

Radioactive waste management in the European Union: Initiatives for new legislation

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ABSTRACT

Improving the management of radioactive waste in the European Union is a major theme of the “nuclear package” recently adopted by the European Commission. Included in the package are proposals for new legislation that would bring about the development of common safety standards in Europe covering the full nuclear sector, segregated funds to cover all nuclear liabilities that remain after the operating lifetime of an installation and clearly defined waste programmes for radioactive waste management in each of the Member States of the Union. Included in these programmes must be firm dates for a number decision points leading to disposal of all forms of radioactive waste. The package also puts significant emphasis on more, and better co-ordinated, research on radioactive waste management as the present levels are thought to be inadequate.

INTRODUCTION

On 6 November 2002, the European Commission adopted what is known as the “nuclear package”. This is a series of documents centred around maintaining a high level of nuclear safety in a soon to be enlarged European Union (EU). Included in this package were two proposals for new “EURATOM Directives” – pieces of legislation. Both of these have very important implications for the future of radioactive waste management in the EU.

THE NUCLEAR PACKAGE

The nuclear package contained five sets of documents. Three of these were formally adopted by the Commission:

- A Communication from the Commission to the Council and to the European Parliament on nuclear safety in the European Union
- A Communication to the Commission “Trade in nuclear materials with Russia” and a proposal for a Council decision instructing the Commission to negotiate a cooperation agreement between the European Atomic Energy Community and the Russian Federation in the area of trade in nuclear materials
- A proposal for a Council Decision to raise the ceiling for Euratom loans for nuclear installations from 4 billion euros to 6 billion euros

¹ The views expressed here are those of the author and may not represent those of the European Commission

The two other sets of documents were draft proposals for new legislation that were to be submitted to a group of experts from the Member States for its opinion. These texts were approved by the Commission. They were:

- A draft proposal for a Council Euratom Directive “Defining the basic obligations and general principles for the safety of nuclear installations”
- A draft proposal for a Council Euratom Directive “The management of spent nuclear fuel and radioactive waste”

This paper focuses on the first Communication on nuclear safety in the EU and the two draft proposals for legislation as far as they relate to radioactive waste management.

It was expected that the two draft proposals will be formally adopted by the Commission in January 2003.

SECURITY OF ENERGY SUPPLY

In November 2000, the European Commission adopted a Green Paper on security of supply or – to give it its full title – “Towards a European strategy for the security of energy supply”. Since that date it has been the subject of an intensive debate around a number of essential questions which “shed light on the energy choices to be made”.

The Green Paper pointed out that the future of nuclear energy is uncertain, particularly in Europe and depends on several factors including:

- a solution to the problems of managing and stocking nuclear waste;
- the economic viability of the new generation of power stations;
- the safety of reactors in Eastern Europe, in particular applicant countries;
- policies to combat global warming.

It then went on to conclude:

“Nuclear cannot develop without a consensus that gives it a long enough period of stability, bearing in mind the economic and technological constraints of the industry. This will only be the case when the waste issue finds a satisfactory solution with maximum transparency. Research in this area should be oriented towards waste management”.

This view is clearly shared by the Public in Europe. The European Commission regularly conducts EU-wide public opinion surveys during which 16 000 people are interviewed on a variety of topics. During a recent “Eurobarometer” survey, people were given a list of eight possible priority topics for government action from which they could select three. The majority of people identified food safety (52%), but this was closely followed by nuclear safety (50%) and then by management and disposal of radioactive waste (47%). Rather surprisingly (at least to the author) was the fact that road accidents – that result in thousands of deaths across the EU each year – was only identified as a priority by 19%. Safety of oil and gas transport was identified by 16%.

EUROPEAN LEGISLATION AND NUCLEAR SAFETY

The Euratom Treaty, which defines the framework for the European Union's activities in the nuclear sector, did not explicitly establish a Community responsibility for nuclear safety.

The Treaty did require the establishment of "uniform safety standards" to protect workers and the general public. This has enabled the preparation and implementation of important legislation in the fields of radiation protection under Chapter III of the Treaty. There is also extensive legislation on the safeguarding of nuclear materials.

However, legislation in the field of the safety of nuclear facilities and management of radioactive waste has not developed in parallel.

On the other hand, there is a well developed "European safety perspective" as a result of voluntary co-operation between the main nuclear actors at EU level since the 1970s. It is built on fundamental common principles that form the basis of all the EU national nuclear safety regulations and stated in various internationally accepted documents.

This, albeit slow, route to harmonisation of regulations and practices appeared acceptable to most players until it was realised that the next proposed enlargement of the European Union – to include countries such as Lithuania, the Czech Republic, Hungary and Slovakia - could result in a number of Soviet-designed nuclear reactors being located within the Community. This brought calls for these "Candidate Countries" to meet Western safety standards.

For the first time in its history, the European Union started the process of carrying out the overall evaluation of nuclear safety in an independent State, in this case in all the candidate countries. Towards the end of 2000, a Working Party on Nuclear Safety (WPNS) was set up by the European Council's Atomic Questions Group to undertake this assessment for those countries with civilian nuclear power plants.

The main negotiations regarding nuclear safety with the countries that are now expected to join the Union in May 2004 have now been concluded. However, the debate on nuclear safety in the context of enlargement raised questions about what are Western standards for nuclear safety. These questions proved very difficult to answer – at least in a clear *and transparent* way to the non-expert.

As the energy commissioner, Vice-President Loyola de Palacio explained to the European Parliament, the current situation is unsatisfactory because:

- there are no equivalent standards and criteria for comparable situations across the EU;
- the strict requirements currently being imposed on the applicant countries as part of the accession negotiations cannot, paradoxically, be imposed on Member States;
- the public need to be reassured that the highest levels of nuclear safety are being achieved across the Union and that when the current applicant countries become Member States a high level of safety can continue to be enforced in these countries.

In recognition of the importance of immediate and effective action, the Laeken European Council in December 2001 committed itself to maintaining a high level of nuclear safety in the Union and stressed the need to monitor the safety of nuclear installations in general. It also called for regular reports from Member States on nuclear safety.

Most recently, on 10 December 2002, there was a very important ruling of the European Court of Justice, in the context of the Nuclear Safety Convention. This ruled that there is Community competence in the following areas:

- the establishment of a legislative and regulatory framework to govern the safety of nuclear installations;
- measures relating to the assessment and verification of safety;
- emergency preparedness;
- the siting of a nuclear installation; and
- the design, construction and operation of nuclear installations.

This clearly opened to path to greater harmonisation in the area of nuclear safety at the level of the European Union.

The new proposals of the Commission, outlining a new EU approach to nuclear safety and radioactive waste management, should be viewed in this context.

A COMMUNITY APPROACH TO NUCLEAR SAFETY

The future approach to nuclear safety at a Community level is set out in a new Directive “Defining the basic obligations and general principles for the safety of nuclear installations”. The interest from the specific point of view of radioactive waste management is twofold. Firstly, the Directive covers all nuclear installations, not just nuclear power plants. As such it covers all the facilities for the management on spent nuclear fuel and radioactive waste – including for their disposal. Secondly, there is an important part dealing specifically with “decommissioning funds”. Decommissioning wastes form an ever more important part of the radioactive waste stream – and the management of spent nuclear fuel and radioactive waste is responsible for a major part of the costs following closure of a nuclear facility.

The future approach will be based on common European standards. Even though these will not necessarily be of a detailed technical nature, they will take time to develop. The starting point, as set out already in the framework Directive, is the Nuclear Safety Convention and the Directive takes over many of the Convention's basic requirements. This Directive, like the Convention, does not contain detailed technical rules. However, it lays down a precise legal framework constituting the basis for a nuclear safety system. Clearly, such a Community approach to safety cannot, ultimately, be restricted simply to taking over the relevant provisions of the Convention on Nuclear Safety. However, it does provide a starting point on which there should be agreement since all the Member States have to implement them already, supplemented by other elements.

Initially, the Community system will be based on this “corpus of minimum standards”. This will also establish a legal framework comprising a mechanism allowing the standards to evolve and develop. In practical terms, States the further development of

European safety standards will be done in close co-operation with experts from the Member States. It will take fully into account the results of the work of the International Atomic Energy Agency (IAEA) in the field of nuclear safety an area in which the Agency has been working for many years. It will also take into account the results of the work of the Commission's expert working group on nuclear safety over the past 25 years and other relevant bodies. The proposals will also need to be reviewed by other committees before being formally adopted by the Member States themselves.

Member States will be required to produce regular reports on all aspects of nuclear safety in their country and these will be the subject of "peer reviews" and compiled into a regular report on nuclear safety in the EU. This reporting will be backed up by a system of verification that will rely mainly on the technical experts from national safety authorities. The focus of this verification system will be on checking the ways in which national safety authorities carry out their tasks in order to assure the Community that there is an equivalent level of nuclear safety regulation and control throughout the EU.

DECOMMISSIONING FUNDS

Maintaining a high level of safety in nuclear installations requires that adequate resources are available. This is also true for the decommissioning phase of a nuclear installation. However, here there is the added complication that the facility is no longer generating income.

Decommissioning of nuclear installations is inseparable from the issue of radioactive waste management. Decommissioning is the process that provides an ever increasing part of the radioactive waste stream. Also, the management of the wastes following closure of an installation are a very important element of the total liabilities. In some instances, especially in those countries with small or relatively limited nuclear programmes, the cost of managing the wastes may account for more than half of the total decommissioning costs.

In March 2002, the European Parliament voted with a large majority to adopt an amendment to a Directive on opening up of the electricity market. This amendment called for decommissioning funds to be set up and managed in such a way that sufficient funds would be available when necessary for the safe decommissioning of all nuclear power plants, including for the management of the wastes. Moreover, the amendment said that the funds should not be used for any other purpose than decommissioning.

It should be kept in mind that decommissioning a nuclear installation is a major industrial undertaking which can take many years – often tens of years. The cost of decommissioning operations can be very high. Estimates of the full cost of decommissioning of a 1GWe nuclear power plant range from around \$200 million to close to \$1 billion. It is essential to avoid any possibility that the decommissioning of a nuclear installation will not be able to start as planned, can not be carried out using the appropriate safe procedures, or be abandoned before completion due to a lack of resources.

The primary objective of the proposed new European legislation in this area is to make sure that sufficient resources are collected over the operating lifetime of an installation to cover all end-of-life nuclear liabilities.

Normally, the necessary resources will have to have been built up by the plant operator during the active life of the nuclear installation. However, it is not simply a question of collecting money but of managing it in such a way that it is available as and when required over a long period of time. Furthermore, because of the size of the funds, there is concern that they are managed in such a way so as not to disrupt the electricity market.

In order to meet the primary objective and other concerns, the legislation would require the creation of decommissioning funds that are independent from the regular accounts of the operators and specifically earmarked for the decommissioning of their nuclear installations. In other words, the funds would be “segregated” or “ring-fenced”. Only in exceptional cases, where duly justified reasons make such a separation of funds impossible, the management of the funds could continue to be undertaken by the operator, provided that the availability of assets to cover the costs of decommissioning operations is guaranteed.

The proposed legislation covers the decommissioning of all nuclear installations – not just nuclear power plants. Nor is it limited to commercial installations, though non-commercial facilities will need special funding arrangements to be designated by the individual Member States.

While the funds are referred to as “decommissioning” funds for simplicity, they must cover all nuclear liabilities that remain at the end of an installations normal life. In other words, they must cover the management of any remaining spent fuel and radioactive waste, including disposal.

The present proposal leaves a great deal of the detail concerning the size of the funds, how they are to be collected and how they are to be managed by the individual Member States. This is reasonable given the variety of financing schemes presently in use throughout the Union which will take some time to harmonise and the fact that Member States will be ultimately responsible for making sure that decommissioning is completed to a high standard of safety. However, if, on the basis of the regular reports that will be received from the Member States, there are problems with the funds or irregularities which could either compromise the completion of decommissioning or create distortions in the electricity market, then the Commission has made it clear that it would be ready to propose further legislation.

MANAGEMENT OF SPENT NUCLEAR FUEL AND RADIOACTIVE WASTE

The use of nuclear energy to generate electricity results in the production of spent nuclear fuel and radioactive waste. In the European Union – as in other regions of the world - the most hazardous and radiologically toxic forms of this material are presently held in temporary storage facilities. None has yet been disposed of. In the meantime, accumulations of this material continue to grow.

Irrespective of future strategies regarding energy production, the waste that exists now must be dealt with in a way that respects the basic principles of protection of human health and the environment. Action must be taken very soon to ensure that the responsibility and burden of managing the growing quantities of spent fuel and waste held in temporary storage are not passed on to future generations. Current policies in most Member States and those countries that are candidates to join the Union do not adequately address these issues.

This situation must change. It is simply not sustainable. What in the past might have been regarded as technical reasons for delaying decisions have now become excuses for failing to make progress. The proposed legislation sets out to address this issue. It is clearly motivated by the absence of progress in most Member States – particularly, but not exclusively, in the long-term management of high-level waste.

What is the situation in the EU?

In total, about 40,000 m³ of radioactive waste are produced per year in the EU as a whole, the majority originating from activities associated with nuclear electricity generation.

Though disposal of the short-lived low- and intermediate-level waste is well established, it is currently only practised in five Member States with active nuclear power programmes (Finland, France, Spain, Sweden and UK (for LLW)). In Germany, disposal operations have taken place in the past, but neither Belgium nor the Netherlands has developed any disposal capabilities for this category of waste and both countries are currently storing their accumulations in centralised national depots. Similar indefinite interim storage is also practised in Member States without nuclear power programmes.

In the case of high level waste, all accumulations are being stored in surface or near-surface facilities pending the availability of a more permanent solution. Finland and Sweden are perhaps the most advanced, with long-established programmes for the development of deep disposal. Some Member States are once again reassessing all their options as well as the associated decision-making processes. Others are still following a policy of “wait and see”.

What is the view of the European Commission?

In its Communication of nuclear safety in an enlarged Union and in the introduction (“Explanatory Memorandum”) to the proposed new legislation, the Commission sets out its views regarding the management of waste, in particular high-level waste. These are that:

- Further delays in decisions on the development of repositories for the disposal of radioactive waste cannot be justified. On the contrary, there is a sound basis on ethical, environmental and nuclear safety grounds for the rapid development of these facilities. Any delays that could be interpreted as passing on to future generations the responsibility for disposing of our wastes should be avoided, especially since such delays, particularly in the case of the more hazardous wastes, may also increase the potential risk of accidents and terrorist attacks.

- Member States should develop appropriate strategies and prepare detailed programmes for the long-term management of all the waste types under their jurisdiction. Though the Community as a whole should maintain the capacity to store its wastes, the emphasis of these programmes should be on the development of repositories for the disposal of radioactive waste. Open and comprehensive public information and involvement together with respect for the “polluter pays” principle are crucial aspects of these programmes.
- Member States should ensure that the necessary research and technological development (RTD) is carried out to enable the deadlines for implementing their programmes to be met. For the further extended use of nuclear energy it would also be beneficial to explore alternative technologies for possible application in the future.

The proposed new legislation

The objective of the proposed legislation is to bring about progress towards the safe long term management of spent nuclear fuel and radioactive waste. While the emphasis of the Directive is on high-level waste – including spent nuclear fuel that is to be disposed of directly – it does cover all forms of radioactive waste and all spent nuclear fuel regardless of the management route followed (reprocessing, storage or direct disposal).

The Directive is very much inspired by the **Joint Convention** on the safety of spent nuclear fuel and radioactive waste management. It includes a number of “basic requirements” for safe management that will be quickly recognised by all who have studied the Convention. These measures can be considered as established international best practice in the field of spent nuclear fuel and radioactive waste management, and cover such aspects as public health, environmental protection, nuclear safety, financing and governance. Many of these measures are part of current policy in many Member States.

The Directive requires that each Member State establish a **clearly defined programme** for radioactive waste management covering all radioactive waste under its jurisdiction and covering all stages of management including disposal. The programme must also cover the management of all spent nuclear fuel that is not subject to reprocessing contracts or, in the case of research reactor fuel, take-back agreements. In particular, the programme shall specify an approach to long-term management and disposal with a definite timetable for each step of the process. Where there is no suitable alternative to disposal available, a small number of decision points must be included in the programme.

The Member States must report at regular intervals on their programmes and the Commission, with the help of national experts, will review these reports and publish its own report on the situation regarding radioactive waste management in the Union.

Possibly the most controversial element of the proposed legislation relates to the **decision points** that must be included in the programmes. There are three of these. They are:

- authorisation for development of appropriate disposal site(s) to be granted no later than 2008. In the case of geological disposal of high-level and long-lived waste, this authorisation could be conditional upon a further period of detailed underground study;
- in the case of short-lived low and intermediate-level waste, if this is to be disposed of separately from high-level and long-lived waste, authorisation for operation of the disposal facility to be granted no later than 2013;
- in the case of high-level and long-lived waste, to be disposed of in a geological repository, authorisation for operation of the disposal facility to be granted no later than 2018.

There have already been a number of comments that these dates are not “realistic”. The main objection being that it will take time to develop the necessary local consensus around potential sites. It should be clear that we are not saying any Member State should be able to identify and authorize a site within 6 years of starting producing waste. Some of our Member States have been producing radioactive waste now for over 50 years and have still not identified even potential disposal sites. The message to these States is “if you have not already identified a site – you are late”.

There has also been criticism that the Directive emphasises geological disposal to the exclusion of possible **alternative technologies**. This is not true. It clearly states that there is a consensus based on current knowledge that geological disposal is the best method for long-term management of high-level wastes. It is also very widely accepted that some of the present waste forms will not be further processed and that even if partitioning and transmutation becomes technically feasible and economically attractive, it would still leave a high-level waste stream that would need to be disposed of. The Directive does strongly encourage progress on geological disposal, but it also advocates research, including into new technologies that would result in less radioactive waste.

In addition, the Directive allows the **shipment of wastes to third countries** as an alternative to disposal in a national repository. However, in order to avoid the risk of radioactive waste being sent to a country that could not safely manage it, there are strict conditions that would apply to such shipments. In particular, the shipments must be covered by firm contracts and only take place to a country with appropriate facilities that met the accepted norms and standards of the country of origin and, in the case of special materials are under adequate safeguards.

Finally, the Directive aims to encourage more – and better – research on radioactive waste management. The Commission’s concern here is two-fold. First, the level of **research on radioactive waste management** is presently inadequate. Secondly, the research that is done could be more effectively co-ordinated. From looking at the level of research being carried out in those countries that are the most advanced in management of their waste, and often closest to identifying disposal sites, we derived a figure for the amount of research that is required relative to the amount of nuclear electricity that is produced. This appears to be a reasonable application of the “polluter pays” principle. The amount is around 500 000 euros/year for every terawatt-hour of nuclear electricity generated. Only two or three of our Member States spend this much on radioactive waste research. The Commission believes that the present level of

research in the Union is inadequate. But, in addition to encouraging a higher level of research, the Commission wants to see the work better co-ordinated and plans to introduce proposals to achieve this in the coming months.

Summary

The objective of the nuclear package, in particular of the proposed new legislation, is to try to provide better guarantees of a high level of nuclear safety throughout and enlarged European Union.

The proposed legislation will impact in a number of ways on the management of radioactive waste in the EU:

- It will promote the development of common standards and good practices for spent nuclear fuel and radioactive waste management;
- It will require the establishment of segregated funds that will cover all nuclear liabilities that remain at the end of life of nuclear installations, including for the management of the spent nuclear fuel and waste;
- It will require Member States to establish clearly defined programmes for waste management, including a firm time scale for disposal, and encourage a higher level and better co-ordinated research across the Union.

The proposals do not depend on future decisions about the role of nuclear energy. They should be implemented regardless of any changes in policy on the nuclear option.