with nuclear

power plants very costly in terms of cost per waste volume. Economies of scale can be achieved through regional solutions and countries within a region were encouraged to consider such approaches. The subject can be politically sensitive but progress might be made by means of a step-by-step approach, starting, for example, with regional waste processing facilities before moving eventually to the more difficult area of disposal.

Concern was expressed by several participants that some governments do not take their responsibilities for managing radioactive waste sufficiently seriously. In the discussion that followed, it was suggested that an important first step towards indicating that a country has a serious commitment to managing its radioactive waste safely is to have an established national waste management strategy setting out priorities, plans and responsibilities. A further comment was that the lack of such a national policy might discourage otherwise sound initiatives in the country.

The importance of involving the waste producers in the national and international debates related to waste management, as a way of involving them in efforts to establish proper waste management strategies and activities was raised as an issue in the discussion.

Another point concerned the need to avoid unnecessary duplication of effort (mostly in international organizations) and to redirect the resources saved towards activities in countries having insufficient levels of development in radioactive waste management infrastructure.

It was finally recommended that international organizations should consider the following actions in the context of helping developing countries:

- 1 establish a clear approach for assessing the adequacy of national arrangements for safe radioactive waste management
- 2 produce more practically useful projects for developing countries, such as the “borehole disposal project”, as well as practical guidance and “ready-to-use” assessment and management tools.

Summary of Topical Session 2

Very Low Level Radioactive Waste (VLLW)

The session was started with a presentation explaining the history of the successive IAEA waste categorisation schemes. It has been recognized that some important waste streams are not included in the most recent scheme, including the category of very low level waste. This, and the publication in 2004 of the new Safety Guide on Application of the Concepts of Exclusion, Exemption and Clearance (RS-G-1.7) indicate the need for the revision of the IAEA categorisation. A revised IAEA classification scheme should be more closely linked to an overall scheme for managing all types of radioactive waste in which each waste type is identified with a suitable disposal route; such a scheme is under development at the IAEA under the title “a common framework for radioactive waste management”.

Presentations from France and Spain described national progress in establishing disposal facilities for very low level waste (VLLW). The French VLLW disposal facility at Morvilliers has been operational since mid-2003 while, in Spain, a technically similar facility, planned to be sited at El Cabril, is currently undergoing regulatory review. One difference in approach is that the Spanish facility will be regulated as a nuclear facility, while the French facility is regulated in relation to conventional hazardous waste disposal regulations.

A third presentation focused on the current strategic review of LLW management in the UK, under the aegis of the new Nuclear Decommissioning Authority. Preliminary assessments have shown that the remaining capacity of the Drigg surface disposal facility will be insufficient when account is taken of the expected waste volumes from future clean-up and decommissioning operations. The participation of stakeholders and the public in the definition of the strategy are stressed as being essential, and for that reason, the range of possible management options being considered is very broad.

The last presentation described the efforts of the EC in developing clearance levels for application to different materials. The presentation reviewed the various approaches to the management of VLLW in EU countries and assessed the merits of the different approaches, e.g., recycling, landfill and VLLW repositories.

Following these presentations, a panel session was held with the title “Clearance and VLLW disposal: Competing or complementary approaches?”.

Most participants considered that the clearance concept and VLLW disposal can be complementary but that further clarification and elaboration of how the concepts can be applied separately and together is needed.

A VLLW waste category was considered by most participants to be useful, however, one view was that it may complicate unnecessarily the overall waste management scheme, especially for countries with small amounts of waste or with exclusively NORM waste.

Clearance is a logical and well-based scientific concept with the potential for avoiding costly and unnecessary regulation. While it is clear that the adoption of policies such as

clearance in countries is affected by public acceptance, the role of the scientific and technical community is to provide clear and scientifically based advice (decision aiding rather than decision making).

There is a need for flexibility in defining acceptable management solutions for VLLW, whatever the solutions considered may be (clearance, disposal...). Some reasons are:

- different management solutions (including different clearance policies) may be justified depending on the circumstances, for example, for small amounts of material or for particular materials for which the final destination is known.
- the costs and difficulties associated with transporting large amounts of radioactive waste to distant sites may provide an argument for relaxations in disposal arrangements at the site of origin;
- different disposal arrangements may be decided upon depending on the origin of the waste, for example, if it is from operational practices or from intervention situations involving the cleanup of contaminated areas.

However, the requirement for flexibility does not remove the need for a well-defined regulatory framework that will ensure consistency.

At the international level, there is a need for more guidance on the practical application of the clearance concept (and of the new document (RS-G-1.7)), on approaches for demonstrating compliance with clearance criteria, on an operational framework for transboundary trade in material, and on the safety requirements for VLLW surface disposal facilities.

Summary of Topical Session 3

Low Activity Radioactive Waste from Decommissioning

The session started with a presentation from the NEA giving a global overview on estimates of the radioactive waste produced as a result of the decommissioning of NPPs. However, the exercise revealed that such data are sparse and, although available for some common reactors types, the estimated amounts are variable, and so it is concluded that it is currently difficult to provide reliable global estimates.

It was followed by a presentation describing the system in France for managing the waste from decommissioning operations. It is characterized by a “defence in depth” approach with a leading role for “zoning” as a means of distinguishing conventional from nuclear waste at nuclear facilities. It is supplemented by checking and measurement procedures as additional safety steps. The advantages of the approach were described from both technical and socio-political perspectives.

The third presentation described the experience of decommissioning nuclear fuel production facilities in South Africa. Metal scrap from the facilities has been successfully decontaminated and recycled. However, radioactive waste has yet to be disposed of. It awaits the establishment of a national policy for radioactive waste management in South Africa. In its absence, approved waste disposal routes are lacking, although a potential site exists at the existing LLW disposal facility at Vaalputs.

Two presentations described the plans for managing decommissioning waste in Japan. A large number of facilities will eventually have to be decommissioned and considerable efforts have gone into making plans for the disposition of the resulting waste. Progress towards establishing a comprehensive scheme for managing and disposing of radioactive waste from decommissioning was described, ranging from clearance policies, at one extreme, to geological disposal, at the other.

The final presentation covered plans for decommissioning the Ignalina NPP in Lithuania. An assessment performed to estimate the expected waste amounts from decommissioning was described; it includes a categorization scheme based on the predicted external radiation doses from the various waste streams.

A panel session addressed the question “Radioactive waste disposal routes – a bottleneck for decommissioning?”

For the countries represented on the panel there is no bottleneck effect so far. This is because three of them (Sweden, Belgium and Lithuania) are at a fairly early stage of decommissioning; they each anticipate that near surface radioactive waste repositories will become available at the appropriate time to deal with the low and intermediate level waste from decommissioning. In the case of the other country, USA, there are various near surface disposal options available at present and these are being utilised to the full by decommissioning companies.

Even without the availability of a near surface disposal facility at the time when radioactive waste is being produced from decommissioning, the implementation of decommissioning is not necessarily excluded. If a clearance (or zoning) policy is in

place and being implemented in the country, only a comparatively small volume of radioactive waste has to be managed and this can be achieved through the on-site interim storage of suitably conditioned and packaged waste.

IAEA Safety Standards place emphasis on the need to plan for decommissioning at the design stage of nuclear facilities. Such planning was generally not done for the generation of facilities now being decommissioned. However, in response to a question concerning lessons learned to prevent bottlenecks, it was revealed that the designers in Finland are giving consideration to these aspects in the context of planning for their new NPP.

Concern was expressed over the availability in countries of the expertise necessary to carry out decommissioning. This consideration is one of the arguments for early or immediate dismantling - so that advantage can be taken of the expertise of the existing workforce. Participants also described schemes in their own countries to engage young people in their organizations, as another way of addressing the problem.

Summary of Topical Session 4

Long-Lived, Low Activity Wastes/Other Materials

This session was mainly devoted to the issues arising from the need to manage long-lived low activity waste for very long times into the future. However, the session was started with a presentation summarising a study which has reviewed arrangements in the USA for the management of low activity radioactive waste. One of the main conclusions is that while the the regulatory framework that has evolved provides adequate authority for the safe management of low activity radioactive waste, it is based on the origin of the waste rather than the radiological hazard that it presents. Probably as a consequence, the regulatory system was found to contain certain inconsistencies and gaps. Presentations from Belgium, Canada and Estonia described the arrangements that have been made for the management of historic long-lived waste from nuclear and non-nuclear industries, while a presentation from India described the national arrangements for managing long lived low-level waste from the nuclear fuel cycle.

A panel session addressed the question: “Do we have adequate solutions for the disposal of long-lived low activity waste?”.

The focus of discussion tended to be on NORM materials and their long-term management, often in the context of how risks from these materials are managed in comparison with risks from nuclear fuel cycle waste. Some of the major points that arose in the discussion are summarized in the following paragraphs.

Nuclear fuel cycle waste is of extreme concern to the general public (often in contrast to their attitudes to NORM). The lack of definitions, or the use of definitions that are difficult to understand, for terms such as low activity waste or low-level waste, can be frustrating for the public, and the development of more understandable definitions by countries and international organizations would be helpful in building public confidence.

There is a strong need for risk-informed management of low activity radioactive waste. Where the risk is equal from different radioactive waste types, there should be equal treatment of those waste types in managing the associated risks.

Where the amounts of waste material are very large, for example, in the case of NORM waste, institutional controls and the use of greater realism and less conservatism in the assessment of potential radiation exposures may be required as part of rational and practical solutions for managing these waste types.

There is continued debate about the effectiveness of institutional controls, and additional guidance and examples of their use would be of benefit to countries that have to rely on them. One issue concerns the amount of reliance to be placed on passive controls, such as markers, as compared with active controls, such as monitoring. Both points of view were given in the session. In any case, it seems inevitable that institutional controls will be used, but that steps will have to be taken to ensure that they are effective, and better understood. It was noted that the consequences of their failure need to be considered, for example, as part of a safety assessment, because they can

range from very large, if a highly radioactive sealed source is dug up, to very small, if a fence is breached and an unplanned land use occurs on land contaminated with relatively low concentrations of radioactive material.

In addition to focusing on risk, and defining terms clearly, there are other significant steps that countries can take to build public confidence. They include having a clear commitment from governments to solve particular problems, both in words and deeds. This may entail having direct involvement in dealing with those affected, making financial contributions to resolve the problems, and having an ongoing participation and oversight of the solutions that are negotiated.

The session provided information on different ways in which NORM and fuel cycle materials are being managed. At least one country has a systematic framework in place for addressing NORM management that may provide insights for other countries. It is based on risk (or more specifically dose), and makes use of optimization to determine what is practically achievable below a certain radiation dose limit. It also relies on the use of more realistic exposure scenarios than those often employed for radiological assessments of nuclear fuel cycle waste.

The technical community responsible for managing NORM waste is often different from that having responsibilities for managing nuclear fuel cycle waste. In this session there was encouragement for the communities to work more closely together towards finding consistent solutions that properly satisfy international safety requirements.

Summary of Topical Session 5

Unique low activity waste

Presentations were made by invited speakers from the United Kingdom, France, USA, Belarus and Syria addressing work being undertaken to solve a range of problems concerning: situations where there are relatively high activities of long-lived radionuclides in waste, the management of disused sealed sources, the problem of limited resources for waste management in some countries and the issue of historic disposal sites which do not meet modern standards.

Two of the presentations concerned graphite waste from gas-cooled reactors, which contain significant amounts of long-lived radionuclides. Both were given on behalf of countries with capabilities for dealing with these waste types. One was given by an operator of research and development reactors and described an innovative technique for reducing the waste inventory in order to meet waste acceptance conditions for an existing near surface disposal facility. The other paper was given by a waste disposal organisation and described the proposed development of a sub-surface disposal facility to deal with this waste type.

The next presentation described work undertaken to demonstrate the potential for boreholes, sunk to intermediate-depth in thick alluvial deposits, to safely isolate disused sealed sources. This is a conceptually simple, low-cost, option, potentially of interest to countries having small amounts of waste and limited resources to deal with the problem. Work underway to explore the potential for employing the technique for the safe disposal of spent sealed sources in Egypt is a good example of co-operative activity between organizations and countries.

The next presentation described important work in one country to identify and assess a range of historical radioactive waste disposal practices. Some of them fall short of modern safety standards and could give rise to significant risks to the public in the short term. A considerable amount of work will be required to upgrade the existing disposal facilities, or to retrieve waste for subsequent treatment and disposal in facilities built to modern standards.

The final paper addressed the management of NORM waste from the oil and gas industries. It described the development of a national strategy for dealing with different categories of waste and made recommendations to industry and to national regulators in order to implement the strategy.

A panel of experts then discussed with symposium participants the question “What are the remaining gaps and issues related to the disposal of low activity radioactive waste?”.

The panel discussion led to the identification of a list of gaps and issues, which included:

Gaps

- lack of disposal routes in some countries, particularly for sealed sources
- historic disposals which fall short of modern standards

Issues

- the pressure to minimise disposal costs
- the different levels of regulation across Member States
- the inadequate knowledge of some national waste inventories
- the poor understanding of radiation doses associated with NORM
- the inadequate level of support available to countries with limited resources
- the exploitation of countries with lower standards by unscrupulous commercial interests, and
- the option of long-term storage as an alternative to disposal.

A number of possible ways of resolving the identified gaps and issues were discussed by the panel and the participants. The implementation of the borehole disposal concept was one of these. The borehole concept is of interest to many Member States, especially those with small waste inventories and limited resources. The organisations involved in developing the borehole concept are to be encouraged to promote understanding of the potential benefits of this option.

There was a discussion regarding the short and long-term safety of disposed waste in boreholes. This included consideration of the following points: the chance of inadvertent and deliberate/malicious intrusion, the level of safety provided by the borehole compared with levels of safety of the many unwanted spent sources presently in surface storage, the application of the borehole concept in different geosphere/biosphere locations (arid versus temperate, low versus high population, etc), and the potential for engineering design to improve safety.

A strong message emerged from the discussion that signing up to the Joint Convention is a means of avoiding exploitation for countries with existing lower standards.

It is desirable for there to be increased support to countries with limited resources in the provision of: training, advice and guidance on regulatory frameworks, assessment tools and guidance on best available practices and techniques. There is much advice and guidance already available or under development by the IAEA and similar organizations that will facilitate this support.

Symposium Chairman's Summary

This Symposium was very timely because it responded to the need for countries to address the issues associated with low activity radioactive waste management; issues which have often not received sufficient attention in the past. It has included the increasingly important subject of the management of waste from the decommissioning of nuclear facilities and the management of other important low-level waste streams.

The Symposium has provided evidence of the progress being made in many countries towards the safe management and disposal of low and intermediate level waste from nuclear power plants. This contrasts with the generally slow progress globally in establishing geological repositories. However, it is also clear that not all countries are being successful in managing low and intermediate level waste, mainly because of problems in siting near surface repositories or because of a lack of resources to develop repositories.

The Symposium has drawn attention to important aspects where more consideration is still needed, for example, in the application of the clearance concept and arrangements for very low-level radioactive waste disposal.

It has drawn attention to important low-level waste streams for which there is, as yet, no consensus on how they should be managed. Examples are the large volume and bulky waste from decommissioning, the long-lived and large volume waste from other industries and from past events and accidents. For these waste types there is a need to balance safety considerations and economics and to find solutions that are demonstrably safe but affordable.

The problems of developing countries with small but significant amounts of waste were discussed and, in particular, the problems of limited resources and of unfavourable economics of scale, especially in the context of waste disposal.

In many of these areas there have been proposals from the Symposium on how to improve the situation – sometimes through bi-lateral action and sometimes through recommendations to international organizations to establish new programmes or projects.

This has been a technical meeting; its focus has been on how to solve problems by means of scientific and engineering solutions. In real life, politics and public opinion are often major factors influencing decision-making. Nevertheless, there will always be a need for sound science and workable technical solutions. The Symposium recognized that it is the role of the technical community to ensure that decision makers are always provided with such solutions.

One of the main functions of international symposia such as this one is in facilitating the exchange of information between countries. This Symposium has, in addition, been valuable in,

- reaching common views on important subjects - through panel sessions and the involvement of the participants,
- identifying international solutions to common problems, and

- advising the international organizations on priority items for their programmes.

It is clear that the Symposium has made an important contribution to resolving the problems of low activity radioactive waste disposal and that the published proceedings will make a useful addition to the international literature. The subject is very important for Spain and it was appropriate that the Government of Spain was able to host the Symposium.