Parliamentary **Assembly**
Assemblée parlementaire

Parliamentary Assembly
Assemblée parlementaire

COUNCIL OF EUROPE CONSEIL DE L'EUROPE

For debate in the Standing Committee — see Rule 15 of the Rules of Procedure

Doc. 11377
17 September 2007

Radioactive waste and protection of the environment

Report
Committee on the Environment, Agriculture and Local and Regional Affairs
Rapporteur: Mr Alan MEALE, United Kingdom, Socialist Group

Summary

It is imperative to deal with the problem of radioactive waste in order not to leave the burden to future generations.

Since the beginning of the nuclear industry, its waste has been stored in interim storage facilities awaiting the development and implementation of final disposal solutions. European countries have different nuclear policies and different nuclear waste management programmes. However, it seems that the general consensus is that geological disposal of waste, in repositories combining natural barriers and engineered systems to provide physical and chemical containment, is the most appropriate way for dealing with the waste.

Transparency should be the path to follow when options concerning radioactive waste management are taken into consideration and local authorities should be involved as much as practically possible in the decision-taking process.

The report gives an overview of the current state of the management of radioactive waste in Europe, including a series of case studies, and draws recommendations aiming to ensure that the best possible solutions to the issue of radioactive waste are implemented on a pan-European scale.

A. Draft resolution

1. Radioactive waste is and will continue for future generations to be potentially very hazardous to human health and the environment until such time as its radiation has decayed to low levels, it is therefore of importance to carefully monitor its management, in particular its storage and disposal. In its Resolution 1435 (2005) on energy systems and the environment, the Parliamentary Assembly stressed the need for an assessment of the long-term safe storage and disposal of spent fuels and other forms of nuclear waste.

2. Nuclear energy has after decades of stagnation been recently given a new impetus in Europe, in particular that, as a “clean” energy, it contributes to slowing climate change as well as to the need for reducing Europe’s energy dependence, issues which have been both recently dealt with by the Assembly in its Recommendation 1779 (2007) and Resolution 1531 (2007) on the danger of using energy supplies as an instrument of political pressure.

3. The “Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management”, of the International Atomic Energy Agency (IAEA) entered into force in 2001. Today, the “Joint Convention”, the international waste safety standards published by the IAEA and other international organisations and the IAEA’s mechanisms for providing for the application of those standards lead to a “de facto” international radiation and nuclear safety regime. The Joint Convention stipulates that contracting parties “shall take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards”.

4. As far as low and intermediate-level radioactive waste is concerned, a range of long-term solutions have already been found and are currently in use, particularly in respect to surface and near surface repositories.

5. In respect to the very high level radioactive waste (mainly spent fuel, which represents around 1% of the total nuclear waste) what has to be taken into account is that a typical 1000 MW nuclear reactor produces around 25 tonnes of spent fuel per year. More than 60 000 tonnes of spent fuel already exist in Europe, in storage facilities, either on or off the reactor sites. This represents a reality which has to be dealt with, regardless of trends for the future of the nuclear industry in Europe.

6. For the management of the spent fuel, the following options are currently implemented or under consideration:

6.1. disposal of spent fuel in geologic repositories;

6.2. reprocessing of the spent fuel, recycling of the reprocessed plutonium and uranium, and disposal of the wastes remaining after reprocessing operations;

6.3. a “wait and see” policy, which means first storing the fuel and deciding at a later stage on reprocessing or disposal.

7. The solution generally proposed by experts is the use of deep geological repositories, with a combination of natural barriers and engineered systems to provide physical and chemical waste containment. In a number of countries, siting a repository has proven difficult: a few countries in Europe have inappropriate geological structures and in many cases the public continues to have fears about safety, lack of confidence in the technology and lack of knowledge about the options.

8. A number of European countries have already taken concrete steps toward designing and constructing geological disposal facilities. However, the development of these facilities is at very different stages in these countries, because different approaches and timetables have been used both for consulting public opinion and for effective putting into practice the results of research. The most advanced countries are Sweden and Finland, where deep bedrock disposal will become effective in a few years.

9. The nuclear waste issue is not only about the technical construction of final disposal facilities but also a question of ethical and moral issues which concern our responsibilities for future generations. Repositories for spent nuclear fuel or high level radioactive waste have to be constructed in such a way that they require little if any maintenance, even (and particularly) in the long term. However, future generations should be able to both monitor and if necessary retrieve, if so they wish, the spent nuclear fuel or high level radioactive waste (e.g. if technological advances would offer better alternatives to keeping it in repositories, if incidents – geological, safety-related, etc. – would occur which might affect the stability of the repository).

10. The Assembly expresses its concern about the inappropriate management of nuclear waste that has been reported in certain Council of Europe member states.

11. The Assembly calls on the Council of Europe member States and observers that are confronted with the issue of management of nuclear waste:

11.1. to encourage geological trials to identify suitable sites (which ensure long-term stability and which allow the use of multiple barriers to prevent radionuclides from reaching the ground surface) for building deep geological repositories for radioactive waste (as the solution currently considered to be the most appropriate one) in order to ensure the long-term preservation of the environment and, if such sites are identified, to proceed to the building of deep geological repositories for their spent fuel or high level radioactive waste;

11.2. to support R&D which focuses on finding possible alternative solutions to deep geological disposal of radioactive waste (e.g. changing the isotopic composition in order to render waste harmless in shorter amounts of time);

11.3. to ensure the effective independence of the national authorities in charge of the control and management of nuclear waste;

11.4. to organise public and parliamentary debates on options concerning management, methods of disposal and site location for nuclear waste disposal;

11.5. to increase public awareness on all aspects of the management of radioactive waste, by promoting a policy of open transparency as far as the topics of production, transport, storage and final disposal of waste is concerned;

11.6. to ensure that transport of the nuclear waste from the production sites to the storage and/or disposal sites is done in full respect of the principles of the IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management;

11.7. to take appropriate measures to increase safety and security against possible actions of a terrorist nature, at reactor sites, during transport of radioactive waste and at the current storage facilities;

11.8. to ensure that the building of all storage and/or disposal sites is carried out under strict governmental and international supervision, so as to ensure that all safety and quality standards are met;

11.9. to focus, in the possible building of repositories, on the possibility for the future generations to monitor and if necessary retrieve nuclear waste, while keeping in mind that such a retrieval operation should not be made too easy and quick to perform;

11.10. to involve as widely as possible local authorities, citizens and NGOs in the process of deciding upon possible sites for building final and other repositories, in order to increase public confidence both in the methods used for choosing sites and in the technologies for long-term management of nuclear waste;

11.11. to allow especially local authorities and citizens living near the planned repositories to express their opinions, whilst at the same time offering them to be associated to the project by a collaboration contract;

11.12. to allow local authorities concerned to take part in the management of a disposal site located in their respective areas;

11.13. to ensure that data on the disposal sites is centralised both at national and international level, in particular in correlation with the IAEA, so that no loss of information can affect future generations;

11.14. to ratify, if they have not yet done so, the IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management at the earliest possible date and to strictly comply with its provisions.

12. Finally, the Assembly calls upon the European Union to develop, in correlation with the IAEA, common principles and standards to be respected in the management of nuclear waste, and particularly in the further developments of final repositories for nuclear waste in its member countries, such principles and standards having the potential to be extended to the entire pan-European geographical area.

B. Explanatory memorandum by Mr Meale, Rapporteur

Contents

I. Introduction

1. According to the International Atomic Energy Agency (IAEA), at the beginning of 2003 there were about 171 000 tonnes of spent nuclear fuel from nuclear power plants around the world, which were stored in some form of interim storage facility. Of this amount, about 36 000 tonnes were in Western Europe and almost 28 000 tonnes were in Eastern Europe. It is now estimated that, by 2010, the quantity of spent nuclear fuel in the world will be of about 340 000 tonnes.

2. Spent fuel is and will continue to be hazardous to human health and the environment for thousands of years, until such times as its radiation has decayed to low levels.

3. The development of publicly accepted solutions to radioactive waste management is therefore an issue central to the future of nuclear technology. Despite agreements amongst most experts that geological disposal can be safe, technologically feasible, and environmentally sound, the public at large remains sceptical.

4. European countries have different nuclear policies and many different waste management programmes. Some countries (e.g. Finland and France) have a growing nuclear power programme, while other countries (e.g. Sweden) have a more static or even diminishing programme.

5. In Europe, Finland and Sweden have come the furthest with respect to realising the final disposal of spent nuclear fuel, both with respect to method selection and the site selection process. France also has a highly advanced and extensive R&D programme for methods for the treatment, storage and disposal of radioactive waste and both Germany and the UK have advanced research programmes although much remains to be done before sound and workable solutions can be presented.

6. In general, in countries with nuclear programmes, attention is mostly paid to issues relating to the treatment and disposal of spent nuclear fuel and nuclear waste from the operation of nuclear reactors by both representatives of society (political deciders and regulatory authorities) and by the nuclear industry. A common view on principles on how nuclear waste issues should be solved exists in those countries, but the concrete technical solutions and/or the timetables are different. The IAEA Joint Convention on the Safety of

Spent Fuel Management and on the Safety of Radioactive Waste Management is encapsulating the basis for most actions concerning nuclear waste management.

II. The activity of international structures

7. At the OECD Nuclear Energy Agency (NEA)[1], the Radioactive Waste Management Committee (RWMC) is supervising the work within the nuclear waste area. It has initiated discussions on a common approach to issues such as retrievability, the benefit of underground laboratories, stepwise decision-making etc. The RWMC has also organised international peer reviews of various national programmes.

8. The RWMC's Working Party on Decommissioning and Dismantling compiles experience from the Cooperative Programme on Decommissioning Projects (CPD) and other projects. More than 20 years of experience from the decommissioning and dismantling of obsolete nuclear facilities has been collected, representing around 40 projects. In addition to the exchange of experience and technical collaboration, the CPD also publishes reports on radiological data from the dismantling of reactors. The reports published by the NEA reflect agreements between specialists in a number of areas, including:

- deep geological disposal being the most appropriate means of long-term management of the various disposal options considered;
- significant progress has been made in relevant scientific understanding and in the technology required for geological disposal in the past years;
- that the technology for constructing and operating repositories is mature enough for deployment;
- the time-scales envisioned in the past for the implementation of geological disposal were too optimistic;
- currently there is high levels of confidence among the scientific and technical community engaged in waste disposal that geological disposal is technically safe;
- broader public opinion does not necessarily share the same level of confidence;
- there is a need for continued high-quality scientific and technical work;
- also the need for a consistent policy and strict regulatory licensing, with clear decision points which also allow and encourage public dialogue.

9. The NEA also points to a number of specific areas where it suggests that significant progress has been made over the past years:

- the development and construction of facilities for the treatment and interim storage of waste;
- experience from laboratory and field experiments, including studies of natural analogues;
- construction and operation of underground rock laboratories;
- experience in site characterisation;
- development of the design of engineered barriers;
- improved safety assessment methods;
- improved coordination between site characterisation, design and safety assessment;
- the development of regulatory frameworks, including requirements on safety and radiation protection reporting.

10. The importance of the decision-making process has been emphasised by the RWMC along with certain indispensable basic elements, for example:

- a clear strategy for a long term solution and support from governments and policy-creation organisations, based on responsibility and needs;
- flexible decision-making processes which incorporates influence from the public and the needs of those concerned;
- involvement from all of those concerned, including municipalities and authorities;
- a well structured process for dialogue and interaction between industry, authorities, politicians and the general public.

[1] NEA Member States are: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States

11. The International Atomic Energy Agency published in 1995 the "Principles of Radioactive Waste Management" and has since this time put considerable efforts into developing them. In 1997 was adopted the "Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management", which entered into force in 2001 (*Appendix 1: status of signature and ratification).*

12. In 2000, the International Conference on the Safety of Radioactive Waste Management, held in Cordoba (Spain), emphasized that effective national strategies for waste disposal would require a detailed, transparent approach that would enable all parties to participate in the decision making process. The Conference noted the evolution, under the aegis of the IAEA, of a "de facto" international radiation and nuclear safety regime which, in the area of radioactive waste safety, consists of the "Joint Convention", the international waste safety standards published by the IAEA and other international organisations, and the IAEA's mechanisms for providing for the application of those standards.

13. According to the Director General of the IAEA[2], the solution generally proposed by experts is the use of deep geological repositories, with a combination of natural barriers and engineered systems to provide physical and chemical waste containment. In most countries, siting a repository has proven difficult. The public continues to have fears about safety, lack of confidence in the technology, and lack of knowledge about the options. Other hurdles include locating sites with the appropriate geological make-up, establishing appropriate statutory and regulatory mechanisms and sustaining the political support necessary for progress.

14. A number of countries have taken concrete steps toward designing and constructing disposal facilities. However, the development of these facilities is at very different stages in these countries. Research and development is continuing on new techniques to minimize actinide generation[3] and achieve transmutation of long lived wastes. Research is also proceeding on methods of retrieving wastes that have been placed in geological depositories, in case future safety concerns arise or a better solution is developed.

15. The IAEA carries out a range of activities to facilitate technology transfer and information exchange: international symposia on waste safety and technology, co-ordinated research projects and publication of reports on the latest achievements. It also organises peer reviews of national radioactive waste management programmes — as done in the Czech Republic, Finland, Sweden, the United Kingdom and the United States.

16. The Cordoba Conference stressed that, in spite of the important progress made in the development of technology and disposal alternatives for the radioactive waste, further R&D is still necessary in the field of geological disposal, as this type of alternative will most certainly be utilised in the future. International cooperation is of paramount importance for reaching a common understanding between experts and the general public and support for the national programs. The following three tools are especially important:

- the "Joint Convention" as a legal instrument to engage on high level the contracting parties concerning safe management of radioactive waste;
- the already existing international standards;
- international systems that will help to implement the standards.

17. The "Joint Convention" has already contributed to its main purpose, which is to support the safe management of radioactive waste and spent fuel, e.g. by the work to produce the national reports that has helped in identifying needs for increasing nuclear safety. What is still needed is to develop long term plans for waste management and disposal, to adopt a planning for decommissioning of nuclear facilities and to hold consultations between stakeholders in this process.

18. The Cordoba Conference was followed by a series of other manifestations organised by the IAEA: the International Conference on Issues and Trends in Radioactive Waste Management (Vienna, December 2002), the International Symposium on Disposal of Low Activity Radioactive Waste (Cordoba, 13-17 December 2004) and the International Conference on Safety of Disposal of Radioactive Waste Disposal (3-7 October 2005, Tokyo).

19. In the European Union, research work on Radioactive Waste Management and Disposal has been part of the general research and technological development (RTD) within the framework of the EURATOM.

[2] Introductory Statement to the 3rd Scientific Forum during the 44th Session of the IAEA General Conference, Vienna, 19 September 2000.
[3] Actinides mean in this context plutonium and the so called "minor actinides": neptunium, americium and curium, but also protactinium.

Among the research priorities for radioactive waste are the research on geological disposal and methods that lead to smaller waste quantities in connection with nuclear energy production.

20. The EU strongly supports R&D in the field of partitioning and transmutation (P&T), a possibility of radically reducing the radiotoxicity of spent nuclear fuel which has been discussed for several decades. By this method, radioactive substances are rendered less hazardous in the sense that they are converted (transmuted) into more harmless products that are radioactive for a short period of time or are completely stable. This transmutation can be achieved by irradiating the radioactive substances in the spent nuclear fuel so that these substances (the nuclei of the elements) are converted into other elements with the desired properties. The EU's support for P&T research has increased from about EUR 5 million in the third framework programme (1990-1994) to EUR 37 million in the sixth framework programme (2002-2006).

III. Identification of possible repository siting

21. As discussed earlier, disposal of nuclear waste requires cooperation among three main actors: industry, the state and municipalities.

22. According to the "polluter pays" principle, reactor owners are responsible for waste from its activities. The state has to supervise the reactor owners to ensure that they meet their responsibilities and act through the relevant regulatory authorities.

23. The siting, engineering design and construction of facilities in rock for the disposal of spent nuclear fuel should always be performed in an environmentally sound and safe manner. This requires comprehensive and accurate information on the properties of the rock. The facility must be able to perform as intended throughout its envisaged lifetime, namely for about 100 000 years in the case of a repository for spent nuclear fuel.

24. The primary task of the rock in a repository for radioactive waste is to ensure stable mechanical, hydraulic and chemical conditions that are favourable to the durability of the canister and clay barrier. Leaching of radionuclides from the spent fuel must be prevented and delayed as far as possible. The siting of a deep repository in suitable bedrock that fulfils these mechanical and chemical conditions is therefore crucial. Geological methodology, in the broader sense of the term, is therefore necessary in order to site the repository in a location that meets the safety objectives.

25. In this respect, three categories of investigation methods have to be considered:

- geological methods, such as observation on exposed rock surfaces (outcrops), excavation and drilling. The mechanical stability of the rock types being determined by the different mineral components and by the structural-geological history of the region. Rock structure can be plastic (e.g. folding and foliation) or brittle (e.g. joints, faults and crushed zones). Those phenomena are usually included in the concept of tectonics and are a result of the geological evolution of the bedrock and of the original composition of the tectonically deformed material. Tectonic impact is therefore important from a repository perspective and the fracture pattern of the bedrock determines the ultimate design of the repository.

- geodynamic methods, which are required in order to observe changes in specific natural structures and their evolution over time. Geodynamic processes are reflected in changes in the large-scale topography, the occurrence of land uplift, earthquakes and fault zones.

- geophysical methods, which can provide knowledge of deep conditions, down to a depth of several km, without having to excavate or drill down to the area of interest. The purpose of geophysical investigation methods is to construct models of the geological situation to reflect reality. This is a difficult task because in spite of geophysical measurements being very accurate, their results do not always have a unique geological cause, which can lead to uncertainties in interpretation and modelling.

26. The 2005 Tokyo International Conference on Safety of Disposal of Radioactive Waste Disposal noted that, since many countries have comparatively small volumes of radioactive waste, it would be disproportionately costly for each of them to develop its own geological repository. For this reason, studies had been initiated at regional level, supported by the European Union, to examine the feasibility of a regional repository in which the waste from several countries could be placed.

IV. Consultation of municipalities and/or inhabitants

27. The facilities necessary to manage the waste have to be located in municipalities, by agreement with their democratically elected representatives, which should be a condition upon the building of such facilities.

28. In some countries (e.g. Sweden), a municipality can prevent the government from allowing the siting of a facility (for interim storage or for final disposal) on its territory, by the veto right. However, under certain circumstances, the government can still allow a siting of such activities even if the municipality says no.

29. The way in which municipalities have been consulted in Sweden is described in Chapter 6, paragraph 66.

30. In France the location of the underground laboratory of the National Agency for Radioactive Waste Management (ANDRA) was selected from among local authorities which volunteered to house it. For the future storage site a geologically suitable area of about 250 km2 has been identified in the vicinity of the laboratory in Bure. The precise location will also be selected on a voluntary basis within that area. The project to store the waste in a geological formation is part of a territorial development scheme comprising economic and social dimensions.

V. Environmental ethics

31. Once geological structures appropriate for radioactive waste disposal are identified, environmental ethical issues arise. The question whether or not people and / or animals can be harmed by the waste in the repository is raised.

32. Bearing in mind the fact that it is difficult to completely exclude anyone from being subjected to harm, the precautionary principle, described as “the principle of minimal risk”, should be applied*: “we should not subject ourselves or others to any more than a minimal risk of harm”*.

33. In medical contexts, minimal risk has sometimes been defined as *“the probability and the size of physical and mental harm that is normally encountered in normal life”*. The difficulty of risk assessments of nuclear waste storage is that we don’t have complete and absolute certain knowledge of what could happen with a deep repository located in bedrock. We know about certain risks, but a basic problem is the unknown risks. We don’t have and neither do we expect to obtain any certain knowledge of all the conditions that can result in risk, for example, high level waste leaching into the groundwater causing harm to humans and animals in thousands of years’ time.

34. Risk must also always be weighed against positive opportunities. For instance, if there are particularly large gains associated with certain measures, one may think one is morally entitled to accept certain risks, especially if the risk is voluntary and primarily relates to a person committing the act. However, as far as radioactive waste is concerned, the risk is imposed upon others - upon future generations - therefore the margins for allowable risk should be made narrower.

VI. Case studies

i. Sweden

35. As part of the preparation of the report on radioactive waste and protection of the environment, the Committee instructed the Rapporteur to carry out a fact-finding visit to gather on-the-spot information on the topic.

36. Accordingly, on 12 and 13 March 2007, the Rapporteur went to Oskarshamn in Sweden to visit the Swedish Nuclear Fuel and Waste Management Company (SKB) premises and meet staff of the nuclear site and representatives of the Municipality of Oskarshamn:

- Mr Peter Wikberg, SKB Site Manager;
- Mr Jörgen Lundsten, Plant Manager, SKB Central Interim Storage Facility (CLAB);
- Ms Linnéa Sandwall, Public Relations, SKB Äspö Hard Rock Laboratory;
- Mr Mathias Karlsson, Public Information Officer, SKB Canister Laboratory;
- Mr Rolf Persson, Project Manager, Municipality of Oskarshamn;
- Ms Elisabeth Englund, Chairperson of the Future Perspective Group, Project Nuclear Waste, Municipality of Oskarshamn;
- Mr Anders Högmark, former member of the Committee.

Background

37. Sweden has been producing electricity by means of nuclear power since the early 1970's. Today nuclear industry ensures 50% of the total electricity production in the country. The spent nuclear fuel from the Swedish reactors is currently kept in the SKB Central Interim Storage Facility (CLAB), on a peninsula where the Oskarshamn nuclear power plant is also located.

38. Spent nuclear fuel needs to spend 30 years in interim storage to allow the radioactivity and heat output to decline. At the moment used fuel (4000 tonnes) is interim-stored at CLAB in large water pools more than 30 meters below the ground surface. The water in the pools provides radiation shielding whilst at the same time cooling the fuel. It is possible to walk around the pools without being exposed to radiation. CLAB has been expanded by the addition of a second storage building to increase capacity. With the new storage building, CLAB ultimately will be able to store 8000 tonnes of nuclear fuel in the pools.

39. Since Swedish nuclear power plants are situated on the coast and have their own harbours, the radioactive waste is transported by sea. A ship ("Sigyn") has been specially built for transporting radioactive cargoes from the nuclear power plants both to SFR (the final repository for radioactive operational waste, which has a low or intermediate level of radioactivity and a short half-life, located close to the Forsmark nuclear power plant) and to CLAB.

40. Nuclear fuel consists of cylindrical pellets of uranium dioxide in ceramic form. The pellets are stacked on top of each other in bundles of tubes called fuel assemblies. The fuel stays in the reactor for five years before being replaced. The nuclear reactions in the reactor produce new atoms with excess energy. This is why spent nuclear fuel is radioactive and emits radiation. Most of the radioactivity in the substances formed in the fuel declines during the time that the fuel spends in CLAB, producing a more easily handled and cooler material. But even after 30 years, the spent fuel is still hazardous. It has an elevated level of activity for a very long period (about 100 000 years) – therefore the need for a final repository to safely store for very long periods such materials.

41. SKB is accordingly planning to build a final repository for all Swedish spent nuclear fuel – a final repository that requires little monitoring by future generations.

42. The plan is for the fuel to be taken from CLAB and placed in leaktight copper canisters with a cast iron insert. The canisters will then be transported down to a deep bedrock repository consisting of a system of horizontal tunnels at a depth of 400–700 metres in the granite bedrock.

43. The tunnels will be about 250 metres long and spaced at a distance of about 40 metres from each other. On the floor of the tunnels, deposition holes will be spaced at intervals of about 6 metres. The copper canisters will be deposited in the deposition holes and surrounded by a buffer of bentonite. When deposition is finished, the tunnels and shafts will be filled with a mixture of crushed rock and bentonite.

44. Multiple barriers will prevent the radionuclides in the fuel from escaping into the environment. The leaktight copper canister will keep the spent fuel completely contained. The buffer of bentonite clay will protect the canister against corrosion attack and rock movements. If a crack should form in one of the canisters, the buffer and intact parts of the canister will prevent water from entering the canister. The rock will provide an environment where the function of the engineered barriers is preserved for very long periods of time. The rock and the great depth of the repository will keep the spent fuel isolated from man and the environment.

The canister

45. The copper canister that will surround the spent nuclear fuel is nearly five metres long and has a diameter of just over one metre. It weighs between 25 and 27 tonnes when filled with fuel. The outer shell consists of thick copper, and inside is an insert of nodular iron (a kind of cast iron) to provide sufficiently high mechanical strength.

46. As long as the canister is intact, no radionuclides can escape into the environment. Corrosion and mechanical forces due to movements in the rock are events that could lead to the breach of a canister. The canister is therefore made of materials that are designed to withstand such events. The canister is also designed to withstand major earthquakes and / or geological movements following a future ice age.

47. Research on the building of the canisters is currently done at the SKB Canister Laboratory in Oskarshamn.

The buffer

48. Before the canister is lowered into the deposition hole, the hole will be lined with blocks and rings so that a layer is formed between the inner walls of the hole and the canister. This layer is called the buffer, since its purpose is to dampen both mechanical and chemical changes in the rock.

49. The buffer consists of bentonite clay. It has three functions in the repository: to prevent corrosive substances from reaching the canister, to protect the canister from minor movements and to retard any radionuclides that might escape from a leaking canister.

The rock

50. The purpose of the rock is to isolate the waste. It is also supposed to provide a stable chemical environment for the canister and the buffer and protect them from whatever happens on the ground surface.

51. The granite rock where the repository is planned to be built is 1,8 billion years old and stable. Therefore the probability of geological changes to occur in the next 100 000 years period is neglectible.

Retrieval

52. The deep repository will be designed in such a way that it is possible for future generations to retrieve the fuel if they want to do something else with it.

53. Between 200 and 400 canisters (of a total of about 4,500) will be deposited in an initial phase. After the initial phase, an evaluation will be performed. If the evaluation has a positive outcome, the rest of the canisters will also be deposited.

54. If the evaluation does not have a positive outcome, the canisters may have to be extracted and retrieved. Like deposition, retrieving the canisters requires a government permit.

Research & Development

55. A large portion of the research on radioactive waste management takes place at SKB's underground Äspö Hard Rock Laboratory (HRL) north of Oskarshamn. Here different technical solutions are tested on a full scale and in a realistic environment.

56. The tunnel at Äspö is 450 meters deep and is connected to the ground surface via lift and ventilation shafts. Above ground, there is a research village with offices, lift and ventilation buildings, storage depots etc.

57. The Äspö HRL’s objectives are:

- to develop and test methods of investigating the bedrock.
- to continue the development and testing of methods of adapting a final repository to the rock's local characteristics.
- to increase scientific understanding of the final repository's security.
- to develop, test and demonstrate the technology that will be used in the final repository.

58. One important area of research conducted at the Äspö Hard Rock Laboratory involves issues relating to the function of the bedrock as a barrier, i.e. how the rock acts as a filter for radioactive substances. In particular, the movements of the groundwater and its chemical composition are key areas of study.

59. Another area of research involves attempts to further increase knowledge of the interaction, under realistic conditions, between the bentonite clay and the copper canister on the one hand and the rock on the other. These and other investigations provide the factual information used in calculating the safety and security of a final repository.

Financial funding

60. The funding for the activities of the SKB are provided by the <u>Nuclear Waste Fund</u> which is created by the payment of 0,01 SEK (~0,001 euros) per kWh consumed. It is the consumer who pays, not the producer.

Site choice

61. The process of choosing the site for the future building of the final deep rock repository implies several steps to be taken.

62. Permits under the Environmental Code and the Nuclear Activities Act are required in order to build the final repository and the encapsulation plant. Both laws require an environmental impact assessment, EIA, with associated consultations. The EIA process results in a document called an environmental impact statement (EIS). The EIS describes what consequences the planned activities may have for man and the environment and how these consequences can be prevented or mitigated.

63. Viewpoints, opinions and questions are being solicited from anyone who will in some way be affected by the facilities. This is carried out via consultations dealing with such aspects as the siting and design of the facilities and the content and design of the EIS. The consultations began in 2002 and will continue until SKB submits the relevant applications (in 2009).

64. The Municipalities have a very strong role to play as far as the selection of the future repository site is concerned. They have the right to veto at any stage of the decision-taking process. The Swedish experience has proved that, the more the citizens are informed about the nuclear industry (being close to a nuclear power plant is also a positive factor), the more they gather confidence and less fear about being close to a final repository.

65. This policy of complete openness of the Swedish nuclear industry has shown positive results in the country. For instance, in the Oskarshamn municipality, since 2003 the percentage of positive replies to the question “are you favourable to locate a final deep repository for nuclear waste in the municipality?” has increased from 69% to 79%.

66. The feasibility studies for siting the final repository have involved 8 municipalities (among the 250 municipalities in Sweden. Site investigations are currently being conducted in two municipalities: Oskarshamn and Forsmark (where the SFR is located). The SKB decision is expected for 2009 and then in 2012 the chosen municipality will be asked if it agrees with the building of the repository.

ii. France

67. The French National Agency for Radioactive Waste Management (ANDRA) is a public industrial and commercial organisation which operates independently of waste producers. ANDRA is responsible for the long-term management of radioactive waste produced in France.

68. ANDRA designs and implements disposal solutions suited to each category of radioactive waste. This encompasses the collection, conditioning, disposal and monitoring of waste from nuclear power plants, hospitals, industrial plants and research laboratories, etc.

69. The agency manages, operates and monitors radioactive waste disposal centres, designs and builds new centres for waste that cannot be handled by existing facilities and defines specifications for the conditioning, acceptance and disposal of radioactive waste, in compliance with applicable safety rules.

70. Mr Gérald Ouzounian, Director of International Affairs of ANDRA, presented to the Committee on the Environment, Agriculture and Local and Regional Affairs the activities of ANDRA on 2 March 2007 and then kindly organised a study visit to the underground research laboratory in Bure on 15 April 2007.

71. Members of the Committee on the Environment, Agriculture and Local and Regional Affairs could receive first-hand information on the research done on the feasibility of a repository in a clay formation in France.

72. The Meuse/Haute-Marne Region underground research laboratory in Bure has been set up to study the feasibility of a deep geological waste repository in clay for high-level and long-lived intermediate-level radioactive waste (HLW/ILW-LL).

73. HLW/ILW-LL is the most hazardous type of waste, because it displays a high level of radioactivity or a very long life.

74. Waste containing the longest-lived radioactive materials must be confined for hundreds of thousands years before its level of radioactivity drops to that found in the natural environment. So far, this waste is safely stored on the producers' sites.

75. HLW/ILW-LL can be divided into two groups:

- "C waste" refers to irrecoverable material contained in spent fuel from nuclear power plants after reprocessing. It gives off a large amount of heat for several decades. "C waste" is currently conditioned in a glass matrix that ensures highly effective confinement.

- "B waste" includes several families of waste generated by spent fuel reprocessing and the dismantling of the most radioactive parts of nuclear facilities. This type of waste gives off little heat. It is conditioned in various matrices (cement, bitumen, etc.) ensuring effective confinement of the radioelements it contains.

76. The other three sites of the ANDRA are:

a. the Manche Region waste disposal facility in Beaumont-Hague, which received waste packages between 1969 and 1994 and is now in the surveillance phase.

b. the Aube Region waste disposal facility in Soulaines, which receives short-lived, low- and intermediate-level radioactive waste (LILW).

77. LILW includes filters, water treatment resins, tools, gloves etc. from more than 1000 producers in France, working not only in the nuclear industry, but also in research laboratories, universities and hospitals. For technical reasons, this waste can contain small quantities of long-lived radioactive elements.

78. It accounts for some 80% of the volume of radioactive waste generated in France (excluding waste from nuclear power plant deconstruction) and within less than 300 years its radioactivity will become comparable to naturally-occurring radioactivity.

79. The concept of near-surface disposal of LILW is based on three confinement barriers:

- the packages (containing the waste);
- the repository structures (repository modules and underground monitoring drifts);
- the geological features of the site.

80. The package consists of 15% waste (gloves, overshoes, tools, etc. that have been in contact with radioactive materials) and 85% encapsulation material (concrete, mortar, resin, bitumen) used to stabilise the waste and make it inert. The packaging is made of either metal or concrete depending on the volume and radioactivity of the waste it contains.

81. The chief function of the repository structures is to isolate the packages from the environment, particularly water. The waste packages are disposed of in reinforced concrete modules 25 m square and 8 m high. The packages are protected by moving roofs while the modules are being filled. Once filled, the modules are closed by a concrete slab and covered with leaktight polyurethane sheeting. A network of regularly inspected underground drifts is used to check that the modules remain leaktight. These drifts and the concrete modules form the repository structures that are designed to withstand earthquakes.

82. The waste repository modules are built on an impermeable layer of clay that acts as a natural barrier to prevent radioactive elements from reaching the ground water in the event of accidental spillage. A layer of sandy soil above the clay drains rainwater off to a single outlet, thus simplifying environmental monitoring. Lastly, the repository is located in a geologically stable area where there is no seismic risk.

c. the disposal facility in Morvilliers (Aube Region), which receives very-low-level radioactive waste (VLLW).

83. VLLW comes from dismantling decommissioned nuclear facilities (the chief source), some chemical or metallurgy industries where manufacturing processes concentrate the natural radioactivity present in certain mineral ores, cleanup and rehabilitation of old contaminated sites.

84. VLLW is divided into three classes according to the type of material:

- inert mineral material: concrete, rubble, earth;
- waste generated by nuclear facilities but which can be regarded as common industrial waste: scrap metal and plastic, mainly from demolition work (structural steelwork, ventilation ducts, pipes etc.),
- waste that can be regarded as dangerous waste, destined for an ultimate waste disposal facility.

85. The principle adopted for disposing of VLLW while guaranteeing long-term protection of human beings and the environment is to isolate the waste from the biosphere.

86. The waste is deposited in disposal cells excavated in clay, the base of which is engineered to receive any water that may seep through, throughout the lifetime of the repository. The waste is isolated from the environment by a system comprising:

- a synthetic membrane surrounding the waste, together with a monitoring system;
- a thick layer of clay under and over the disposal cells;
- a clay cover laid over the waste.

87. These barriers are designed to isolate the waste from rainwater. While the repository is in service, waste handling operations are sheltered from the rain by removable roofs.

88. After several decades, the activity of the short-lived and medium-lived radionuclides will have greatly decreased or entirely disappeared. In the long term, long-lived radioactive elements and chemicals will be confined by the retention properties of the waste (dangerous waste) and the clay site.

iii. United Kingdom

89. In the UK, higher level waste (HLW), which comprises high and intermediate level wastes, is currently stored at nuclear sites around the country, including Sellafield, until a disposal solution is developed. Lower level waste (LLW) is disposed of in several ways including burial at the national disposal facility at Drigg in Cumbria.

90. Since 1976, when the Royal Commission on Environmental Pollution, Nuclear Power and the Environment recognised for the first time that a policy for disposal of the growing quantity of HLW needed a solution, there have been two failed attempts to find a site for an underground repository in the UK. Opposition from local people was a key reason for failure in both cases.

91. In 2001, the government began a new public consultation about disposal of HLW. To command public support, it included widespread public debate overseen by a new independent body, the Committee on Radioactive Waste Management (CoRWM). The level of public participation and the reconsideration of many disposal options took nearly five years. This time lapse was widely criticised.

92. CoRWM's final report was published in July 2006. The key recommendations are:

- the long-term disposal of HLW deep underground in a repository, called geological disposal;
- robust interim storage because the repository may take several decades to build;
- an equal partnership between government and host communities based on a willingness to participate.

93. Safe and secure interim storage is needed to safeguard the waste for 100 years or more, in case of delay or failure in the repository programme.

94. The recommendations apply only to waste that currently exists or will arise through decommissioning of current nuclear sites. CoWRM believes that waste from any new nuclear power stations should be assessed separately, although it is likely that the repository would be suitable for it.

95. In October 2006, the government accepted CoRWM's recommendations and gave responsibility for carrying out the policy to the Nuclear Decommissioning Authority (NDA), which was established to oversee the decommissioning of nuclear sites.

96. The CoWRM report did not make any recommendations about suitable sites for the repository, which are expected to be very contentious. The process of site selection is not supposed to impose decisions, but be carried out in partnership with local communities in an open and transparent manner. Local authorities

would be invited to take part and there will be opportunity for public, stakeholder and expert community involvement. It is thought likely that communities will be offered inducements to participate, such as improved infrastructure or recreational facilities. A further consultation will focus on the framework and outline timetable for implementing geological disposal. It will include proposals on the voluntary approach to site selection.

97. Lower level waste (LLW) contains a very wide range.of concentrations of radioactivity and consequently has been managed in a number of ways in the past: burial at the facility at Drigg; various forms of disposal on the nuclear site where it was generated; controlled burial at landfill sites; and, for small quantities of very low-level waste, disposal with other ordinary refuse.

98. As many nuclear sites and facilities are beginning to be decommissioned, it has been recognised that there will be a very large volume of LLW to be dealt with. Potentially this could fill the Drigg facility a number of times over. This led the UK government to review LLW policy in parallel with the HLW review. The issue for LLW is not that of identifying the best long-term management option itself, but how best to apply those forms of long-term management that already exist.

99. The consultation was published in February 2006 and the government published its revised policy statement in March 2007. This outlines priorities as:

- allowing greater flexibility in managing the wide range of LLW;
- maintaining a focus on safety;
- seeking first to minimise the amount of LLW created before looking at disposal options;
- creating a UK-wide strategy for managing LLW, including at what point in the future a replacement for the facility near Drigg might be required and planned; and
- initiating a strategy for the management of non-nuclear LLW (for example, from hospitals).

100. On 16 and 17 May 2007, the Sub-Committee on Sustainable Development, of the Committee on the Environment, Agriculture and Local and Regional Affairs, held an exchange of views in London on the UK nuclear waste policy with Mr Robert Jackson, Head of the Radioactive Substances Division, Department for Environment, Food and Rural Affairs (DEFRA), Professor Gordon MacKerron, Chairman of the Committee on Radioactive Waste Management (CoRWM), Lord Oxburgh, member of the House of Lords Committee on Science and Technology and Dr David Lowry, independent energy policy consultant. The Sub-Committee then paid a study visit to the nuclear site in Sellafield (including the HLW plant and the LLW national disposal facility at Drigg).

101. The Sellafield site covers an area of approximately 4 km² on the West Cumbrian coast of England. Managed and operated by British Nuclear Group on behalf of the site owner, the Nuclear Decommissioning Authority, its activities centre on remediation, decommissioning and clean-up of the historic legacy. The site is also home to the Thorp and Magnox reprocessing plants, the Sellafield Mixed Oxide Fuel manufacturing plant and a wide range of waste management and effluent treatment facilities.

102. By the end of the 2nd World War, the British Government sought to develop its own independent nuclear capability at Sellafield. In 1947, work began on the construction of two reactors known as the Windscale Piles along with a separation plant to extract the fissile materials needed by the Government. Recognising that atomic energy could be harnessed for commercial as well as military uses, Britain's scientists and engineers combined to develop the world's first civil nuclear reactor programme.

103. Today Sellafield comprises more than 200 nuclear facilities - some 60% of the UK civil nuclear liability to be discharged. The site has around 10 000 employees. British Nuclear Group’s key focus is to significantly accelerate the reduction in radiological risk and hazard associated with legacy waste from silos and ponds whilst securing income from the supply of spent fuel services.

104. A wide range of decommissioning and clean-up activities are underway on the site, delivering accelerated hazard reduction. Decommissioning and site remediation activities include groundwater and contaminated land remediation. Nuclear and non-nuclear waste arising on the site is recovered, treated and then either transported off site for disposal in appropriate facilities already in existence or stored safely on the site until suitable facilities (ILW and HLW repositories) become available. There are strictly controlled liquid discharges into the Irish Sea and aerial discharges through filtered stacks.

105. Commercial operations also cover the storage and reprocessing of spent fuel, the safe storage of the reusable products arising from reprocessing, return of the relevant products such as plutonium in the form of

Mixed Oxide Fuel to customers and the return of appropriate waste products in a stable form suitable for long term storage or disposal. The Sellafield site is treating not only waste of UK provenance, but also waste coming from other countries (e.g. Germany, Japan) which is returned after treatment to the countries of origin.

iv. Lithuania

106. Lithuania represents a case completely different to the ones listed above. Lithuania is a small country and around 80-85% of its energy supply is ensured by the Ignalina power plant, a Tchernobyl-type plant inherited from the USSR when Lithuania gained independence in 1991.

107. The Ignalina NPP was constructed to supply electricity to the entire northwestern system of the USSR rather than to meet Lithuania's demand in electricity. Unit 1 was commissioned in 1983 and it was shut down in 2004. Unit 2, which was commissioned in 1987, is to be operated until the end of 2009. The processus of decommissioning is supposed to include the construction of new facilities for managing nuclear waste, storage facilities and repositories.

108. The Rapporteur paid a study visit on 7 June 2007 to Ignalina to receive first-hand information from Mr Viktoras Sevaldinas, Director General of the Ignalina NPP.

109. Since the commissioning of the Ignalina NPP, all spent nuclear fuel has been stored in special water ponds, 20 meters deep, located in the same building as the reactor. The spent fuel was supposed to be sent to the USSR and dealt with within the integrated spent fuel management policy of the USSR. When the NPP was transferred under the authority of Lithuania, in 1991, the water ponds were already 90% in total use and it was obvious that, if no quick solution was found, an early closure of the NPP had to occur. Lithuania decided then to build an interim dry storage site, located in the vicinity of the NPP, designed to last for more than 50 years (the philosophy behind this being that in 50 years new technologies may be developed).

110. The surface dry spent nuclear storage facility was inaugurated in 1999. This process involves spent fuel being sealed within metal (black steel) and concrete casks which are produced in Germany, with a guaranteed minimum life of 50 years. The casks lie in open air and do not require special attention, other than security-related measures.

111. Since the current storage facility was designed for only 72 casks, which is not sufficient to satisfy the storage demand in the near future (because an additional number of 350 casks would be needed to store the spent fuel removed from the decommissioned units alone), the new surface dry spent fuel facility is due to be expanded.

112. It should be noted that studies showed that the geological situation of Lithuania does not allow the building of a deep rock repository for nuclear waste, so a possible option for the future might be the building of a near-surface repository in Lithuania (a repository built close to the earth surface with natural and engineered barriers to prevent the waste from spreading into the environment). Another option may be for more advanced European partners to help small neighbouring nations to deal with their dangerous issue in the short and medium term, until a safer solution can be found.

113. Finally, what needs to be considered is the increased volume of nuclear waste which is going to have to be dealt with after the decommissioing. As yet, few decisions seem to have been made to deal with the amount of waste coming both from the current activity of the NPP and from the decommissioning. Moves should also be made to stabilise nearby communities who at the moment are very unsettled by the continuing economic insecurity.

v. Finland

114. Finland has about 25% of its electricity ensured by the nuclear industry. The country has two nuclear power plants, in Olkiluoto (owned by Teollisuuden Voima Oy - TVO) and in Loviisa (owned by Fortum Power and Heat Oy), each with two reactor units. In 2002, Finland decided to build a fifth reactor, which is currently under construction in Olkiluoto (OL3).

115. The Finnish authorities are responsible for the principles governing nuclear waste management, safety criteria and for ensuring that legislation is complied with. The Ministry of Trade and Industry is responsible for licenses and legislation and the Radiation and Nuclear Safety Authority (STUK) for supervising safety.

116. Legislation passed in Finland in 1996 requires nuclear waste generated in Finland to be processed, stored and finally disposed in Finland. The power companies concerned, TVO and Fortum Power and Heat Oy, are responsible for the nuclear waste management. The power companies' responsibility covers all actions until waste is finally and permanently disposed of. Posiva Oy, the company responsible with the final disposal of spent nuclear fuel, is owned by the two power companies.

117. The Rapporteur participated to a study visit organised by the European Energy Forum on 29-31 August 2007 in Olkiluoto and met, among others, Mr Eero Patrakka, President of Posiva Oy, Mr Pertti Simola, President and CEO of TVO and Mr Martin Landtman, Senior Vice-President of the new build OL3.

118. The Olkiluoto nuclear site consists of the Olkiluoto power plant (with its two currently working reactors OL1 and OL2 and the third reactor under construction, OL3), the interim storage for spent nuclear fuel, the underground repository for low and intermediate waste and the ONKALO site (the underground rock characterisation facility).

119. The method used for the interim storage for spent nuclear fuel is very similar to the one used in Sweden. The spent fuel is immersed in large water pools, but, whilst in Sweden the water pools are located some 30 meters below the ground level, in Finland they are at ground level.

120. The Olkiluoto repository for low and intermediate waste is located in the bedrock, at a depth of several tenths of meters. It has separate silos and tunnels for low- and intermediate level waste. It has been dimensioned to house all radioactive operational waste that is produced during the lifetime of the power plant. Once the waste has been disposed of, the tunnels and shafts leading to the silos will be filled and sealed.

121. The principle for the disposal of spent fuel is similar to the one considered in Sweden: encapsulating the fuel and placing the canisters in the bedrock at a depth of several hundreds of meters.

122. In 1999, Posiva Oy asked the Government for a decision in principle to choose Olkiluoto as the site for the final disposal facility for the very high level radioactive waste (the spent fuel). Since the municipality had already given its consent to locate the disposal facility in the area and the Radiation and Nuclear Safety Authority (STUK) was in agreement, in 2000 the Government decided in favour of the project. The Finnish parliament approved the decision in principle by 159 votes in favour and 3 votes against. In June 2004 began the construction of the underground characterisation facility, intended to reach a depth of 500 meters, known as ONKALO.

123. ONKALO will be used to obtain further information to plan the repository in detail and to assess safety and construction engineering solutions. It will also enable final disposal technology to be tested under actual conditions. It should be ready in 2010 and the disposal is scheduled to begin in 2020.

VII. Conclusions

124. The nuclear waste issue is not only about the technical construction of a final disposal unit, but also a question of ethical and moral issues which concern our responsibilities for future generation. It also raises basic existential dilemmas, moral responsibilities with respect to issues that we are not sufficiently equipped to answer, for example, inadequate knowledge and other uncertainties, for instance if we can cope with severe climate changes or whether such occurrences as a severe earthquake could destroy a specific repository.

125. Using such an approach would likely lead to repositories for spent nuclear fuel being constructed in such a way that they do not require any maintenance or monitoring, even in the long term, leaving future generations mainly to monitor them repositories and then to improve their final disposal system.

Bibliography:

- Nuclear Waste state-of-the-art reports 2004, KASAM, Stockholm 2005

Appendix

International Atomic Energy Agency

Registration No: 1729

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

Notes: The Convention, pursuant to Article 40.1, entered into force on 18 June 2001, i.e. on the ninetieth day after the day of deposit with the Depositary of the twenty-fifth instrument of ratification, acceptance or approval, including the instruments of fifteen States each having an operational nuclear power plant.

Parties: 45 *(subject to entry into force date)*
Signatories: 42

Last change of status: 04 April 2007

Country/Organization	Signature	Instrument	Date of deposit	Declaration etc. / Withdrawal	Entry into force
[1] Argentina	19 Dec 1997	ratification	14 Nov 2000	☐ ☐	18 Jun 2001
Australia	13 Nov 1998	ratification	05 Aug 2003	☐ ☐	03 Nov 2003
Austria	17 Sep 1998	ratification	13 Jun 2001	☐ ☐	11 Sep 2001
Belarus	13 Oct 1999	ratification	26 Nov 2002	☐ ☐	24 Feb 2003
[1] Belgium	08 Dec 1997	ratification	05 Sep 2002	☐ ☐	04 Dec 2002
[1] Brazil	31 Oct 1997	ratification	17 Feb 2006	☐ ☐	18 May 2006
[1] Bulgaria	22 Sep 1998	ratification	21 Jun 2000	☐ ☐	18 Jun 2001
[1] Canada	07 May 1998	ratification	07 May 1998	☐ ☐	18 Jun 2001
[1] China		accession	13 Sep 2006	☑ ☐	12 Dec 2006
Croatia	09 Apr 1998	ratification	10 May 1999	☐ ☐	18 Jun 2001
[1] Czech Republic	30 Sep 1997	approval	25 Mar 1999	☐ ☐	18 Jun 2001
Denmark	09 Feb 1998	acceptance	03 Sep 1999	☐ ☐	18 Jun 2001
Estonia	05 Jan 2001	ratification	03 Feb 2006	☐ ☐	04 May 2006
[1] Finland	02 Oct 1997	acceptance	10 Feb 2000	☐ ☐	18 Jun 2001
[1] France	29 Sep 1997	approval	27 Apr 2000	☐ ☐	18 Jun 2001
[1] Germany	01 Oct 1997	ratification	13 Oct 1998	☐ ☐	18 Jun 2001
Greece	09 Feb 1998	ratification	18 Jul 2000	☐ ☐	18 Jun 2001
[1] Hungary	29 Sep 1997	ratification	02 Jun 1998	☐ ☐	18 Jun 2001
Iceland		accession	27 Jan 2006	☐ ☐	27 Apr 2006
Indonesia	06 Oct 1997			☐ ☐	
Ireland	01 Oct 1997	ratification	20 Mar 2001	☐ ☐	18 Jun 2001
Italy	26 Jan 1998	ratification	08 Feb 2006	☐ ☐	09 May 2006
[1] Japan		accession	26 Aug 2003	☐ ☐	24 Nov 2003
[1] Kazakhstan	29 Sep 1997			☐ ☐	
[1] Korea, Republic of	29 Sep 1997	ratification	16 Sep 2002	☐ ☐	15 Dec 2002
Kyrgyzstan		accession	18 Dec 2006	☐ ☐	18 Mar 2007
Latvia	27 Mar 2000	acceptance	27 Mar 2000	☐ ☐	18 Jun 2001
Lebanon	30 Sep 1997			☐ ☐	

Registration No: 1729 Last change of status: 04 April 2007

Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

Country/Organization	Signature	Instrument	Date of deposit	Declaration etc. / Withdrawal	Entry into force
[1] Lithuania	30 Sep 1997	ratification	16 Mar 2004	☐ ☐	14 Jun 2004
Luxembourg	01 Oct 1997	ratification	21 Aug 2001	☐ ☐	19 Nov 2001
Morocco	29 Sep 1997	ratification	23 Jul 1999	☐ ☐	18 Jun 2001
[1,2] Netherlands	10 Mar 1999	acceptance	26 Apr 2000	☐ ☐	18 Jun 2001
Nigeria		accession	04 Apr 2007	☐ ☐	03 Jul 2007
Norway	29 Sep 1997	ratification	12 Jan 1998	☐ ☐	18 Jun 2001
Peru	04 Jun 1998			☐ ☐	
Philippines	10 Mar 1998			☐ ☐	
Poland	03 Oct 1997	ratification	05 May 2000	☐ ☐	18 Jun 2001
[1] Romania	30 Sep 1997	ratification	06 Sep 1999	☐ ☐	18 Jun 2001
[1] Russian Federation	27 Jan 1999	ratification	19 Jan 2006	☐ ☐	19 Apr 2006
[1] Slovakia	30 Sep 1997	ratification	06 Oct 1998	☐ ☐	18 Jun 2001
[1] Slovenia	29 Sep 1997	ratification	25 Feb 1999	☐ ☐	18 Jun 2001
[1] South Africa		accession	15 Nov 2006	☐ ☐	13 Feb 2007
[1] Spain	30 Jun 1998	ratification	11 May 1999	☐ ☐	18 Jun 2001
[1] Sweden	29 Sep 1997	ratification	29 Jul 1999	☐ ☐	18 Jun 2001
[1] Switzerland	29 Sep 1997	ratification	05 Apr 2000	☐ ☐	18 Jun 2001
[1] Ukraine	29 Sep 1997	ratification	24 Jul 2000	☐ ☐	18 Jun 2001
[1] United Kingdom	29 Sep 1997	ratification	12 Mar 2001	☐ ☐	18 Jun 2001
[1] United States of America	29 Sep 1997	ratification	15 Apr 2003	☐ ☐	14 Jul 2003
Uruguay		accession	28 Dec 2005	☐ ☐	28 Mar 2006
EURATOM		accession	04 Oct 2005	☐ ☐	02 Jan 2006

----

1 Indicates that the State has at least one operational nuclear power plant.

2 for the Kingdom in Europe

Reporting committee: Committee on the Environment, Agriculture and Local and Regional Affairs

Reference to committee: Doc. 10522, reference no. 3076 of 29 April 2005, extended to 30 September 2007 on 16 March 2007

Draft resolution adopted unanimously by the committee on 12 September 2007

Members of the Committee: Mr Walter **Schmied** (Chairman), Mr Alan **Meale** (1e Vice-Chairman), Ms Elsa Papadimitriou (2nd Vice-Chairperson), Mr Pasquale Nessa (3rd Vice-Chairman), Mr Ruhi Açikgöz, Mr Milos Aligrudić, Mr Gerolf Annemans, Mr Ivo Banac, Mr Tommaso Barbato, Mr Rony Bargetze, Mr Jean-Marie Bockel, Mr Ivan Brajović, Mr Mauro Chiaruzzi, Mrs Pikria Chikhradze, Mr Valeriu Cosarciuc, Mr Osman Coşkunoğlu, Mr Alain Cousin, Mr Taulant Dedja, Mr Hubert Deittert, Mr Tomasz Dudziński, Mr József **Ékes**, Mr Savo Erić, Mr Bill **Etherington**, Mr Nigel **Evans**, Mr Ivàn Farkas, Mr Adolfo Fernández Aguilar (alternate: Mr Julio **Padilla**), Mr György Frunda, Ms Eva Garcia Pastor, Mr Peter Götz, Mr Vladimir Grachev, Mr Rafael Huseynov, Mr Stanislaw **Huskowski**, Mr Jean Huss, Mr Fazail Ibrahimli, Mr Ilie **Ilaşcu**, Mr Mustafa Ilicali, Mrs Fatme Ilyaz, Mr Ivan Ivanov, Mr Bjørn Jacobsen, Mr Gediminas Jakavonis, Mrs Danuta **Jazłowiecka**, Mrs Liana Kanelli, Mr Karen Karapetyan, Mr Victor Kolesnikov, Mr Juha **Korkeaoja**, Mr Gerhard Kurzmann, Mr Ewald Lindinger, Mr François Loncle, Mr Aleksei Lotman, Ms Kerstin Lundgren, Mr.Theo Maissen (alternate: Mr John **Dupraz**), Mrs Maria Manuela **de Melo**, Mr José **Mendes Bota**, Mr Gilbert Meyer, Mr Vladimir Mokry, Mr Stefano Morselli, Mr Tomislav Nikolić, Mrs Carina Ohlsson, Mr Pieter Omtzigt, Mr Ivan Popescu, Mr Cezar Florin Preda, Mr Jakob **Presečnik**, Mr Lluís Maria **de Puig**, Mr Jeffrey Pullicino Orlando, Mrs Adoración Quesada Bravo (alternate: Mr Gabino **Puche**), Mr Kamal Qureshi, Mr Dario Rivolta, Mrs Anta Rugāte, Mr Fidias Sarikas, Mr Hermann Scheer, Steingrímur J. Sigfùsson, Mr Ladislav Skopal, Mr Christophe Spiliotis-Saquet, Mr Rainder Steenblock, Mr Vilmos Szabó, Mr Nikolay Tulaev, Mr Victor Tykhonov, Mr Tomas **Ulehla**, Mr Geert Versnick, Mr Rudolf **Vis**, Mr Harm Evert Waalkens, Mr G.V. Wright, Mr Mykola Yankovsky, Mrs Maryam Yazdanfar, Mr Blagoj **Zasov**.

N.B. The names of those members present at the meeting are printed in bold.

Secretariat to the Committee: Mr Alfred Sixto, Mr Bogdan Torcătoriu and Mrs Marine Trévisan