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MULTI-NATIONAL REPOSITORIES: ETHICAL, LEGAL AND POLITICAL/PUBLIC ASPECTS

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1 INTRODUCTION

The technical challenge of implementing **geological** repositories for **long-lived** radioactive wastes (RAW) has been addressed in numerous countries for some decades. The general consensus in the scientific and technical community is that the task can be accomplished safely. However, societal issues have been tackled much less successfully, with the result that almost all national deep disposal programmes have been delayed or postponed. Concepts for shared multi-national repositories face several problems and challenges in addition to those experienced in purely national repository projects. This is the case despite the fact that they have been proposed over many years and despite the fact that they promise advantages in safety, security, environmental protection and costs.

When assessing the advantages of shared multi-national repositories, it is instructive to examine which ethical, legal and political issues most affect the feasibility of implementing such facilities. This paper addresses the key questions from two opposite sides. The early part takes a "top-down" view, summarising the international debate on the above issues and identifying relevant international legislation and initiatives for multi-national repositories. The latter part of the paper looks "bottom-up" at the problem, by discussing the situation in a small country, Slovenia. Like many countries with only a small nuclear power programme, Slovenia has limited financial resources for implementing disposal – but it has a firm commitment to fulfilling its responsibilities for safely managing all RAW arising in the country.

2 A BRIEF REVIEW OF THE ADVANTAGES AND PROBLEMS OF SHARED MULTI-NATIONAL REPOSITORIES

2.1 Advantages

a) Economy:

It is mainly economic reasons that have led to countries, especially small ones, favouring the idea of shared multi-national repositories. It is obvious that each participating country in a common project could gain significant financial advantages due to the large economies of scale in constructing and operating repositories.

b) Access to safe disposal facilities:

Some countries may not be able to afford to implement safe disposal facilities on their own. Some countries will, for economic reasons, wait several decades before constructing repositories, using the intervening time to accumulate the necessary funds. A multi-national repository can provide access, or earlier access, to safe repositories for these countries.

c) Enhanced global nuclear security:

The term security is used in connection with the prevention of misuse of nuclear materials by terrorists or potential weapons states. Safeguards control for one site is simpler than for many scattered sites and, again, may be realised sooner through cooperation.

d) Lower environmental impact:

The construction of one disposal facility instead of several reduces the negative conventional impacts of such a facility on the environment.

e) Expanded range of geological options:

If several countries participate in a multi-national repository, a larger geological area may be examined and a larger choice of geological formations is available. Simple geological environments that are particularly suitable for repositories may not be available in small countries with complex geologies.

f) Increased technical capacity:

Scientists and specialists from several countries can cooperate and share their knowledge and experience in pursuit of a common goal.

2.2 Key challenges to be addressed

a) Transportation:

Transportation routes will be longer if the wastes have to be brought from other countries. Transportation of nuclear materials, however, is not a technical problem and has been practised safely for many years. However, public reaction to transport is often negative. This can make transports enormously expensive if massive police forces are necessary to control demonstrators. In addition, the different transit rules in the different countries can cause some legal and administrative problems.

b) Different national legislations and definitions:

Each country has its own laws on disposal of RAW. Ranging from the process for development of legislation, through to allocation of responsibilities and liabilities

or to definition of competent authorities, authorisations needed, classification of waste etc., there is a large variety of approaches. Some unification would be valuable. In addition, common definitions have to be agreed. For example, the simple term “radioactive waste” has different meanings. In some countries the RAW includes spent nuclear fuel (SF). Other countries consider SF as a valuable resource that may be reprocessed, and not as RAW.

c) Lack of higher authority to promote, control and enforce common agreements:

Within each national state there is a higher authority that controls and enforces legal requirements. In the case of a multi-national repository there is no such authority. All collaboration is based on voluntary compliance.

d) Cost allocation:

The economic status of the different countries will vary considerably. Therefore it may not be fair, or even practicable, to ask for equal payment from each participant. An adequate key for cost distribution, taking into account the diverse purchasing powers, may have to be elaborated.

e) Different time schedules:

As each country has its own strategy for disposing of its RAW, including for example cooling time, intermediate storage etc., the date by which a final disposal facility has to be ready is different for each country. A common multi-national repository would have to be constructed and operated to fit the timetables of all users.

3 ETHICAL, LEGAL AND POLITICAL/PUBLIC ASPECTS OF SHARED MULTINATIONAL REPOSITORIES

3.1 Ethical issues

As for any national repository for RAW, a multi-national repository has to be ethical, environmentally sound, safe (in a radiological sense), secure (against terrorist acts) and of course economic [1]. The term “ethical” is probably the one that is the most controversial and the one that is interpreted most diversely by different individuals, organisations and countries. It involves several factors [2]:

- There is the common belief that disposal of RAW should be dealt with now rather than left for future generations.
- It is widely agreed that each country has a responsibility to ensure that its wastes are managed in a safe and environmentally sound manner. Taking responsibility for the correct disposal of one’s RAW means adopting a clearly safe solution for humans and the environment. Meeting this responsibility does not, however, necessarily mean disposing of the RAW within one’s own territory. In many cases however, there is a tendency to aim for this in order to allow closer control that the required standards are met – and that earlier bad examples of dumping hazardous wastes abroad are not repeated. However, there are no ethical – and also no (international) legal – obligations to dispose of RAW in the state of its origin only.

- Another principle of ethics is that no region should be forced against its will to host a repository for RAW. Even in purely national repository programmes, this goal is very hard to fulfil, given the strong local political opposition often encountered in repository siting projects. In some countries, therefore, a national government may formally impose a solution. This happened, for example, in the USA when Congress voted to override the veto of the State of Nevada and select Yucca Mountain as the preferred repository site. For multinational concepts, however, national and local acceptance will be an absolute pre-requirement.
- As the last item of ethics it should be mentioned that no unfair advantage may be taken of politically weak and/or less developed and/or poor areas. It is not ethical to offer financial compensation to a local population unless the issues have been fully explained, they have the necessary competence to judge acceptability and the chosen area is clearly technically suitable for hosting a safe repository. Nevertheless, fair compensation for accepting the responsibility and potential inconveniences involved in offering an international (or a national) disposal service should be offered to any hosting area and community.

Finally, it is worth recognising, that some national waste management organisations apply policies (as opposed to laws) against multinational disposal concepts and justify these policies by arguments of ethical responsibility. But, in practice, the policies often reflect instead a pragmatic reaction to the concern that multinational initiatives might disrupt national repository planning.

In practice, the international disposal community has debated the ethical issues associated with repositories extensively, both within national programmes and also in international circles. This is illustrated well by the work of the NEA/OECD, which led to publication of an international consensus document (a “collective opinion”) on the ethical and environmental aspects of RAW disposal [3]. The document was based on a wide-ranging meeting involving experts from within and also from outside the direct field of RAW disposal [4].

Considering all these factors and discussions, it may be concluded that there are no ethical grounds for rejecting multi-national repositories, provided that these are implemented with state-of-the-art technology and their siting is agreed between willing partners.

3.2 Legal aspects

a) Legal aspects in general

As for every large undertaking, construction, operation, closure and monitoring of a repository for RAW need a solid legal base. Items such as financing, protection of environment and humans, safety requirements, liability, competent authorities and authorisation processes etc. have to be regulated [1, 2, 5]. On a national level, this is executed according to the constitutional law of the corresponding state. On the international level - i.e. for a multi-national repository - treaties and conventions have to be concluded. Not only the legal prescriptions themselves, but also the processes of enacting legislation, have to be agreed.

b) National legislation

Countries using nuclear energy for civil purposes have mostly established laws and a legal system covering the disposal of RAW. Some of these legislations, but not all, contain a set of laws, or specific articles in laws, dealing with aspects of multinational, shared repositories and the country's approach to participation therein. Other countries do not explicitly treat the issue of multinational repositories in their legislation. But from the fact that they permit in their laws export of their RAW or even import of foreign RAW, it may be concluded that they leave the international option open, i.e. that they indirectly allow participation in a multinational repository.

The questions of whether a country allows export and/or import of RAW are crucial and decisive for a country's position towards multinational repositories.

Table 1 gives a summary of some European countries' answers to these questions and – where available – of their attitudes and/or policies regarding multinational disposal of RAW [2, 6].

Table 1: Export, import, transfer of RAW; attitude towards multinational repository

Country	Import of foreign RAW for disposal permitted ?	Export of RAW permitted ?	Disposal Policy for RAW, Attitude towards multinational repository
Austria	No	Yes (conditions)	Return to USA (research reactor only)
Belgium	Yes (conditions)	Yes (conditions)	Dual track 1st priority national
Bulgaria	No	Yes	Return to Russia
Croatia	No	Open	No official policy
Czech Republic	No	Yes (conditions)	Dual track 1st priority national
Finland	No	No	National only
France	No	Yes (conditions)	National only
Germany	Yes (conditions)	Yes (conditions)	National only
Hungary	No	Yes	Dual track
Italy	No	Yes (for treatment)	No official policy
Latvia	No	Yes (conditions)	Dual track
Lithuania	No	Yes (conditions)	Dual track
Netherlands	Yes (conditions)	Yes (conditions)	Dual track
Romania	No	Yes (conditions)	No official policy
Slovakia	Yes (conditions) for treatment, no for disposal	Yes (conditions)	Dual track 1st priority national
Slovenia	Yes (conditions)	Yes (conditions)	Dual track
Spain	Yes (conditions)	Yes (conditions)	No official policy
Sweden	Yes (small quantities, conditions)	Yes (conditions)	National only
Switzerland	Yes (conditions)	Yes (conditions)	Dual track 1st priority national
United Kingdom	Left open	Left open	No official policy

Countries that treat the issue of multinational repositories in their legislation do this in a variety of ways. The range extends from prohibiting multinational solutions completely to specifically prescribing them as a goal in the legislation.

In more detail, many nations prescribe in their laws that a national solution has to be found for their RAW, i.e. a repository within the own country. Hereby some states very

strictly demand an internal solution only and prohibit consideration of multinational options. An example is Finland that prescribes an internal solution and prohibits import and export of RAW. Others take a broader approach in that they follow a "dual track policy", i.e. they look for a national solution but also consider multinational options. As examples may be listed Belgium, Bulgaria, Czech Republic, Hungary, Latvia, Lithuania, Netherlands, Slovenia and Switzerland. Switzerland, in fact – in its new Nuclear Law – explicitly lays out fair, symmetrical conditions for import and export of RAW¹. A third type of country prescribes explicitly in its legislation, that multinational solutions may or even must be considered. An example is Austria². Other countries have not yet decided which path they will follow, or have a national repository research and development (R&D) programme, but have not yet taken a clear decision for or against participation in a multinational repository. Examples are Croatia and Spain.

c) International legislation

For participation in a multi-national repository, corresponding legislation on the national and on the international level is necessary. Firstly, on the national level, participation in a multi-national repository has to be allowed. On the international level then, the necessary treaties and conventions have to be concluded. Finally, these have to be transferred into national law to be applicable in the individual countries.

On the international level, several legal instruments on international cooperation in various fields regarding the peaceful use of nuclear energy and radioactive materials and also referring to multi-national repositories already exist. Especially in the fields of liability and transportation, several treaties and conventions have been concluded³. The subject of a multi-national repository itself is addressed explicitly in the Joint convention on the Safety of Spent fuel Management and on the Safety of Radioactive Waste management (Joint convention) [5], and the Euratom Proposed Directive (Euratom Proposal) [7], to mention two important examples.

Given that the attendees at the present conference are specialists in nuclear law, we assume that they are familiar with the Joint Convention. We therefore restrict ourselves to its parts with special relevance to multi-national repositories. This is mainly the preamble, which keeps the door open for multi-national repositories. In its final version, the preamble states that RAW should, as far as it is compatible with the safety of the management of such material, be disposed of in the State in which it was generated. At the same time it recognises, that

¹ § 34 Kernenergiegesetz of 21 March 2003, entered into force on 1 February 2005

² § 36b section 2 Strahlenschutzgesetz, amendment entered into force in December 2004

³ Selected examples are:

- Code of Practice on the International Transboundary Movement of Radioactive Waste, IAEA/INFCIRC/386
- Council Directive 92/3 EURATOM on the supervision and control of shipments of radioactive waste between Member States and into and out of the Community
- IAEA Regulations for the Safe Transport of Radioactive materials, TS-R-1 (ST-1 Revised)
- Council Regulation Euratom No 1493/93 of 8 June 1993 on shipments of radioactive substances between Member States
- Convention on Civil Liability for Nuclear Damage of 21 May 1963 (Vienna convention) IAEA/INFCIRC/500
- Convention on third Party Liability in the Field of Nuclear Energy of 29th July 1960, amended (Paris convention), NEA
- Convention of 31 Jan.1963 supplementary to the Paris Convention of 29 July 1960, amended (Brussels Convention) NEA
- The 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (Joint Protocol)

in certain circumstances safe and efficient management of RAW might be fostered through agreements among contracting parties to use facilities in one of them for the benefit of the other parties. – The IAEA itself was an early supporter of multinational approaches [8] and this support has recently been strengthened [9, 10, 11], based largely on security concerns.

The other important international legal instrument mentioned, the Euratom Proposal, is the subject of ongoing debate in the EU on the subject of EU-legislation on nuclear safety and waste disposal. Originally, the EC had proposed to enact binding legislation compelling all Member States to implement repositories for all types of RAW by fixed deadlines. Many stakeholders raised objections against the Euratom Proposal. They objected to the overly ambitious timescales, some to the encouragement given for regional solutions and a few – primarily the UK – objected to the identification of geological disposal as the preferred long-term solution. In the context of the current paper, the positions taken with respect to multinational repositories are of most interest: There was wide consensus on the subject of international repositories. The most controversial debate in the EC has been on issues of national sovereignty in nuclear legislation rather than on multi-national repositories. As a result of the dispute, the text was amended and demoted to a non-binding resolution. However efforts are still underway at the EC to develop a Waste Directive – and the latest drafts continue to acknowledge the potential benefits of regional repositories. [12]

d) Conclusion

The sovereign right of the government of any country to refuse to import RAW is universally accepted, also in supranational structures such as the EU. At the same time, the existing legal framework would allow multi-national repositories to be implemented. Only a few states could – under their present legislation – not participate. The far majority of states and also the international community do not have any objections to multi-national repositories, or indeed support them.

3.3 Political and Public attitudes

Nuclear energy, and even more so, disposal of RAW, are politically highly charged items that engender much public controversy. Most people are content to use energy created by nuclear power, but in the debate on nuclear energy and the infrastructure that surrounds it, irrational fears play a strong role and people are often unable to discuss objectively, but rather reject any proposal on emotional grounds. Anti-nuclear pressure groups also have an enormous impact on any decision in the field of peaceful use of nuclear energy and waste management. These societal and political processes greatly influence legislation and even authorisations and present large obstacles on the way to implementing facilities for nuclear energy, including repositories for RAW. Political and sociological opinions have an enormous impact on the laws governing disposal of RAW and on their application in practice. Laws are, in a way, a mirror of public attitudes towards any important issue – although due to the usually long duration of the law making process they often lag behind the current situation.

Some examples demonstrate how policies and politics influence the enactment and enforcement of legislation.

- The UK Government has left open the question of whether their RAW may be exported and has agreed in the past to accept foreign wastes for disposal and recently to exchange wastes under an equivalence principle. However,

the implementing organisation in the UK (not the government however) has expressed strong views against multinational repositories.

- Both Sweden and France, whose legislations do allow export (and for Sweden also import under certain exceptional conditions) and who have accepted foreign wastes in the past, now apply firm policies (but not laws) against multinational disposal concepts.
- German law allows import and export of RAW. However, the current German government, specifically the responsible minister, takes the firm position that no radioactive material should be imported to or exported from Germany [13].
- In Australia, one State (WA) has passed a law against import of foreign wastes but the national government – despite having a strong policy against import – did not consider that a specific Federal law was required to block this.
- Some countries (e.g. Czech Republic, Lithuania, Slovenia) have official governmental policy documents that encourage the waste agency to study the possibility of multinational disposal.
- The USA is not considering import or export of commercial SF, but it has repatriated research reactor fuels. Also, government officials are on record as supporting the concept of small countries collaborating to implement multinational repositories.
- Russia took back SF from the Former Soviet Union, is taking back research reactor fuels and is the only country today which is officially interested in the possibility of hosting a multinational storage (and perhaps disposal) facility.

These examples demonstrate that laws and decrees by themselves do not give a complete picture of the reality in the field of RAW management. Politics and policies have to be taken into consideration too.

4 STEPS TOWARDS IMPLEMENTATION OF MULTI-NATIONAL REPOSITORIES

In spite of the existing – mainly political – barriers, over the years several initiatives and projects for international repositories have been launched. Some topical examples are mentioned here:

- **ARiUS**, Association for Regional and International Underground Storage. Arius was set up in Switzerland by waste management organisations from several countries as a non-commercial body to promote the concept of regional and international facilities for storage and disposal of all types of long-lived nuclear wastes. [14]
- **Initiative for EC-Directive:** Euratom Proposal for a council directive (EURATOM) on the management of spent fuel and radioactive waste (mentioned above). The proposal has launched a broad discussion on – among other topics – multinational repositories, but unfortunately yielded a non-binding resolution

only. Nevertheless, it led to acknowledgement of wide interest in multinational repositories.

- **SAPIERR**, Support Action, Pilot Initiative for European Regional Repositories. SAPIERR is a project within the 6th framework programme of the EU, which is designed to explore the feasibility of regional repositories in the EU. [15]
- **IAEA – Russia Initiative**. In July 2005, a special conference on the possibility of a Russian international repository was held, based on an agreement between the Director General of the IAEA and the responsible Russian minister. The Russian and American national academies of Science (RAS; NAS) have also been studying the concept and met in Moscow in 2003 and again in 2005 in Vienna and later on in Moscow.
- **IAEA MNA**, Expert Group on Multilateral Nuclear Approaches. This expert group was established by IAEA as part of its efforts to prevent the spread of nuclear weapons. It focuses on security issues of proliferation-sensitive parts of the nuclear fuel cycle. Among other approaches it is considering for the back end of the nuclear fuel cycle are multilateral approaches to the management and disposal of SF and RAW. [16]

5 VIEW FROM A SMALL COUNTRY, SLOVENIA

Slovenia is among the countries with the smallest nuclear programmes. It operates only one nuclear power plant (NPP), NPP Krško, which was jointly constructed by Slovenia and Croatia and is owned in equal shares by Slovenian and Croatian utilities. The NPP is a 676 MWe pressurised water reactor (PWR) and has been in commercial operation since 1983. Besides the NPP there is also a small, 250 kW TRIGA research reactor, which has been in operation since the mid sixties, and the uranium mine Žirovski vrh, which was in operation in the eighties. It was closed in 1990 and is now being decommissioned.

The amounts of RAW produced in Slovenia are accordingly very small. The main producer of all waste categories is the NPP Krško. The contribution of other producers is relatively small. At the end of 2004 the amounts of low and intermediate level waste (LILW) reached about 2350 m³ and the amount of SF rose to about 310 tonnes of heavy metal. The waste from the past mining and milling activities are about 2 million tons. It has been estimated that after the decommissioning of all nuclear facilities the total volume of operational and decommissioning LILW will be approximately 17000 m³ and about 620 tons of heavy metal [17].

National nuclear legislation was updated in 2002. The new Act on Ionising Radiation Protection and Nuclear Safety, harmonized with the EU legislation and relevant international conventions, regulates ionising radiation protection, enables development, production and use of radiation sources and regulates implementation of nuclear safety measures in the production of nuclear energy. It also regulates RAW and SF management, import, export and transit of nuclear and radioactive materials.

Export, import and transfer of RAW and SF are allowed but are subject to licensing by the Slovenian Nuclear Safety Administration. The requirements to obtain a license comprise mainly the consent of the competent authorities in the destination country and countries of transit, the guarantee that the RAW or SF is handled according to the regulations.

In spite of the small nuclear programme and consequently higher costs of waste management and in spite of limited financial and human resources, Slovenia is fully committed to responsible, safe management of its wastes. The competencies and responsibilities are clearly allocated between the waste generator, regulator and waste disposer and all activities are thoroughly supervised. Of particular relevance here is the long-term strategy, and this must be specifically adapted to national requirements, capabilities and resources.

For a small programme it is particularly important that future nuclear liabilities are known well in advance and that provisions for covering these liabilities are in place already in the early stages of the facility's operation. Otherwise, there is a risk that the required financial resources will not be accrued during plant operation. Slovenia prepared the first Decommissioning Plan for the NPP and long-term SF strategy already in 1996 [18]. A special Fund was also established about 10 years ago to raise money to cover future decommissioning and waste disposal costs. Estimates of future liabilities are regularly updated and improved and the contributions to the Fund adjusted to new estimates to guarantee sufficient financial resources at the end of the scheduled lifetime of the NPP [19].

Due to the shared ownership of the NPP Krško, the disposal of waste is the responsibility of both countries and long-term waste management solutions need to be agreed between the two parties. Slovenia and Croatia decided to develop jointly the new revision of the Decommissioning and Waste Management Programme, covering future dismantling of the NPP as well as disposal of LILW and disposal of SF. Both parties should finance all liabilities in equal shares. The programme was finalized in 2004. However, the process of establishing a Croatian Fund for financing these activities is still pending.

Because only small quantities of RAW are produced, the disposal facilities can be dimensioned to accommodate both: the operational as well as the decommissioning waste. The repositories' construction is therefore scheduled according to the operational and decommissioning plans of NPP. Due to the limited LILW storage capacities in the NPP the disposal of LILW has clear priority in the programme. The repository is scheduled to start its operation a few years before the end of operation of the NPP and to be closed after the decommissioning is completed.

Because there is sufficient capacity for wet storage of all SF for the whole NPP lifetime, there is no time pressure on SF disposal plans. The disposal of SF and high level waste (HLW) is scheduled only after 2065, at the end of the decommissioning of the NPP and after 45 years of dry storage. Taking into account the limited financial and human resources available, a very rational and modest approach is applied in the SF disposal scenario. R&D activities are reduced to a minimum. No underground laboratory is planned. Long-term management solutions are more or less based on available technologies. The time spans in planning to accommodate the SF are also adjusted to take the advantage of different financial tools and mechanisms.

The size of the nuclear programme and small quantity of waste, the planned phasing out of nuclear energy and the limited financial and human resources are strong factors influencing development of a disposal programme. A rational approach and optimisation of all solutions are prerequisite for the feasibility of such a programme.

Slovenia developed its programme well in advance and, based on its cost estimates, it successfully raises the money for covering its future nuclear liabilities and it is hoped that

Croatia will follow the same course. The programme is based on national disposal solutions for the LILW and for the SF. But since the disposal solution for SF or HLW is planned only after 2065, the programme keeps other possibilities open. Different initiatives for the disposal solution at multinational or regional level will be closely followed. Such a solution is expected to be more economical and therefore very interesting for small nuclear programmes. Slovenia is taking part in EU project SAPIERR, mentioned above, and intends to participate in the EU project CATT⁴, which will investigate the viability of implementing technology transfer between the member states. ARAO, the Slovenian agency of radwaste management, is also involved in ARiUS, the before mentioned association for promoting multinational approaches. However, the relatively distant need for geological disposal places limits on ARAO's engagement in these initiatives at the present time.

6 CONCLUSIONS

The brief conclusions that that can be drawn from this paper are as follows:

- Multinational repositories can offer their users advantages in safety, security and economics when disposing of long-lived RAW.
- There are no ethical reasons to reject multinational approaches, provided that the arrangements made are between willing partners and the facilities implemented are safe and secure.
- The existing international agreements and treaties would make possible the implementation of multinational repositories.
- Support of international organisations for multinational initiatives has been growing in recent years.
- The legal position with respect to potential participation in multinational repository projects varies strongly between different countries.
- National political attitudes and policies vary even more strongly.
- Countries with small or recently established nuclear programmes, in particular, face a dilemma in that there is no urgent technical need for disposal (national or multi-national), but there is public and political pressure to show that solutions exist. Early implementation of full-scale national programmes may be ruled out on cost grounds. Directly supporting early realisation of multinational facilities also requires resources, although more modest. Neglecting or postponing multi-national initiatives could, however, lead to a situation where national repositories become de facto or de iure obligatory.
- Today, there are numerous countries in which the current policy and legislation would allow participation in a multinational disposal project in a foreign country. The political will, or the legal freedom, to act as a host country, however, are far less widely evident.

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