# Radioactive waste in the European Union

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Saying something new about radioactive waste – especially about radioactive waste disposal – is very difficult if not near impossible. After decades of painstakingly detailed research, endless discussions and arguments and massive investments by the nuclear sector, we are still left with a small quantity – in terms of most other waste volumes and incredibly small quantity - of highly radioactive material which we have not yet been able to dispose of. Why is this? Why cannot we in Europe, the birthplace of the majority of the greatest scientists that ever lived, the leaders in the field of many of the most advanced forms of technology – including nuclear technology, solve this problem of a few thousand cubic metres of material? Or is it, as some people would claim, not only an unsolved problem – but an insoluble one?

## The Public's perception

In November 1998, the European Commission conducted a public opinion survey on the subject of radioactive waste. Over 16 000 people across the Union were interviewed on the subject. This included around 2000 people in Germany. It is clear from these results that the average European is worried, but poorly informed about radioactive waste.

Three quarters of the population are worried about radioactive waste. There was considerable regional variation in the replies. Those in the south of the Union are most worried (up to 98% in Greece) while those in the north-east have the least concern (down to 41% in Sweden). Less than one person in five is willing to live within 100 km of a disposal site. Over 90% of people interviewed expressed concerns about the transport of the waste to the site, the impact on the environment and the long term safety of the waste. Around 70% were worried because of the impact on house prices.

However, it is also true that three quarters of the people questioned thought they were not well informed on the subject. Only 2-3% thought they were very well informed. Asked who they would turn to for further information, the average European is divided between government bodies and the media. In Germany, however, the radioactive waste management agency ran the government a very close second with only a fraction of a percentage point between them. In Sweden and Finland, the waste agencies were clearly the favourite sources of information for around half the population.

Asked if they knew which country in the Union produced the most radioactive waste, Germany came a rather close second to France. In fact, in 5 States (Denmark, Greece, Spain, Portugal and Sweden) Germany was identified as the biggest single producer.

Given that the nuclear industry makes much of the small quantities of waste that are produced, it was interesting to see that less than 7% of the population realised that this was less than one litre per person per year. Actually, the amount is below 200 ml/year

or around 15 litres for one person lifetime. This includes all levels of waste – of which high level waste will be a less than one percent.

When we asked what was done with the radioactive waste, very few people – one person in eight - realised that the large majority of the waste is disposed of by shallow burial. Even in countries such as France and the UK where sites have been in operation for many years, less than one person in five identified this as a technique for disposal. The majority of people thought that waste is stored pending a final decision. In Germany, this was the view of 70% of the people interviewed. An alarmingly high percentage believed that it is dumped at sea or exported to other countries. These latter beliefs probably result from the high publicity given to discharges from the reprocessing plants and the movements of spent fuel for reprocessing in these plants.

**The present situation**

In January 1999, the Commission published its fourth "Situation Report" on radioactive waste management in the European Union. This report is mainly concerned with radioactive waste within the system of control. In addition, it looks at wastes from industrial processes involving concentration of natural radionuclides and residues from enrichment of uranium, both of which are not strictly considered as *radioactive* waste.

Annual production of all conditioned radioactive waste in the EU is around 50,000 m3. On average the figure was somewhat less until 2000 and somewhat more after. A comparison with what was expected when we produced the previous report shows a dramatic reduction. In 1992 we forecast of 80,000 m3/year for the Community. Even without taking into account the arisings in Austria, Finland and Sweden, which were not Member States at that time of the last report, the present expectations is still 60% less than we had predicted.

The reasons for this reduction are: the construction of new power plants has been practically halted; a number of older plants have been definitively closed down; nuclear power plant operators have made tremendous efforts to reduce waste production at the source; and they have applied advanced volume reduction techniques.

Quantities of high level waste and spent fuel are somewhat more difficult to calculate as it will depend on the actual technology used for the management of the spent fuel – the reprocessing or direct disposal route. Some States calculate the actual amount of glass containing the waste for disposal rather than the volume of the waste itself. Others calculate the weight of heavy metal contained in the fuel elements. We would estimate that the total volume of the waste – once it is in a form for disposal – would be in the region of 300 to 500 m3/year.

We should keep these quantities in perspective. It is estimated that approximately 2 billion tonnes of waste are produced in the Union every year – close to 4 tonnes per inhabitant. Around 35 million tonnes of this is "hazardous waste" – 80 kg per inhabitant. These include pesticide residues, heavy metals, asbestos and contaminated hospital wastes. There are around 55 000 sites in the Union contaminated by waste

disposal – of which almost half are in a "critical state", threatening public health and groundwater quality in the vicinity of the site.

Of the radioactive waste, a very large percentage of it is now disposed of in very closely regulated sites. By now, close to 2 million $m^3$ of low and some intermediate level wastes had been finally disposed of. Until 1982 ocean disposal was frequently used, but there is a moratorium on such practices that is unlikely to be overturned in the foreseeable future. A large majority of the wastes have been disposed of at Drigg in the UK and at the Centre de la Manche and Centre de l'Aube in France. Near surface and shallow disposal are still the main techniques used. Finland, France, Spain, Sweden and the United Kingdom operate surface- and shallow-disposal facilities for radioactive waste containing only small quantities of long-lived radionuclides. Until recently, Germany ran a deep geological disposal facility in a former salt mine.

**The main issue**

Undoubtedly the biggest issue concerning radioactive waste management is that of high level waste. Most processes involved in radioactive waste management have reached the stage of industrial use. The only element lacking is actual disposal of high-level heat-generating waste.

Some countries managing high level wastes have no plans for what to do with it. Three countries with nuclear power production plants, Italy, the Netherlands and the United Kingdom, have decided to postpone disposal of high-level waste for periods ranging from at least fifty to more than one hundred years.

Not one Member State in the Union can say that their high level waste will be disposed of at a specific site. Nobody can say, "that is where it is going to go". Finland is the closest and there may be a final decision in the coming months. At one stage it appeared that Germany was even closer, but expectations appears to have receded in recent months. France has located one of its underground laboratories. Sweden and Belgium both have extensive experience of underground laboratories but still seem some way from taking a final decision on the site. Meanwhile, the quantities of waste continue to grow. They have been growing for over 40 years. They grow slowly, but they do grow.

It must be clear that the present situation regarding storage of high level radioactive waste in the European Union does not pose any significant environmental or radiological threat. However, it was never the intention to store these wastes indefinitely. Therefore the delays in identifying sites for geological repositories must be a cause for concern.

**Reasons for delays in siting repositories**

In the past, some of the reasons for delay were technical. Storage at the surface allows the highly active shorter-lived radionuclides to decay, reducing their radioactivity and heat generation. This makes their eventual disposal easier and simplifies repository design. In addition, the volumes of such waste are small and they could be easily

managed at or near the surface. There was little urgency to identify a disposal site. This delay allowed extra time for possible advances in disposal technology.

But now, there is a very broad consensus on the concept of geological disposal. In fact, the view of the experts is that for the foreseeable future, geologic disposal represents the only available option for assuring the safe isolation of the waste for thousands of years. The necessary technologies to do it have all been tried and tested. Research and development will continue to refine data, models, and concepts related to long-term safety of disposal. In particular, it is most important that work continue in the underground laboratories as they provide invaluable insight into the behaviour of future repositories. Efforts on advanced partitioning and transmutation will also continue, even if the chances are slim that this technique could eliminate the need for repositories in deep geological formations. However, the experts have very little, if any doubt that we could dispose safely of wastes today. There are now no technical reasons to delay decisions on disposal.

However, there continues to be opposition from large sectors of the public to most proposals concerning the siting of repositories. Given this, it is increasingly difficult to get political support – or even political decisions – on such sites. This failure to advance to the next stage in the waste management process reinforces the Public's initial suspicions and resistance. In turn, this makes political decisions even harder.

In the Public Opinion survey, we asked people why they thought no Member State had yet decided on how to dispose of its highly active waste. Over 80% believed that "it shows how difficult and politically unpopular it is to take decisions about the elimination of any toxic waste". This was the view of 85% of the people in Germany.

It is also the case that three quarters of the population are not convinced that there is no safe way of disposing of the waste. However, only half the population thought that the delays were a result of the national authorities carefully studying all the risks before taking a decision.

**Other issues**

Before looking at what might be done to change the situation – to break the deadlock – there are a number of other issues concerning the disposal or other management of radioactive waste that should be touched on.

The first concerns the large quantities of radioactive waste that show very low levels of remaining radioactivity after they have been decontaminated or decay. These mainly occur during dismantling of nuclear installations. A large quantity of the material may even be totally free of artificial radioactivity. It is important to achieve, at Union level, a common set of rules for clearance (preferably for unconditional clearance). The present situation, where some countries have clearance levels and others not, and where released material may circulate freely in the Common market, is not satisfactory.

The second concerns the disposal of low level waste. As I mentioned earlier, the large majority of such waste is already the subject of routine disposal. Unfortunately, this is not the case in all countries. In Belgium, for example, difficulty has been encountered

in obtaining local agreements on a site. The situation now seems to be improving, but the message must be clear for any country that does not yet have a site – there can be strong resistance even to locating a low level waste repository, even though this is standard practice elsewhere.

Returning to high level waste, a very fashionable discussion is now taking place on the subject of retrievability. Books have been written on the subject and, undoubtedly, more will follow. I am afraid that I find much of the discussion an intellectual exercise which, in the end, comes down to semantics. The basis concept of geological disposal is "contain and isolate". The primary – or sole - objective is to prevent accidental recovery or release of the radionuclides. Building in technology to assist future recovery – at some time after closure – would seem to conflict with this objective. It could reduce the effectiveness of the disposal. However, for those people who think "what if we come up with a new technology for ridding ourselves of the waste in future years", it is clear that no "contain and isolate" disposal technology will be "non-retrievable". It will only ever be a question on economics. As any geologist or mining engineer will tell you, we have located and recovered minute amounts of crystalline carbon and gold from kilometres down in the earth's crust. Beware of retrievability as a "red herring".

An even more sensitive issue is that of regional repositories – disposing of other people's wastes. Such repositories are much lauded by the technologists who see a small number of high level waste repositories as reducing environmental impacts and risks, improving the long-term safety and having very significant economic benefits. However, even the concept of such repositories is shunned by those developing national disposal sites. The main reason is, of course, public perception. In our questionnaire we asked the almost unthinkable question of would you be willing to dispose of some other State's radioactive waste in your country? Four out of every five people (80%) said "no". In Germany the percentage was somewhat below average (73%). We were a little surprised to find that more people are against temporarily storing others waste than there are against disposing of it. We were even more surprised to find that in some countries a not insignificant percentage would accept to dispose of another country's waste – around 15% in Germany and France and over 35% in the Netherlands.

Apparently a very frequently asked question by the local population at any potential disposal site is "will we be forced – or expected – to take another country's wastes?" This is, of course, a natural reaction. None of us would like to see our neighbour's rubbish just tipped over the fence into our garden. The Commission answers a lot of questions from very agitated parliamentarians assuring them that no Member State could be forced to accept another country's high level radioactive waste. However, this is not really the issue. Returning to my garden, my rubbish is collected and taken away – some for recycling, some for burning and some for disposal. My neighbour's rubbish is collected and taken to the same place and, like mine, managed by experts. We are not even allowed to dispose of it in our gardens.

The analogy is a simple one but I think the message should be clear. While we all generate waste, there may be a better method than each disposing of his own. The Commission applauds the sense of responsibility that is behind any State's desire to be self-sufficient in managing its own wastes. In fact, the Commission believes that

the European Union must be capable of managing all its own wastes. However, we will continue to argue in favour of working together as neighbours if this can lead to an even safer and more environmentally sound solution.

Turning very briefly to the role of the regulatory authorities, in supporting work by the radioactive waste management agencies to establish a safety case for a deep repository, the Commission became aware of difficulties in getting this accepted by the safety authorities. In the "Situation Report" the Commission recommends including, to a large extent, national safety authorities in preparatory work prior to requests for licensing of such repositories. We believe the approach taken in Finland has played an important role in the progress made there. The Commission also strongly promotes co-operation between the safety authorities of the Member States in this, as in other, areas.

**The role of the Public**

The key to progress now rests with the Public. They are concerned about radioactive waste and do not believe a solution has been found to dispose of them. On the other hand they admit that they are poorly informed about radioactive waste. What we see here is the classic strong correlation between concern and lack of information. Across Europe the concerns are always the greatest in those States where the people feel less well informed.

However, around 80% of the Public were interested in knowing more about radioactive waste. We know that for many of them the waste management agencies and the government are trusted sources of information. If is interesting to note that in those countries where the public feel that they are best informed about radioactive waste management – a feeling supported by other questions in our survey – the waste management agencies are the preferred source of information. This is the case, for example, in both Finland and Sweden.

This brings me to something of a favourite topic of DG Environment – information for the Public. Many of you may be aware that in 1985 the European Council adopted a Directive on "the assessment of the effects of certain public and private projects on the environment" (Directive 85/337/EEC). This was amended in 1997 (Directive 97/11/EC). What these Directives do is require that environmental impact assessments (EIAs) be produced for certain projects. Such projects include installations designed "for the final disposal of irradiated nuclear fuel" or "solely for the final disposal of radioactive waste". An EIA is also required for installations designed "solely for the storage (planned for more than 10 years) of irradiated nuclear fuels or radioactive waste in a different site than the production site".

The Directives also give some information on what the EIAs should cover and who should be involved in their preparation. In particular the Directives also require that the information "are made available to the public within a reasonable time in order to give the public concerned the opportunity to express an opinion before the development is granted". DG Environment made a study of the possible role of the EIA in siting repositories. The report in available on our website[1]. I strongly

[1] http://europa.eu.int/comm/environment/nuclear/index.htm

recommend anyone involved in this field to read it. We are presently turning it into a Communication to the Council and the Parliament. However our message can be summarised as follows. The public must have the opportunity to be fully involved in the decision making process. However, the developer should not regard an EIA as an unavoidable imposition. He should regard it as an opportunity to establish a full and open dialogue with all local bodies and representatives. The final EIA should not be a product that he will need to defend against public criticism, but a joint developer/public document that all sides can endorse and support. Reducing the message to its simplest form – consult early and often.

Finally one thing that really concerns us about the delays in taking decisions on siting repositories is the legacy that we leave to our children and their children. Not only will we be leaving them all our waste – we will be leaving them with decisions that we ourselves have been unable to take. Much has been written on sustainability and the ethical considerations surrounding waste disposal. It is clear that the present generation should bear the responsibility for the management of its own wastes and make available the technology and the funds for implementing disposal facilities.

I will leave the last word on this subject to the public. Our survey showed that only 6 percent of the population are in favour of leaving the responsibility for developing and implementing a solution for waste disposal to future generations.

**The message**

The message is clear.

- Radioactive waste exists. We generated it. We must manage it. It we are not to pass our waste on to future generations we should also dispose of it.

- Therefore, the Member States of the European Union are encouraged to continue their activities for siting, constructing and operating a repository for high-level waste in deep clay, granite or salt formations.

- One of the main issues is now the lack of acceptance by the public for any specific site in their neighbourhood. Better information should help to overcome this negative reaction. The waste agencies have a very important role to play here. However, they must be able to expect strong support and clear decisions from their governments. Otherwise our inability to act will pass on a dangerous legacy to our children.