

SAPIERR – Idea of European Regional Repositories is Taking Shape

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Abstract.

SAPIERR is a project under the 6th Euratom Framework Programme of the European Union. It is carried out by a consortium of DECOM Slovakia and ARIUS. SAPIERR was launched on 1st December 2003; its overall duration is 2 years so it is close to its end. This project aims to bring together countries in Europe with an interest in investigating the possibilities for shared repositories for spent nuclear fuel / high-level radioactive waste, and to present the case for such an option. As many as 21 organisations from 14 countries (Austria, Belgium, Bulgaria, Croatia, Czech Republic, Hungary, Italy, Latvia, Lithuania, The Netherlands, Romania, Slovakia, Slovenia and Switzerland) have agreed to 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, and produced a subsequent report on options and scenarios for European regional disposal and on recommendations for future research & development in the EU during the second year.

This paper describes the overall project, briefly presents interim results such as inventories of spent nuclear fuel, high-level waste and long-lived intermediate-level waste and proposed standardization of waste disposal packages. Full results of the SAPIERR project including inventories, capacities of storage facilities, national radioactive waste management policies and programmes for repository development, their cost aspects, as well as the legislative framework in the individual countries, size requirements of the hypothetical SAPIERR repositories for various options, encapsulation needs, timing considerations and proposals for further work and actions will be presented on the closing seminar to be held in Brussels on 9th November 2005.

1. BACKGROUND

Following an initiative started by Arius, Switzerland, a consortium composed of DECOM Slovakia and Arius submitted a proposal within the Euratom 6th Framework Programme for a pilot study called SAPIERR on the regional approach to waste disposal. SAPIERR is an acronym for Support Action: Pilot Initiative on European Regional Repository. SAPIERR is a pilot initiative to help the organisations involved to begin to establish the boundaries of the European regional repositories issue, collating and integrating information in sufficient depth to allow concepts for potential regional options to be identified and any new research and development needs to be scoped. The primary objective of SAPIERR is to bring together those Member States of the current and the extended European Union wishing to explore the feasibility of regional European solutions for deep geological disposal. Specific proposals for regional facilities, including potential siting are deliberately left

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beyond the scope of this initial pilot study. 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.

The proposal for the SAPIERR project was submitted to the European Commission in the first batch of the Calls for proposals under the 6th Framework Programme in May 2003. After successful evaluation of the proposal by independent experts, the project was accepted for funding and launched on 1st December 2003. Planned project duration is 2 years.

The funding for DECOM's work, as coordinator of the study, is provided through the 6th Euratom Framework Programme managed by the European Commission in Brussels. Under the bilateral arrangements existing at the time of project initiation between Switzerland and the EU, Arius is supported directly by the Swiss Department of Education and Science. At present, SAPIERR is in its second year. Thus far all the project objectives have been met and the culminating event – a closing seminar – is planned to be held in Brussels on 9th November 2005.

2. IAEA CONTEXT

IAEA has been watching the SAPIERR project since its beginning. The agency itself is a promoter of the multinational repositories idea mainly from the safeguards point of view. The IAEA publication TECDOC 1413 [1] issued in October 2004 reviews the possibilities for the realization of multinational repositories and is intended to serve as a reference for Member States potentially interested in multinational repository concepts as hosting, partner or third party countries. The report updates work done in a previous study in 1998 (IAEA-TECDOC-1021) and attempts to define the concepts involved in the creation of multinational repositories, to explore the likely scenarios, to examine the conditions for successful implementation, and to point out the benefits and challenges inherent to multinational repositories.

In 2004, IAEA helped to organise entire section devoted to the considerations on multinational repositories at the WM04 conference in Tucson in which it sponsored the paper on the SAPIERR project. Similarly, IAEA invited contributions on SAPIERR at the waste management conferences in Cordoba 2004 and now in Tokyo 2005. Vice versa, the representatives of IAEA have been invited to take part in the closing seminar in Brussels on 9th November 2005.

3. PROJECT STRUCTURE AND ACHIEVEMENTS

SAPIERR is project of a small scale and pilot nature. The first year was devoted to gathering of inventories data and analysis of legal aspects for multinational repositories. This was achieved by establishment of a working group and supply of national data to the consortium for further analysis. The objective of the project in its second year is to analyse options for European regional repository based on the above collected data and finally suggest the areas for further research and development in this area.

3.1. Data on inventories and legal aspects

In the data gathering & analysis work package, the consortium has collated and documented the data and views from European countries interested in regional solutions. This has been done interactively with the working group participants. These data have been complemented by a review of the existing information from the European Commission and from IAEA databases. The issues examined comprise:

- for each country, the amounts, types and times of arising of wastes that might be candidates for disposal in a regional disposal facility
- the nature of legal issues concerning waste transfer, liability and waste transport, export/import
- national political and organisational views and policy, European radioactive waste policy
- economic aspects of shared facilities (nationally and in the European Union).

The above information was collected from the working group participants by means of two questionnaires: on inventories and on legal aspects. The questionnaires were prepared by the consortium and further discussed and refined at the working group kick-off meeting. The kick-off meeting took place in Piestany, Slovakia on 19th – 20th February 2004. As many as 21 organisations from 14 countries (Austria, Belgium, Bulgaria, Croatia, Czechia, Hungary, Italy, Latvia, Lithuania, Netherlands, Romania, Slovakia, Slovenia, Switzerland) have agreed to take part in the SAPIERR working group. It must be noted that the organisations involved in the project represent only themselves and not the official views of the respective countries.

The consortium reviewed the above questionnaires and consulted with the working group participants when necessary. When additional data were needed, other published data were used and the source was referenced. Similarly, the data for non-SAPIERR EU countries have been derived from published documents.

Subsequently, two technical reports have been compiled on the basis of the gathered information:

- Legal Aspects by Christina Boutellier and Charles McCombie [2]
- Inventory of Radioactive Wastes by Vladan Štefula [3]

These reports were submitted for comments by all the working group participants and later by the European Commission.

The Legal Aspects report tries to document the current legal framework related to the option of a regional solution for storage and disposal of long-lived radioactive wastes. An overview of the status of national and international legislation regarding waste transport and transfer, export and import is given and the radioactive waste management programmes included competent authorities and funding and waste policies of the countries covered in the study are noted. The legal framework on liability management, which also plays an important role in connection with internationally shared repositories, was excluded from the present study but will have to be looked at in subsequent studies.

The Inventory of Radioactive Wastes report presented a status of nuclear power in Europe and assumptions on its future development, surveys of waste management policies in the SAPIERR countries, and estimates of radioactive wastes arising in the SAPIERR countries. An attempt was made to assess cumulative inventories of spent nuclear fuel, high-level radioactive waste and other long-lived waste from all SAPIERR countries and its growth in time. See Figure 1.

Comparisons are drawn between the size of nuclear power programme in individual SAPIERR countries and other EU countries and between the inventory of spent fuel in the SAPIERR countries and other countries with large nuclear programmes.

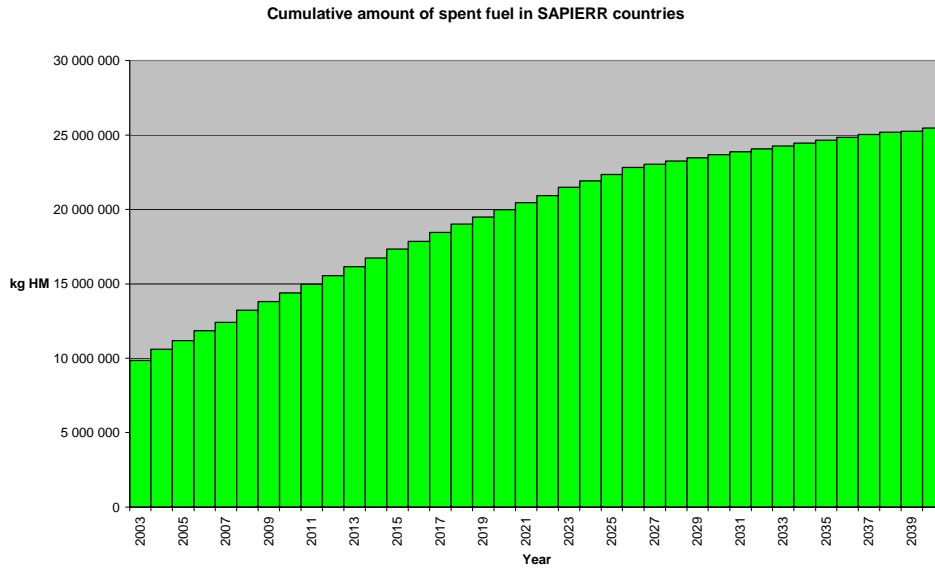


Figure 1: Cumulative amount of spent fuel destined for disposal from all SAPIERR countries

The graph in Figure 2 shows a comparison of the total installed power in all SAPIERR countries and countries intending to construct national deep geological repositories. Seeing that the total installed power in all SAPIERR countries is still less than the one in France, one can easily deduce the reasons why the 11 SAPIERR countries owning nuclear power plants (plus 3 countries owning only research reactors) would like to examine possibilities for construction of a shared deep geological repository instead of 14 such facilities.

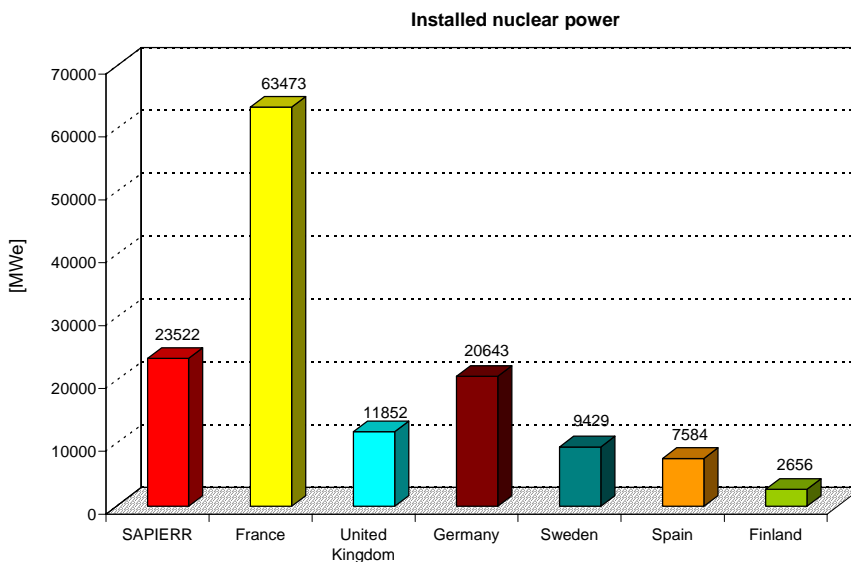


Figure 2: Comparison of size of nuclear power industry in terms of installed power in all SAPIERR countries and countries intending to construct national deep geological repositories

More specifically, the SAPIERR countries' spent fuel inventory can be compared to the inventories of the countries with large nuclear programmes, for example France or Germany. At the end of 2002,

about 7200 tonnes of French fuel was stored at La Hague and 3600 tonnes in EDF’s nuclear power plants. An estimate of the amount of radioactive waste generated in Germany is that 9000 tonnes of spent nuclear fuel that will all have been generated by around 2020. The total amount of 10800 tHM of French spent fuel is 10% larger than the current inventory of spent fuel in all SAPIERR countries. Taking into account the policies of individual SAPIERR countries described in the Inventory report, it can be expected that also in 2040 the spent fuel inventory of all SAPIERR countries together will be still less than the spent fuel inventory of France alone and will be only about twice as big as the spent fuel inventory of Germany.

Another good example of a large size deep geological repository for spent fuel is the Yucca Mountain in the USA. The US Department of Energy currently is preparing to submit a license application to the US Nuclear Regulatory Commission for repository construction authorization. The US legislation limits the emplacement of waste at the first geologic repository to 70000 tHM until such time as a second repository is in operation. The materials that may be disposed at Yucca Mountain include about 63000 tHM of commercial spent fuel; about 2333 tHM of defence programme spent fuel; and about 4667 tHM of defence programme high-level radioactive waste.

The important messages given by the above figures are that all of the SAPIERR reference spent fuel could fit into a single repository smaller than that which France or the USA will need, but that the quantities are high enough to suggest that it could still be economical to implement more than one repository for regional use

Other issues, such as storage capacities, national repositories programmes, and costs of the repositories development have been also addressed.

3.2. Options and scenarios

Under the working package 2, which is still unfinished, the scenarios and possible concepts for European regional disposal are identified. First of all, three types of standard disposal containers have been proposed for all spent fuel from the SAPIERR countries to be disposed of. Such standardization is an important cost saver and may be the first and easiest step towards the development of the European regional repository. Figure 3 shows how many containers of each size would be produced assuming a uniform cooling time of 50 years for the spent fuel before conditioning.

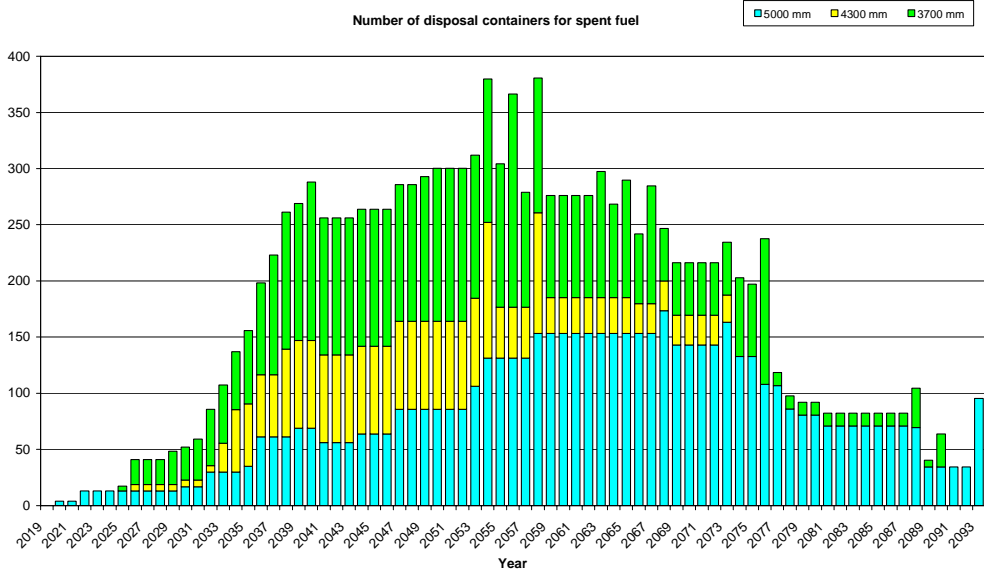


Figure 3: Production of the disposal packages with spent fuel from the SAPIERR countries

With similar standardization of packages for HLW and partially also for ILW, the options for a single repository for all the waste and separate repositories for spent fuel and ILW are being analysed in terms of optimum point in time when they should be available and in terms of size and costs.

The study on options and scenarios will be complemented by identification of requirements on trans-national research and development to be carried out in future; as such an output is a requirement of the Support Action instrument. SAPIERR will clarify the research and development requirements to address unresolved safety, governance, and economics aspects of a potential European regional repository. More specifically, it should also propose mechanisms for developing strategy options & research and development needs in future European Union programmes.

4. CLOSING SEMINAR

The working group participants will meet again, towards the end of the project, at an international seminar in Brussels on 9th November 2005 open to anybody interested in the topic. The objective of the seminar will be to review and disseminate results of the project to a wide audience and to record views on the most effective subsequent steps on the way towards a European Regional Repository. Regional repositories are also of interest outside Europe but have been little studied. SAPIERR and its concluding seminar will hopefully put the European Union in a leading position to provide advice and, possibly services, to other countries.

REFERENCES

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