

INCREASING INTEREST IN THE SAFETY, SECURITY AND ECONOMIC ASPECTS OF MULTINATIONAL REPOSITORIES

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ABSTRACT

International fuel cycle facilities first were proposed many years ago, when peaceful nuclear technologies were being transferred from weapons states to other countries around the world. The societal problems in siting all sorts of nuclear facilities, however, led to increasing resistance to such concepts. Exceptions where capabilities for international services were implemented were in competitive, commercial areas such as fuel fabrication or reprocessing. In the disposal area, problems were greatest. Countries such as France and the UK that had previously agreed to dispose of wastes from reprocessing foreign fuels ceased this practice; countries with active repository siting programmes (e.g. Sweden, Finland and France) fearing negative influences on their national disposal plans, introduced legislation banning waste imports or exports.

Nevertheless, the importance of finding shared solutions for countries with small arisings of long-lived wastes from nuclear power generation has been increasingly recognised over the last few years. In addition, enhanced fear of nuclear proliferation or of terrorist acts has led many in the nuclear community and in political circles to recognise the potential value of more centralised, more controllable final disposal facilities for spent nuclear fuel and high-level wastes. In this article, we summarise recent developments focusing on international organisations and on countries interested in advancing the concept of shared repositories.

A SHORT HISTORY AND STATUS REPORT

Over the past decades, there have been numerous initiatives to promote shared storage facilities or repositories. Some of these have originated from international organisations, some nationally and some from private initiatives. Early initiatives included the IAEA study on Regional Nuclear Fuel Cycle Centres (1975-77), studies in 1975 and 1982 by an International Spent Fuel Management Group (based on the INFCE project), a 1980 report by an expert group on International Plutonium Storage, and an OECD/NEA Study in 1987. In addition to these studies there were specific project proposals, e.g. for international disposal in the Chinese Gobi desert and by the Synroc Study Group in Australia in the mid-1980s.

In the 1990s interest revived. The IAEA set up a consultant group on multinational repositories and this produced a final report, TECDOC 1021, published in 1998. In 2001, the topic was taken up again by the IAEA and the new working group established has prepared a draft document that will be discussed in Vienna in September 2003. Further specific siting proposals for international repositories were also made by various organisations. Proposals for remote islands (Marshall Islands, Wake Island, Palmyra Island) met with little approval in the international community. The Pangea project, which was largely financed by BNFL, was based on a particular "high isolation" concept, and various regions of the world possessing especially favourable geologies were identified in Australia, Southern Africa, Argentina and China. The project received solid support

in scientific and business circles world-wide and in Australia. However, political opposition in Australia was strong and Pangea has ceased operations.

Currently individual active initiatives on international disposal include those of the Non Proliferation Trust (NPT) and of the Arius Association. The US based NPT has proposed implementing international storage and disposal facilities in Russia, with the substantial revenues being used for remedial action in Russia, for job creation and for charitable purposes. A similar proposal – without the NPT condition on stopping reprocessing – has been made a the Russian Government itself, through Minatom. Arius (Association for Regional and International Underground Storage), is a non- commercial organisation, composed of member organisations from small countries. The activities of Arius are described in more detail below.

Importantly, individual initiatives such as those mentioned above are being more widely discussed at present and international bodies are also addressing the issue. The increasing interest and reduction in tensions between national and international concepts are due to various factors. Pressure is increasing on some small nuclear programmes (especially in the European Union) to develop credible back-end strategies – and shared repositories may be the only feasible route. There are many nuclear programmes that are so small that they will not be able to finance a national geological repository (see Fig 1). The potential economic advantages of larger repositories are illustrated by Fig 2, which shows that economies of scale are achievable. In addition, the challenge of ensuring global nuclear security is an increasing worry with respect to some types of waste. Spent nuclear fuel, with its content of fissile material is a particular concern. Shared, centralised solutions can ease these concerns. Lastly, the security of disused radiation sources is of increasing concern. Since there are very many research, industrial and medical users of sealed radioactive sources. This raises fears that some countries may not have the capability to track and control them properly, raising the possibility of their easy diversion to use in ‘dirty bombs’.

All of these reasons have made it easier to progress the concept of shared repositories. Much of the recent promotion of the concept has been done by the Arius association, described below.

ARIUS – A DEDICATED ORGANISATION FOR MULTINATIONAL COOPERATION

The Arius association was formed in February 2002 to promote regional and international solutions worldwide. Arius is non-commercial and aims to attract members and interest from around the world; currently, however, it currently has a strong European focus. Arius has both organisational and individual members. The organisational members in its founding year are from Belgium, Bulgaria, Hungary, Italy, Japan and Switzerland. There are other countries that could obviously benefit from sharing repositories, based on one or more of the following criteria: limited waste inventories, small size, complex geological situations or difficult economic status. These countries are in Europe (e.g. Netherlands, Slovenia, Lithuania, Czech Republic, Romania, etc.), in Asia (e.g. Taiwan, South Korea), in the Americas (e.g. Mexico, Brazil, Argentina etc.) or in other parts of the world (e.g. South Africa, Australia). The support of international bodies will clearly be needed to ensure progress; accordingly, the 2003 developments mentioned in the following sections are very welcome.

The initial goals of Arius are to organise studies of the technical, legal, political and societal issues associated with multinational storage and disposal options, and to ensure that these options remain a topic for discussions on the world stage and are recognised as a feasible future choice for countries that opt for this strategy. Arius will undertake studies on the feasibility of regional repositories in Europe and elsewhere, reviews of treaties/agreements/liabilities affecting the import/export of wastes and of regulatory and licensing processes for international facilities, analyses of the economics of shared storage and disposal facilities and surveys of public attitudes to import and export of wastes. One such study is being planned in the scope of the European Commission SAPIERR project mentioned below. Individual organisations or countries can not, however,

succeed in moving the multinational concept ahead unless international support is shown. It is therefore gratifying that steps are being taken at the IAEA and in the EU, as summarised in the following sections.

IAEA SUPPORT OF MULTINATIONAL CONCEPTS

Two significant developments have occurred over the last eighteen months: the completion of a report on regional and international disposal concepts and accelerated evaluation of the security of spent source disposal, which has potential implications for shared facilities.

The new report, entitled '*Developing and implementing multinational repositories*' considers three 'sharing' scenarios. The first is that a large nuclear country accepts waste from smaller programmes on an 'add-on' basis; the second that small countries join together because they do not have the capabilities themselves to implement a deep repository; and the third that countries join up, not because they cannot implement national solutions but because they are aiming at economic and environmental optimisation. The report lays out the benefits challenges and requirements for all stakeholders – host country, partners and third parties.

The security of disused radiation sources is of greatly increased concern at the IAEA. In March 2003, the IAEA held a conference to address this security issue. One alternative being evaluated at present is the use of properly designed borehole disposal facilities. Even this technology may not be affordable in all developing countries and a number of countries each with only a small inventory of spent sources could agree to share a repository or a borehole disposal facility situated in one volunteer state. The potential for regional initiatives to ease the security hazard of spent sources was referred to directly by US Energy Secretary Abraham, who chaired the IAEA Conference. He stated that the USA is willing to help in "*developing a system of national and regional repositories to consolidate and securely store these sources*".

THE EUROPEAN UNION AND REGIONAL REPOSITORIES

In the European Community, the recent 'Nuclear Package' of directives has caused controversy within Members States for various reasons, including general issues of national sovereignty and specific objections to the proposed over-ambitious deadlines. The particular aspect of the Directive that is of interest here is related to its mention of the possibility of regional, shared waste management solutions. The memo accompanying the Directive notes that a "*regional approach, involving two or more countries, could also 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*". Clause 4 of Article 5 of the Directive itself reads as follows: "*The programme may include the exports of radioactive waste or spent fuel to another Member State or third country if such exports are fully in compliance with existing EU legislation*".

The obvious need for European regional solutions led the organisations Arius, Switzerland, and Decom, Slovakia, to develop a project, SAPIERR (Support Action: Pilot Initiative for European Regional Repositories), which is intended to take the first steps to identify the major factors that determine the feasibility. The project proposal has passed the evaluation process for the EU 6th Framework Programme and negotiations on funding are in progress. Specific proposals for regional facilities, including potential siting, would not be part of this initial pilot study. Support in kind for the SAPIERR proposal has been offered from numerous European countries.

MANY INDIVIDUAL COUNTRIES ARE INTERESTED IN SHARED SOLUTIONS

The fact that numerous countries are interested in shared repositories is illustrated by the responses to the SAPIERR project mentioned above. Willingness to participate in the working group that will follow the project has already been signalled by organisations in a wide range of countries. These include those countries in which Arius members are located as well as the Czech Republic, Latvia, Lithuania, Norway, Romania, Slovakia and Slovenia. Further countries from which positive opinions on the concepts of regional or international repositories have been given include the Netherlands, Taiwan, Austria and South Korea, of which only the last has an active R&D programme on disposal. Taiwan is often cited as a clear example of a nuclear power generating country for which international repositories may be necessary, given the small size and complex geological conditions there. In fact, the utility, Taipower, has considered a range of such options, even for LLW.

One country that has long provided a good example of how multinational and national disposal programmes can be pursued initially in a "dual track" strategy is Switzerland. At the end of 2002, the Swiss national waste management agency, Nagra, submitted to the government a major project (Entsorgungsnachweis 2002), which is intended to demonstrate that Switzerland can safely dispose of its spent fuel, high-level waste and long-lived intermediate level wastes within its own territory. This project is the culmination of many years of Switzerland's working as one of the leading countries in the field of geological disposal. In addition, however, the Swiss strategy keeps open the option of disposal of HLW in the scope of a multinational project and its new Nuclear Law contains explicit requirements that would be applied to such a project. Since the deep repository is needed only around 2050, there is ample time for examining both national and shared repository options. This dual track strategy could be adopted by numerous other small countries that are interested in both building up local know-how in the disposal area and in keeping long-term options open.

SOME COUNTRIES MAY CONSIDER HOSTING A REPOSITORY

Despite the political problems that are inevitably associated with any proposal to host a shared repository, some countries have been ready to address the issue. These include Russia, China and Kazakhstan. Further countries and communities interested in exploring the potential benefits of hosting an international facility may well appear, once the "taboo" has been broken.

In Russia, a high-profile initiative for acceptance of foreign spent nuclear fuel, is gathering momentum in Russia, where the government is prepared to accept spent nuclear fuel from other countries. This is allowed under the law passed in 2001. This law permits import of spent nuclear fuel for storage and reprocessing. Wastes must in principle be returned to the original owners, but the government would like to have the option to dispose of the wastes permanently, in a deep repository, and amendments to the law may make this possible. Russian locations being considered for international storage and disposal are at Krasnoyarsk and Krasnokamensk, both in Siberia. In May 2003, these ideas were presented in Moscow at the Symposium of the World Nuclear Association and at a special seminar on the topic, organised jointly by the Russian Academy of Sciences and the National Academies of the USA. Before deciding upon the feasibility of safe storage and disposal in Russia, studies and site investigations are needed and the Russian experts involved are open for international cooperation already at this stage.

In Kazakhstan, the government has suggested that a state-of-the-art repository for low-level wastes (LLW) could be constructed and operated in a disused open-cast uranium mine in the Mangistan region, using financing provided by countries that could send such wastes to Kazakhstan. The recommendation of the

Government to approve the agreement and change legislation as required is currently before the Kazakhstan parliament. China is carrying out geological exploration at its very remote HLW disposal site in Beishan. The programme foresees implementation of an underground laboratory as a preliminary step to initiating disposal in 2040. Many believe that a repository implemented at Beishan might well eventually become a multinational facility.

For many others, the most likely scenario for shared disposal facilities is that several small countries agree to seek a common site in one of their territories. The model for such cooperation would be rather like that used in the USA for trying to encourage States to form compacts that would share a LLW disposal facility. The disappointing lack of progress in this process in the USA does not necessarily result from defects in the logic or basic philosophy behind the principle.

SOME COUNTRIES ARE OPPOSED TO THE CONCEPT

Some countries that have firmly decided to implement national facilities, often because they have been apprehensive that discussion on multinational initiatives could disrupt national efforts. This sensitivity was felt particularly in Sweden and Finland, both of which have been in delicate siting phases during the last few years. Now that the national programmes in both countries are stabilising, it appears less problematic for them to acknowledge that shared options can benefit others, whilst maintaining their own objective of self-sufficient repository implementation.

The United Kingdom has also declared a policy of 'self-sufficiency' in disposal, despite having accepted earlier that wastes from reprocessing of foreign fuels could remain in the UK. In practice, this had little practical implications for HLW disposal since the UK long ago ceased active work in this area. The current situation, in which it is no longer even acknowledged by the government that geological disposal is the only feasible method of ensuring long-term safety, the policy is even less meaningful. Today, discussion in the UK centres upon the feasibility of substitution, a scheme by which the larger volume ILW wastes generated by reprocessing need not be returned if an equivalent quantity of other, smaller volume radioactive wastes (e.g. HLW) is substituted. In Germany, despite the fact that import and export of radioactive wastes was discussed in an objective manner a few years ago, and despite the fact that Germany disposes of chemotoxic wastes for many countries, the current anti-nuclear government has taken a strong line that these are no longer options. The now disbanded German Government advisory group, AkEND, has also raised arguments in favour of a national repository.

WHAT DOES THE FUTURE HOLD?

Over the last few years, there has been growing acceptance of the arguments put forward for multinational repositories. There are significant moves towards concrete projects and even definite proposals for actual international facilities. The milestones achieved over the past few years have been:

- open debate and acceptance that any discussion of global disposal issues must address the multinational concepts as well as national programmes;
- the readiness of key international organisations to respond to the wishes of their member countries and directly examine the status of multinational repositories;
- the emergence of specific countries that are willing to consider the option of hosting a shared facility – the increasing intensity of the debate may well increase the numbers of such countries;

- the prospects (e.g. through the proposed SAPIERR project) that objective concrete discussions on advantages, drawbacks and potential obstacles can take place between interested countries.

Today we believe that important conclusions can be drawn concerning the concept:

- International and regional repositories can bring environmental benefits and help to improve global safety and security. They will not replace national repositories, some of which are now moving towards implementation. Both national and international facilities will be needed.
- For the latter to succeed, it will be necessary for the international nuclear community to provide support for the general concept of shared repositories and, specifically, for any country willing to consider hosting one. There are encouraging signs that this support will be given.
- Recent developments indicate that regional or multinational repositories may be a credible solution to be aimed at by numerous countries requiring access to deep geological disposal facilities. There is still much work to be done, however, before concrete implementation projects can be initiated.
- All those who are interested in global environmental protection and security and all those interested in retaining a nuclear energy option have good reasons for supporting the further development of the shared repository concept.