CONSIDERATIONS ON MULTINATIONAL REPOSITORIES

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ABSTRACT

In response to requests from several Member States expressing an interest in multinational disposal options, the IAEA produced in 1998 a technical document (TECDOC) outlining the important factors to be taken into account in the process of realizing such options. Currently the IAEA is reviewing the work done in the previous study, taking into account developments since its publication in 1998 as well as current activities in the field of multinational repositories. This resulted in more specific examination of possible implementation scenarios and more detailed specification of conditions. The aim is to produce a reference document for Member States potentially interested in multinational repository concepts, whether as hosting, partner or third party countries. This paper summaries the considerations given in this current document as regards the definition of the multinational repository concepts, scenarios and conditions of their implementation, their benefits and challenges as well as the role of international institutions.

INTRODUCTION

To date, multinational co-operation on radioactive waste disposal has been intensive, but has been largely limited to the area of R&D. Repository development has been carried out on a strictly national basis. The possibility of adopting a multinational approach to the disposal of radioactive wastes therefore needs to be examined, especially with a view to determining the parameters involved in creating such a co-operative system.

There are several examples of international co-operation in waste management, in which organizations in some countries accepted responsibility and custody of waste generated in other countries. One example is the sharing of processing and conditioning facilities for radioactive waste as well as reprocessing facilities for nuclear spent fuel on a multinational basis. Other examples are the return of US enriched spent research reactor fuel to the USA and the return to the former USSR of commercial spent fuel of USSR origin. Despite these examples of multinational co-operation, the management of radioactive wastes still centres mostly on national strategies, particularly for disposal. This tendency towards unilateral action reflects the fact that radioactive waste is a sensitive political issue, making co-operation among countries difficult.

In the recent past, a wish or a need for multinational co-operation has been expressed by a number of countries, which are not in a favourable position to implement self sufficiently national repository programmes for all types of waste arising in their countries and/or which seek to benefit from multinational co-operation for the implementation of a nuclear repository. In response to requests from several Member States expressing an interest in multinational disposal options, the IAEA produced in 1998 a technical document (TECDOC) [1] outlining the important factors to be taken into account in the process of realizing such options. These factors include for example, technical, institutional, economic, socio-political and ethical considerations. After examination of many rational arguments, potential

benefits and challenges for the development and implementation of multinational repositories, the report concluded that:

- the multinational repository concept does not contradict ethical considerations;
- the high ratio of fixed to variable costs for a repository ensures that considerable economies of scale will apply; and
- transport of nuclear material is so safe that the distances resulting from a multinational repository will not have a significant impact on public health.

An important development in the international arena was the signing of the "Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management" [2]. This convention, whilst encouraging Contracting Parties to take responsibility for the management of their radioactive waste, and also recognizing "that any State has the right to ban import into its territory of foreign spent fuel and radioactive waste" goes on to state "that, in certain circumstances, safe and efficient management of spent fuel and radioactive waste might be fostered through agreements among Contracting Parties to use facilities in one of them for the benefit of the other Parties, …." As a result, multinational repositories should be regarded as complementary to those repositories that are being developed strictly on a national basis. Member States that do not have the necessary resources to undertake the development of a repository project entirely on their own or that would prefer to collaborate in shared initiatives because of their economic advantages should have the right to engage in developing multinational facilities.

Currently the IAEA is reviewing the work done in the previous study, taking into account developments since its publication in 1998 as well as current activities in the field of multinational repositories. This resulted in more specific examination of possible implementation scenarios and more detailed specification of conditions. The aim is to produce a reference document for Member States potentially interested in multinational repository concepts, whether as hosting, partner or third party countries, which is summarized in this paper.

The updated report deals with multinational disposal of all kinds of radioactive wastes. These include spent fuel and radioactive waste resulting from nuclear energy and application programmes as well as spent radiation sources. The considerations are valid for all internationally accepted disposal options, i.e. both near surface and geological repositories, including borehole concepts are taken into account.

THE MULTINATIONAL REPOSITORY CONCEPT

Different terms have been used to describe the underlying concepts with slightly different meanings for each of these terms. The term "multinational repository concept", used throughout this paper assumes that waste originating from more than one country is being disposed in a common repository. The country in which the repository is located ("host country") accepts waste from one or more other countries ("partner countries"). The latter have also been referred to as "customer country" or "client country". Apart from the host and partner countries other countries ("third party countries") may also have an interest in the multinational repository system. For example, a third party country may be a transit country for the shipment of the waste from the partner country to the host country or a country having certain rights in terms of international agreements that stipulate prior consent rights for the transfer of spent nuclear fuel to the host country.

The term "regional repository concept" is applied to multinational concepts in which the host country and the partner countries are located in the same region of the world. The term "international repository

concept" as used in this paper, implies that the waste disposal is organized under the authority of a supra-national body such as the United Nations for instance.

SCENARIOS FOR DEVELOPING MULTINATIONAL REPOSITORIES

Various different considerations for developing and implementing multinational repositories have been discussed in the past and are still subject to an ongoing debate. However, the interest in shared repositories has not led to great progress in the area, due primarily to the lack of potential and capable countries willing to host multinational repositories but also to the reservations expressed by some national programmes. Consequently, it is expected that scenarios for developing and implementing multinational repositories will depend significantly on the specific circumstances in potential hosting countries and that these circumstances may change with time.

It is, however, already feasible to propose scenarios that could credibly lead to the development of multinational repositories, provided that the necessary political support can be obtained. These could be classified according to various criteria, e.g. according to the waste management capabilities of potential hosting countries and of countries interested to dispose of their waste abroad or according to the main incentives to create a multinational repository. Economy of scale, improvement of physical security and improvement of global nuclear and environmental safety are examples of major incentives. The three main scenarios below are classified according to the degree of self-sufficiency and independence of the repository host country.

Type I: Add-on scenario

The host country offers to complement its national inventory of wastes for disposal by wastes imported from other countries. This scenario is characterized by the availability of all necessary resources and capabilities in the hosting country. It requires that the hosting country have the political will, the technical and financial resources and the natural conditions (geology) to develop a repository. Its motivation can have various sources: straightforward business initiative; a desire to share repository development costs; willingness to help neighbours (in the context of a regional repository); an interest in reducing global security risks; a commitment to reduce the number of disposal sites worldwide; an opportunity to trade its offer to take radioactive waste from its partners for some other national goal to which all partner countries can contribute. In practice, in this add-on scenario, the repository remains effectively a national repository, but with a part of the waste inventory coming from abroad.

Type II: Co-operation scenario

In the case where multinational co-operation is, by necessity or choice, an indispensable element of repository development and implementation. This is characterized by the participation of (partner) countries in developing a repository programme jointly together with the potential hosting country. In this case one or more other countries interested to dispose their waste in the potential hosting country or countries will be involved directly in repository development and implementation. There are various scenarios that can be included in this category; such as:

Type II-a

Several industrialized countries with relatively small nuclear energy programmes decide to co-operate for the disposal of their radioactive waste in a host country satisfying all necessary technical requirements. The prospective countries in such group would be attracted to the multinational concept because of the prospect of reducing the number of waste sites and saving resources by not developing individual repositories and by benefiting from economies of scale.

Type II-b
Countries with small quantities of radioactive wastes and in varying stages of development seek assistance from each other and cooperate to ensure that one of them acquires all necessary technology and institutional structures. This scenario could be exemplified by co-operation between the significant numbers of Member States that operate only research reactors and/or one or very few nuclear power reactors. These countries might all be faced with similar difficulties in implementing a self-sufficient national disposal concept for all types of radioactive waste and particularly for high level waste and spent nuclear fuel. An example, which is assisted by the IAEA, is the development of borehole disposal of spent nuclear sources from several developing countries in a multinational facility.

Type II-c
Specializing of repositories for specific types of waste, possibly combined with arrangements for international exchanges. In a process of optimization, it could be judged as useful if certain countries were to specialize in the disposal of specific types of waste. They could accept wastes of this type from other countries either as part of a commercial arrangement or, conceivably, as part of an agreement involving exchange of waste types. Examples could be the collection of spent sealed sources for disposal in only a few countries, the exchange of heat generating waste against non-heat generating transuranic waste (TRU) or of LILW against HLW.

Type III: International Scenario

In which a higher level of control and supervision is implemented. It has been suggested that global acceptance of a multinational repository might be enhanced if the operation were fully in the hands of an international body. The host country would, in this scenario, effectively cede control of the necessary siting area to the international body. This scenario seems unlikely in the foreseeable future because such transfer of sovereignty is of extreme political sensitivity.

The above-mentioned scenarios should be recognized as representative only. Similar or other constellations, or combinations of the above, may also be feasible. Scenarios which receive attention in future will depend on the needs and interests of potential hosting countries and on the capabilities of partner countries to respond to this demands appropriately. Due to the very limited experience to date it is hard to predict in this respect, which of the indicated or other scenarios might be the most promising.

BENEFITS AND CHALLENGES

Important benefits and challenges for countries contemplating a multinational repository programme are in areas related to safety, security, non-proliferation, economics, institutional requirements, and public acceptance and support. Without doubt, the most important aspects are those concerning safety and security. If any proposed multinational repository would not meet the accepted high standards for radioactive waste disposal, then it should clearly not be implemented.

Safety, Security and Non-proliferation

The concept of multinational repositories offers the opportunity of safe and secure radioactive waste disposal to countries that are not able for various reasons to implement a national repository project in a timely fashion. It is important to note that the improvements in safety and security that are expected are at a global scale. The global benefit results from making a proper disposal facility accessible to countries that may not be in a position to implement a state-of-the-art national repository.

Conditions for security of a multinational repository relate to measures necessary to guarantee the non-proliferation and physical protection. Prior to the terrorist attacks on the USA in September 2001, non-proliferation of weapons-grade nuclear material was arguably the primary security concern associated with nuclear facilities. However, since then, the threat of terrorist attacks against nuclear facilities that could result in the release of radioactive debris into the atmosphere and the unauthorized removal of dangerous radioactive material that could be used in radioactive dispersal devices has greatly expanded security concerns. It is possible that, for a large multinational facility an increased level of security might result through the involvement of the international community.

Multinational repositories may also increase some security risks, however. The accumulation of larger volumes of nuclear materials might attract various subversive attacks and increase the potential consequences resulting from them. Also, a multinational repository will involve transport between the partner and host country over longer distances. This could result in increased risks of theft or diversion of nuclear material during transport.

Because many countries with nuclear programmes are not planning to develop a repository for many decades, a multinational repository approach offers the potential for them to dispose more quickly of the radioactive waste currently held in storage in those countries. It follows that the development of a multinational repository to serve those countries could reduce safety, security and non-proliferation concerns associated with continued, decades-long periods of storage. In addition, a multinational repository approach has the potential to reduce on a global basis the total number of future repository sites that would otherwise be needed. This creates the potential to avoid the environmental impacts that would have been incurred as a result of the construction and operation of the numerous repositories that would be needed in the absence of a multinational approach.

Implementation of a multinational repository could have positive environmental consequences in the host country, if some of the revenues from users were to be used for carrying out improvements. Several of the suggested projects for importation of foreign wastes to countries that have existing problems with contamination have included proposals for funding remediation of the sites.

Economics and Finance

Disposal facilities and in particular geological repositories involve high levels of fixed costs that are independent of the quantity of waste to be emplaced. Examples include capital costs such as site characterization, underground and surface facility design and construction, infrastructure construction, procurement of capital equipment and materials, and licensing costs. Fixed operating expenses include security, maintenance of facilities and equipment, and administration. For a single repository these costs could be in the billions of US dollars. These liabilities are a serious concern for radioactive waste producers in any country. Thus, a large-capacity, multinational repository could offer an economic advantage in achieving a lower unit cost than would otherwise be the case for a national programme undertaken by either the host or partner countries acting alone [3]. The host country could negotiate additional economic benefits, for example, a reduction of its share of the repository costs or an annual fee for discretionary or non-discretionary uses such as environmental clean-up, education, and social programmes.

Potential added costs could arise from the longer transport distances involved in shipping between partner countries and the host, and from the more complex modes of transport that might involve combinations of sea, road and rail transport through host, partner or other countries. Additional administrative costs could be created as a result of the host/partner, partner/partner, and third party/host/partner legal and financial arrangements needed for the project.

Developing a multinational repository is a decades-long undertaking; therefore, for all involved countries, there are decades-long economic risks associated with failure or significant delays, including those that could result from changes in the political systems in the host or partner countries. These risks may result in dramatic increases of disposal costs or in case of total failure of the project in the loss of the invested funds.

Technical Issues

From a technical point of view, the same requirements apply to a multinational repository as to national one and the same technical principles should be followed in designing the facility. Technical advantages can result from collaborating on repository implementation. More expertise is available; more funding can be made available for developing robust engineered systems; a wider choice of siting may be possible.

There are also additional technical challenges. One potential technical challenge arising from the larger scale of a multinational disposal facility is that there may be a greater variety of waste sources. In this context, the waste acceptance criteria might be more complex due to differences in the nationally employed conditioning technologies and waste packaging and a greater variety of waste handling equipment might be required.

Legal and Institutional Issues

A decision to enter into a multinational repository agreement would result in a need for the host and partner countries to compare and contrast different elements of the institutional framework for radioactive waste management in each country. The result of the exercise could lead to greater levels of shared knowledge of the institutional framework in each country, and perhaps even to a benchmarking of elements of the institutional framework in each country. It is reasonable to expect that areas would be identified in the infrastructural framework of one country that could be considered for adoption by other countries for purposes of modification of their own infrastructural framework, should the need arise.

A possible institutional challenge could develop as a result of the long operating life of the multinational repository, which extends through closure and sealing of the subsurface facility and through decommissioning of the surface facilities. The operating life of a multinational repository could therefore extend beyond the life of the critical institutions in the host and partner countries. Treaties at national levels would most likely be needed. New and specific questions might arise in the context of transboundary movement of the waste, associated with transfer of title. Particularly in case of the execution of a retrievability option for the repository and in case of intervention measures that involve waste retrieval, the question of waste possession should be clearly addressed.

Sociopolitical Issues

For repository projects in general and especially for international projects, sustained public support is necessary and is an enabling function. Past history shows clearly that public acceptance is difficult to achieve, but, once achieved and sustained, public acceptance and support can lead to the sustained political support that is essential for multinational repository concepts. A challenge would develop if circumstances led to decisions by political incumbents, or challengers, to oppose the multinational repository because of a perceived political advantage. If a potential host is recognized by the international community as providing a needed environmental service in a responsible manner, then there will be a greater chance of hosts volunteering.

For nuclear projects such as a multinational repository project, public acceptance and support must be carefully and deliberately sought, and continuously nurtured through all phases of the project. An

effective public and stakeholder outreach programme, ensuring that the public is informed with balanced views and complete information, could provide enormous benefit to a multinational repository project. The benefits – and the challenges – of achieving public and political support may well be the issues of overriding importance.

For public perception and for stable public and political support, it is important that the arrangements for a multinational repository are based on a fair and equitable sharing of benefits and challenges between the host and partner countries. Neglecting the internationally agreed high safety standards for the disposal of radioactive waste would, correctly, be recognized as shifting an undue burden to another country.

CONDITIONS FOR IMPLEMENTATION

The present section addresses the conditions that a host country, partner country or third party should fulfil if the advantages are judged to outweigh the drawbacks so that the goal becomes successful development of multinational repositories. It also addresses conditions that a host country, partner country or third parties might impose as necessary for successful development. Many of the conditions addressed in this chapter relate to the benefits and challenges discussed in the previous chapter.

Before moving to specific requirements in these areas, it is valuable to consider the ethical issues related to multinational repositories, even though these are not conditions to be satisfied in the same sense. Rather, ethical considerations are overarching matters that should be the concern of all parties involved. There is a consensus that each country bears ultimate responsibility for its own radioactive wastes. However, this does not imply from an ethical standpoint that disposal must be on the national territory of the country that generated the waste [2,4,5]. The host county, the partners and the international community could agree that if there has been equitable treatment of all parties, then there are no ethical grounds ruling out a given proposal for a multinational repositories. A specific ethical issue included in the IAEA Safety Principles [4] and relevant for multinational repositories is that repository host countries may not impose on others burden greater than those acceptable in the host country itself.

Safety, Security and Non-proliferation Requirements

Non-proliferation and Physical Protection

An important condition for hosts, partners and third parties is to site, design, and operate multinational repositories so as to take advantage of the inherent ability of repositories to enhance the physical security and safeguards for the emplaced waste.

The purpose of IAEA safeguards is to verify that nuclear material or equipment is not being diverted from peaceful nuclear activities to develop or produce nuclear weapons. Host, partner and third parties should expect that an IAEA safeguards regime will be required for a multinational repository for spent nuclear fuel. Means that are expected to be applied to repositories include rigorous control over access to repository facilities, surface and subsurface, and local and remote surveillance designed to detect undeclared surface or subsurface activities at the repository and in the vicinity.

As a minimum, the host country will be responsible for safeguards applied during transport of the waste within the host country, during temporary surface storage of the waste at the repository site, during emplacement, and after the repository is closed and sealed. The host country should also anticipate that safeguards will continue for the duration of the safeguards agreements. The partner country remains responsible for safeguards within its own borders.

Safety Issues

The host will be required to ensure that the disposal solution implemented is environmentally acceptable and presents no unacceptable radiological hazard. There are international standards that have to be adhered to. A condition that should be satisfied by the host country is that the repository itself must be state-of-the art and the safety should be checked by performance assessments involving qualitative and quantitative safety case arguments. The siting of a safe repository is possible in almost all countries, given the right combination of geological conditions and engineered barriers enclosing the wastes. Nevertheless, some countries may have particular problems in locating suitable stable geological environments or may be so densely populated that unwanted environmental impacts of any major new nuclear facility, including a repository, are difficult to avoid. For third parties, the most important issue is a responsibility to exercise oversight to assure that the performance assessments and related safety case analyses have been performed.

Economic and Financial Arrangements

Economic

All over the world, SNF/HLW disposal expenses are treated as a part of nuclear power production costs and they represent a significant fraction of these costs. It is therefore widely assumed that organizations responsible for the management of SNF/HLW would pay potentially substantial disposal fees to a multinational repository. For low level wastes, the disposal costs are lower and the volumes so much higher that transport begins to play a significant role in determining costs. This reduces economic drivers for multinational LLW repositories. The implementation of a multinational repository would have economic consequences for all parties.

A requirement that the host country will obviously put on any multinational repository project is that there must be an economic advantage in offering a multinational repository site. For a large, self sufficient host (add-on scenario), this can be through defraying some of the costs of implementing the national facility. For a smaller host (co-operation scenario), the main advantage might be in achieving a cost-sharing arrangement that allows it to take care of its own wastes in a manner that might otherwise be economically infeasible.

The partners must be prepared to meet their share of the costs and also to compensate the host for the service provided. It is conceivable that third parties or international organizations might financially support multinational efforts, for example if global security were thus significantly enhanced.

Financial Arrangements

The financing arrangements will normally be bilateral agreements affecting simultaneously both host and partner. One mechanism is that host and partners agree to a co-financing scheme for the entire project development. Other financing options include those used for other large-scale projects, such as the issuance of bonds, to be repaid over a number of years out of operating revenues, or the issuance of stock.

Under each option for financing the multinational repository project, participating partner countries would have to make decisions about how costs would be divided among each partner country, and in negotiation with the host country how revenues would be allocated to the host country. The most important consideration would be that financing must be secured. This involves consideration also of sharing financial risks of extra costs due to cost overruns, failure to obtain licenses or permits, or potentially expensive remediation work. An equally important consideration is that the funds must be secure to prevent theft, fraud, or for uses not agreed to by the participating parties.

Technical Requirements

As a minimum, the technical requirements for hosting a multinational repository would be similar to those required for a national repository. The requirements must be fulfilled by the host country before a multinational repository can be operated. The requirements will include a suitable site, a transportation system and infrastructure, the ability to characterize a potential site, to evaluate the performance of a repository design, and to design, license, construct, operate, close and monitor such a facility.

Each partner country will have to assess its waste arisings, agree to condition wastes so as to meet acceptance criteria at the repository and establish a binding schedule of transfers of wastes to the host country. Partner countries must have or acquire the technology to properly condition and characterize wastes to be sent to a multinational repository. Appropriate oversight by national bodies in the partner country or from international bodies would still be necessary. Third parties might also be involved in ensuring that technical requirements are met by the host. This could be through the provision of technical know-how, e.g. through bilateral agreements between waste agencies or provision of consulting services.

Legal and Institutional Requirements

The Joint Convention [2] is the broadest international agreement on the safe management, storage and disposal of spent nuclear fuel and radioactive waste. All parties will be bound by the overarching requirements in the Joint Convention. The Joint Convention commits parties to assuring safety for current and future generations, establishing proper siting procedures for facilities, performing appropriate design and assessment activities and operating facilities safely. It also requires establishment of a legislative and regulatory framework, clear allocation of responsibilities, provision of appropriate human resources, and application of quality assurance throughout the system.

Organizational Infrastructure

The host country must fulfil all the infrastructural requirements of the Joint Convention [2] and also those in further IAEA Requirements and Guides (e.g. [6]). If the host country does not have in existence the required internal organizational infrastructure, then assistance can be obtained from capable external sources in order to develop the required structures within the host country.

Partner countries need to have in place sufficient parts of an internal organizational structure to guarantee that it and the internal organization of the host country have clear, correlative opposite elements within their respective internal organizations. This condition is necessary in order to organize and manage the legal, economic and safety aspects related to waste acceptance, transport, and repository development and operations. It is also conceivable that partner countries might group together in order to assure that they have a common voice on issues of overarching importance. Third parties not directly involved in the multinational repository can be concerned with issues related to waste transport activities, or possibly about potential transboundary impacts. These third party countries should have appropriate bodies in their national organization for interacting with the host and partners on such issues. It is also conceivable that an expanded role of an international body might be requested by the host state and/or the partners.

Legal

It is recognized, also by international organizations (e.g. IAEA [2], EC [7]) that no state may be compelled to accept foreign waste and that individual states can legislate against this. Thus, a state that seeks to accommodate a multinational repository within its territory will have to ensure that an appropriate national legal framework is in place. A specific legal issue will concern the transfer of ownership of wastes from a partner to a host country. Transfer of ownership of spent fuel might be more complicated, as spent fuel can also be regarded as a potential resource rather than a waste and as the transfer involves safeguards issues.

The partner country will have to satisfy its national legal requirements. Some countries have legislation forbidding export of wastes. A partner country might propose specific legal requirements to be met before export is allowed. There are also international requirements to be met, in particular concerning transport. The issue of transfer of ownership or liabilities is obviously key also for the exporting (partner) country. The concept of continuing shared liabilities may be acceptable when compared to the option of retaining full liabilities, as within a national project, but it weakens the potential partner country incentive of capping definitively future liabilities.

Many countries supplying fuel fabrication or uranium enrichment services for the international market place restrictions on future transfers of material they have fabricated or enriched. Thus, before transferring SNF to a multinational repository, in many cases, the partner country will be required to notify or obtain the consent of the country in which the SNF was originally mined, fabricated or enriched. Another issue concerns legislation governing spent fuel transit through third countries en route to the multinational repository. Agreements for transit rights will have to be negotiated.

Treaties

An initiative to construct a multinational repository and the transport of material there would be also affected by several international agreements to which many countries are parties or which they actively support. The most directly relevant agreements are The Joint Convention [2]; Code of Practice on the International, Transboundary Movement of Radioactive Waste [8]; and the reporting requirements of the IAEA Safeguards Agreements of the transferring States and the Supplementary Protocol to these agreements [9,10].

Regulatory

The host would need a regulatory system satisfying the IAEA requirements laid out in document [6]. The host regulator would be the primary oversight body. In addition, it is conceivable that the regulators from partner countries would demand a degree of oversight. The costs of regulation will be passed on to the users of the facility through the host country. In some countries, export of radioactive wastes is allowed only if the country's national regulators are satisfied that the host country repository meets the standards of the partner country. Depending on the constellation of host and partner countries, there may be international pressure for strengthening regulatory measures to provide independent oversight of safety and security.

Sociopolitical Requirements

Problems in implementing even national repositories are today more of a societal than a technical nature. A sufficient degree of acceptance in a host country is necessary. How this acceptance is measured may differ widely between potential hosts, in particular the balance between political and public approval. For multinational repositories, the challenge is obviously greater. The long and often largely unsuccessful efforts to promote acceptance of repositories at the national level indicate that a concerted effort will be needed for multinational repositories.

In the partner country, it cannot be automatically assumed that export of the waste is the most acceptable societal solution. The advantages for the host as well as for the partners should be clearly laid out also for the public in the partner country. It might be thought that acceptance in partner country political circles would be easily achieved, because social unrest caused by national siting efforts might be avoided. This political attitude need not be the case. Firstly, some politicians will argue that disposal should be national. Secondly, publicly advocating an export solution may be politically more exposed than nominally supporting a national solution – especially when specific measures to progress such a solution can be postponed for long times.

It would seem reasonable that the world community would regard any proposal for a multinational repository as being more promising if the host State has a political system that is regarded as stable.

THE ROLE OF THE INTERNATIONAL INSTITUTIONS

Although the responsibility for the safe management of radioactive waste remains fully on national institutions, a broad consensus exists of its international dimension. Involvement of international organizations with regional or worldwide domains may enhance and accelerate implementation of a multinational facility. The roles of the European Commission (EC), the OECD Nuclear Energy Agency (NEA) and the IAEA should be considered in this context, but a new specialized organization could also be created and entrusted to assure some of the further specified objectives.

In its Communication and Fourth Report on the Present Situation and Prospects for Radioactive Waste Management in the European Union [5], it has been stated: "The possibility of voluntary co-operation between Member States (..) should be kept open, where, for example, a regional approach to disposal could result in improved safety and environmental benefits."

More recently, the Commission's position has been reiterated in the Explanatory Memorandum to the proposed new Directive on the Management of Spent Nuclear Fuel and Radioactive Waste [7] in which it is stated: "An approach involving two or more countries could (..) offer advantages especially to countries that have no or limited nuclear programmes, insofar as it would provide a safe and less costly solution for all parties involved. However, no Member State should be obliged to accept imports of radioactive waste from other Member States." The Explanatory Memorandum goes on to state: "It is recognized that for certain Member States with very limited accumulation of waste, export to other countries probably represent the most viable option from the environmental, safety and economic points of views."
The proposals effectively permit waste exports to form part of a Member State's programme provided certain strict conditions are met. Note that the proposals are currently the subject of discussions with the EU Member States and the European Parliament and are liable to be amended before any formal adoption in EU law.

The primary objective of the NEA is to promote co-operation among the governments of its participating countries. This is implemented by procedures including:

- Developing exchange of scientific and technical information; and
- Setting up international research and development programmes and joint undertakings.

Some considerations of possibilities for international co-operation in the exploitation of radioactive waste facilities were summarized in the 1987 NEA publication [11]. This, together with above mentioned objective of the NEA, provide a good basis for future involvement of this institution in studying multinational solutions of the disposal of radioactive wastes.
Although all these international institutions may have a role in the development and implementation of multinational repositories, the IAEA, the nuclear organization with the broadest international mandate, can most naturally take a leading role in the development and promoting the idea of multinational repository. The IAEA could support by its authority and by its tools for co-operation the implementation of a project in all stages of its development. Specific support could be provided on request to a country volunteering to host a multinational facility or to any other involved country, but the IAEA could also be involved in initiating generic discussions assessing the viability of such a solution.

The IAEA has established strong positions – either by explicit political mandates or by the content of its work – in the key areas of relevance here, namely safety, security and non-proliferation. As stated in its

Statute, the IAEA objectives in encouraging peaceful uses of atomic energy throughout the world. The IAEA can advise all interested parties on how to identify requirements necessary for implementation of multinational repository concepts. Assistance to the involved parties can also include identifying and implementing the conditions stipulated by international agreements, such as the Joint Convention. Finally, the IAEA may help in resolving conflicts of interests of the countries involved in multinational waste disposal concept.

Currently, the Director General of the IAEA is re-emphasizing the Agency's interest in this area: "we should consider multinational approaches to the management and disposal of spent fuel and radioactive waste. (…) Not all countries have the right geology to store waste underground and, for many countries with small nuclear programmes for electricity generation or for research, the costs of such a facility is prohibitive. Considerable advantages – in cost, safety, security and non-proliferation – would be gained from international co-operation in these stages of the nuclear fuel cycle." [12]

When assessing the potential role of international institutions, the creation of a new, fully integrated international entity can also be considered. This would consist of representatives of institutions/countries involved in a particular international project. Such an institution could establish and enforce on its members radioactive waste management standards and execute all financial and contractual arrangements for the state hosting the multinational repository.

CONCLUSIONS AND RECOMMENDATIONS

The contributors that have worked on the drafts of the current IAEA document have come to following conclusions:

- Multinational repositories can enhance global safety and security by making timely disposal options available to a wider range of countries. For some Member States, multinational repositories are a necessity, if safe and secure final disposal of long-lived radioactive waste is to replace indefinite storage in surface facilities.

- The global advantages of multinational repositories are clear and the benefits can be significant for all parties, if they are equitably shared. For individual countries, the balance of benefits and drawbacks resulting from participation as a host or as a partner must be weighed by the appropriate national decision making bodies.

- Implementation of multinational repositories will be a challenging task. However, there are a number of conceivable scenarios under which their development might take place.

In addition, the contributors to the current document share the conclusions of the earlier IAEA document [1] on this topic, as mentioned in Introduction. At the end, the contributing group made the following recommendations:

- The concept of multinational repositories should continue to receive support from all countries that have an interest in a shared disposal solution.

- Discussion on the advantages, drawbacks and boundary conditions for multinational concepts can be initiated by interested countries without prior definition of potential host countries.

- Proponents of national and multinational repository concepts should acknowledge that both types will be implemented and should try to ensure that activities undertaken in either case do not negatively impact the other.

- An immediate practical step could be to facilitate multinational or regional disposal concepts for spent sealed sources.

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