

Multinational repositories for radioactive wastes: one component of a dual track waste management strategy

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Introduction

Concepts for multinational or regional¹ disposal of radioactive materials continue to be the subject of active discussions in the waste management community. Only quite recently, published work on the topic could lead to controversial differences of opinion, but today, the potential benefits of shared facilities are generally recognised within the community. However, the difficulties and the potential problems in implementing such facilities are also clear. This article addresses several key questions concerning multinational repositories:

- Are they ethical, legal and politically feasible?
- Is there a real justification and a demand for shared repositories ?
- Why would any country choose to host an international repository?
- Could projects for international repositories disrupt the progress in national programmes?
- How and when might international disposal become a reality?

Is international disposal ethical, legal and politically feasible?

The ethical basis of geologic disposal itself has been intensively discussed over the years. The technical consensus is that the only ways to assure safety and security for future generations are by geologic disposal or by continued controlled storage. The ethical merits of each - minimising future burdens versus maximising future choice - have been much debated. For almost all countries, the clear preference is for disposal, which provides safety for all future generations without their taking active measures. If geologic disposal is chosen as the more ethical option, there are no ethical reasons that compel countries to implement national solutions - although every waste producing country does have a prime responsibility for safe and secure management of its wastes, wherever this takes place. The nuclear fuel cycle is already international, with mining, enrichment, fuel fabrication, reactor construction and reprocessing all being carried out by relatively few nations as a commercial service for the dozens of countries using nuclear power. Other non-radioactive but toxic wastes are imported and exported when better environmental results can be achieved by doing so. International agreements and legislation, e.g. the IAEA Radioactive Waste and

¹ The term regional is used to indicate international repositories which would be shared by geographically close countries. This approach would obviously reduce transport requirements and may also be more politically acceptable.

Spent Nuclear Fuel Convention or the draft EC Directive on radioactive waste disposal, recognise the potential benefits of such transfers. Some individual countries have, nevertheless, chosen to legislate against waste import. This is a national prerogative that must be respected. It is based, however, more on considerations of public acceptance and political feasibility than on ethical considerations.

Is there a real justification and demand for international repositories?

There are two very compelling justifications for international repositories:

- they can make a vital contribution to global environmental safety by ensuring that radioactive substances are permanently removed from the human environment
- they can greatly enhance global security by simplifying the task of preventing malicious use of fissile and radioactive materials.

Of course, the same safety levels could be assured by implementing geologic repositories in every country with long-lived radioactive wastes, currently over 40 countries. This could be possible. It obviously requires suitable geologic formations to be available, but most countries should be able to find suitable sites. The key advantage of a global or regional choice of geologic environments may concern not the absolute level of safety, but rather the **confidence** with which we can predict the future safety. The long timescales associated with geological disposal make it a challenge to develop a convincing safety case. A site selected because of its geological simplicity could ease this problem and a world-wide search capability would make it easier to find such sites.

Even if a national repository is technically feasible, however, it may be ruled out by economics. In any country, no matter how small the volume of wastes to be disposed, a deep geologic facility will cost a billion Euros or more, and it is inconceivable that each country with such wastes will be able to provide such resources. Some countries have only a single reactor, some have no power reactors but still produce long-lived wastes from medicine research and industry. For such countries shared geologic repositories are essential. For other countries, complex geology, intense land use or economic optimisation justifies pursuing international options, even if national disposal could be realised. For these reasons, there is increasing interest in the international and regional concepts and recent initiatives have led to the organisation of multinational "interest groups" which can explore the possibilities.

Increased emphases on nuclear security

The security justification for international repositories has become increasingly prominent in recent times. Geological disposal in general can increase security but international disposal facilities offer further positive features relative to the inherent safeguards advantages of a national deep repository, e.g.

- many countries with spent fuel may not have repositories soon or ever
- host countries with especially good safeguards credentials can be chosen
- control is then even more international than through current IAEA regime
- siting can be very in remote areas that make surveillance easier

Recent public positions taken by the IAEA have strengthened support for multinational fuel cycle centres and shared repositories. In speeches to the 2003 General Conference of the IAEA (El Baradei 2003a) and at the major Waste Management Conference in December 2003 in Stockholm, Director General Mohammed El Baradei pointed out the potential advantages of small countries sharing disposal solutions. Still wider attention to the issue was drawn by an invited article by El Baradei, published in the *Economist* in October 2003 (El Baradei 2003b) , in which he states that :

“..... we should consider multinational approaches to the management and disposal of spent fuel and radioactive waste. More than 50 countries have spent fuel stored in temporary sites, awaiting reprocessing or disposal. 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 are 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.”

In a recent speech to the Carnegie International Non-proliferation Conference (El Baradei, 2004), he repeated these sentiments.

The IAEA also established an Expert Group to consider ways to tighten international controls on the nuclear fuel cycle. The Group’s focus was on proliferation-sensitive parts of the nuclear fuel cycle - the production of new fuel, the processing of weapon-usable material, and spent fuel management. The Group included 26 experts drawn from as many countries and was chaired by a former Deputy Director General, Mr. Bruno Pellaud of Switzerland. Amongst the options the Expert Group explored were multinational approaches to managing and disposal of spent fuel and radioactive wastes. Its final report, published in early 2005, lists five approaches to strengthen controls over fuel enrichment, reprocessing, spent fuel repositories and spent fuel storage. Amongst these are

- *fuel leasing and fuel take-back offers, commercial offers to store and dispose of spent fuel, as well as commercial fuel banks; and*

- *multinational, and in particular regional, MNAs for new facilities based on joint ownership, drawing rights or co-management for front-end and back-end nuclear facilities, such as uranium enrichment; fuel reprocessing; disposal and storage of spent fuel (and combinations thereof).*

The Group's report has been sent to the IAEA's 138 Member States and will be more widely circulated for discussion, including to the May 2005 Review Conference of 189 States party to the global Nuclear Non-Proliferation Treaty (NPT).

Why would any country choose to host an international repository?

In the past, various schemes have been proposed for international repositories. The prime argument intended to attract a host country has been economic. There are potentially huge financial benefits for a country accepting wastes for disposal. However, this cannot be the primary driver. Safety and security are top of the list. In the potential host country it must be possible to develop a demonstrably safe repository. Even this is not enough. Willingness to host a repository will not be possible unless the host country is recognised to be providing a service whose value is acknowledged by users and also by the international community. This is why an advocacy body, including potential users, publicly acknowledging its needs, is important. This is why other nations (including those dedicated to implementing national repositories) should take a rational and objective stance, supportive of any suitable hosting offer.

Could projects for international repositories disrupt the progress in national programmes?

Why should countries with active national programmes be concerned about discussions on international repositories? There are two perfectly justifiable reasons. One is that local or national populations in such countries may fear that the national repository will later choose or be compelled to accept foreign wastes. In Sweden, for example, opponents of national programmes have deliberately attempted to use such arguments, despite the existing Swedish legislation ruling out waste import. For this leading programme, which is on the way to developing the first, or one of the first, spent fuel repositories, the public fears are more easily played upon. Other countries with dynamic disposal programmes (e.g. Finland and France) have also reacted guardedly to the shared repository concept. It is important for the international community to give a maximum of support to such national disposal programmes by acknowledging clearly that no country can be forced to accept foreign wastes; the Waste Convention and the proposed EC Directive are useful documents in this respect. In practice, the existence a credible international repository project should decrease any apparent pressure on any other countries to serve as an unwilling host.

The other argument which can make national programmes wary of international projects is that the prospect of a politically easier or economically better external solution might lead national politicians or waste producers to be less committed to preparing a national solution. This argument is irrelevant in those countries (e.g. various small countries like the Netherlands), where national geologic repository preparations are in any case not being made currently; it is also not very important in those countries (e.g. Belgium, Latvia, Lithuania, Slovakia, Slovenia and Switzerland) that have chosen a dual strategy, investigating both national and international disposal. For those countries fully committed to national disposal, the concern is real and can be countered only by firmly emphasising the national strategy. In practice, national and international programs can co-exist if their objectives are understood and mutually supported?

How and when might international disposal become a reality?

A national programme that has decided not to develop a deep geological repository of its own has a limited range of waste management options available to it:

- It can store its wastes indefinitely within its own borders
- It can store its wastes at home or abroad until an international solution is available.

In the latter case, it must then either:

- Await the development of a national or international facility offering a disposal service, or
- Participate in pursuing and developing an international solution.

An international repository cannot be implemented without a willing host country that has suitable geological and environmental conditions for hosting a demonstrably safe facility and that is prepared to be fully open to the scrutiny of the world. This will not be achieved quickly. The huge and unexpected delays in moving national programmes along indicate that progress will probably not be any faster for an international facility. It has been argued that national repositories will have to show the way and this argument may be true (although experience with LLW disposal facilities does not indicate that the existence of operating repositories in some countries makes implementation of new facilities in other countries any easier). It is, in any case, not sufficient reason for postponing the initiation of international planning. For international repositories, as for national programmes, there are no safety grounds necessitating rapid implementation. Safety is being, and can continue to be, assured by correct interim storage. For security reasons, on the other hand, geologic disposal in general, and international repositories in particular, may be more urgent, given the growing concerns in the non-proliferation community about the possible misuse of fissile or hazardous materials by terrorists.

At some future time, there will almost certainly be more than one international repository since there are good reasons for concentrating on differing geographical regions: users will not wish to be dependent on a single supplier of this service, the world community would not like to see too great a concentration in one country and normal commercial competition will play a role. Who will implement the first international repository? There have been various proposals in the past, and currently the Russian government is openly interested in the possibility of being a host country. The advantage for Russia, apart from the obvious economic gains, are that resources would become available for urgently required clean-up programmes. Although there are negative attitudes towards the Russian proposals in some other countries, with good will and a concerted action programme an acceptable Russian solution could be possible. Extreme measures, with intensified international controls may be needed. The IAEA could play a key role in such an approach; its original charter shows that such concepts are not new.

A further solution that could become more attractive with time is a regional solution in some part of the world. East Asia or Europe are obvious candidates. In fact, although some individual members of the current EU are opposed to shared repositories, officials in Brussels openly recognise that this could be a sensible approach. The recent increase in EU membership involves a number of candidate countries that would be obvious partners in disposal projects.

Arius and SAPIERR

Recognition of the growing need for shared multinational disposal facilities has led in recent years to the formation of a new Association and to the initiation of a specific project on regional European repositories, SAPIERR. In 2002, a small group of organisations from diverse countries inaugurated a new association to support the concept of sharing facilities for storage and disposal of all types of long-lived radioactive wastes. The new body - called Arius (Association for Regional and International Underground Storage) – is an organisation without commercial goals. The mission of the association is to promote concepts for socially acceptable, international and regional solutions for environmentally safe, secure and economic storage and disposal of long-lived radioactive wastes. The Association is open to all organisations sharing its goals, and currently has member organisations including waste producers, waste management agencies and companies from 8 countries.

As Arius develops, it plans to undertake a number of studies that are aimed at answering some of the principal questions surrounding international solutions. These include studying the feasibility of regional repositories in Europe and a first project managed by Arius together with the Slovakian organisation Decom is already running. SAPIERR is a project within the EC Framework Programme 6, designed as a pilot initiative to help the European

Commission to begin to explore the European Regional Repositories issue. The primary objective of SAPIERR is to bring together Member States of the European Union wishing to explore the feasibility of regional European solutions for the deep geological disposal. Specific proposals for regional facilities, including potential siting are deliberately left beyond scope of this initial pilot study. A significant achievement of this project is that 21 organisations from 14 countries (Austria, Belgium, Bulgaria, Croatia, Czech Republic, Hungary, Italy, Latvia, Lithuania, The Netherlands, Romania, Slovakia, Slovenia and Switzerland) take part in the SAPIERR working group. Using the inputs of these working group members, the consortium has put together two technical reports – one on inventories of radioactive wastes in the SAPIERR countries and the other on legal aspects of the regional repository – during the first year of the project. These reports are now being used as basis for preparation of a subsequent report on options and scenarios for European regional disposal and on recommendations for future research & development in the EU. The results will be presented at an open workshop in Brussels at the end of 2005.

The development of a geological repository is a very long-term project with an overall duration of decades. Given the rapid geopolitical development in Europe, the socio-political reservations concerning multinational repositories that have been expressed by some countries may well have been overcome by the time of actual construction, and the environmental and economic advantages of these solutions may prevail over the political problems.

Conclusions

Geologic disposal of radioactive wastes is the only feasible way of fulfilling our responsibilities to future generations without imposing on them unnecessary burdens. Geologic disposal is needed to solve the global safety and security challenges in dealing with the legacies of nuclear technology. Both national and international deep geologic repositories will be necessary. The waste management community has a responsibility to take all reasonable measures to enhance the chances of success for open and responsible, state-of-the-art implementation projects of both types. We should continue to actively foster an open dialogue on the role that international or regional solutions to meet the challenge of safe disposition of nuclear wastes. Given the timescales of decades before implementation of geological repositories, a prudent approach for many countries is to follow a dual track approach keeping both options open.