

**The EU Approach for Responsible and Safe Management
of Spent Fuel and Radioactive Waste - 12118**

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ABSTRACT

In July 2011 legislation on responsible and safe management of spent fuel and radioactive waste was adopted in the European Union (EU). It aims at ensuring a high level of safety, avoiding undue burdens on future generations and enhancing transparency. EU Member States are responsible for the management of their spent fuel and/or radioactive waste. Each Member State remains free to define its fuel cycle policy. The spent fuel can be regarded either as a valuable resource that may be reprocessed or as radioactive waste that is destined for direct disposal. Whatever option is chosen, the disposal of high level waste, separated at reprocessing, or of spent fuel regarded as waste should be considered. The storage of radioactive waste, including long-term storage, is an interim solution, but not an alternative to disposal. To this end, each Member State has to establish, maintain and implement national policy, framework and programme for management of spent fuel and/or radioactive waste in the long term. Member States will invite international peer reviews to ensure that high safety standards are achieved. The EU approach is anchored in internationally endorsed principles and requirements of the IAEA safety standards and the Joint Convention and in this context makes them legally binding and enforceable in the EU.

INTRODUCTION

All 27 EU Member States have radioactive waste. It is generated by many beneficial activities, such as electricity production in nuclear power plants and a range of radioisotope applications in medicine, industry, agriculture, research and education.

More than half of Member States operate nuclear power plants. There are nuclear reactors under construction and being decommissioned, as well as plans for new builds in a number of Member States. The operation of nuclear reactors also generates spent fuel. There are currently two options for managing the spent fuel: reprocessing to recover plutonium and uranium for possible re-use, or interim storage and eventual direct disposal if the spent fuel is considered as waste as part of national policy. However, even if spent fuel is reprocessed, either by current or advanced fuel cycle practices, there is still 'ultimate waste', i.e. the separated vitrified residues containing the unrecycled fraction, that also needs to be disposed of.

Whatever the future of nuclear power and non-power applications, the implementation of disposal as the end point in the management of existing and future radioactive waste is needed in order to assure safety in the long term. Ultimate responsibility for the safe management of spent fuel and radioactive waste is a national responsibility. Furthermore, it is an accepted ethical principle that the society should avoid imposing undue burdens on future generations, and this places the responsibility on the current generation: those who benefited from nuclear electricity or medical interventions have to manage appropriately all resulting waste.

Temporary storage is an important stage in the overall management of radioactive waste, in particular for spent fuel and high level waste (HLW), allowing effective cooling and radiation levels to decrease thereby making handling safer. However, there is also a broad consensus

that storage of spent fuel and radioactive waste, including long-term storage, is only an interim solution requiring active and permanent institutional controls. In the longer term, only disposal with its inherent passive safety characteristics can guarantee protection against all potential hazards. Whereas the typical disposal concept for low and intermediate level waste is near-surface disposal, for high level waste, including spent fuel considered as waste, it is broadly accepted at the technical level today that deep geological disposal represents the safest and most sustainable option as the end point of its management.

Despite the above considerations, most EU Member States have yet to take key decisions regarding the management of spent fuel and radioactive waste. This is particularly true for spent fuel and HLW, where only a handful of Member States have well established programmes to implement disposal. The consequences of the delay are that burdens will be passed on to future generations, both to implement disposal as well as maintaining interim storage options. The associated risks are evident – unavailability of financing, lack of expertise, disruption as a result of unforeseen societal upheaval, etc.

At the international level, there are safety standards developed in collaboration with other organisations by the International Atomic Energy Agency (IAEA) that are not legally binding and for which incorporation into national legislation is voluntary. The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention), concluded under the auspices of the IAEA, is the most significant international agreement in its field. However, there are no sanctions for noncompliance. Therefore the internationally accepted principles and requirements laid down in the Joint Convention and related IAEA safety standards do not guarantee a uniform responsible and safe approach at EU level.

EU competences regarding spent fuel and radioactive waste arising from civil nuclear activities fall under the framework of the Treaty establishing the European Atomic Energy Community (Euratom Treaty). The issue of spent fuel and radioactive waste management is clearly an area where national legislation had to be supplemented by legislation at EU level owing to the cross-border aspect of safety and requirements of the EU internal market for ensuring a level-playing field to avoid distortion of competition.

To address the issues of spent fuel and radioactive waste management in the EU, the European Commission (Commission)¹ launched an EU wide consultation process, involving governments, national regulators, radioactive waste management organisations, radioactive waste producers, together with the various European Institutions, non-governmental organisations and other partners [1]. A detailed contribution from the European Nuclear Safety Regulators Group (ENSREG) was taken into account. This was of key importance given the specific competence of ENSREG, which represents national nuclear regulatory or safety authorities in all Member States, nuclear and non-nuclear alike. Special attention was given to the societal dimension through a variety of public consultations, including dedicated Eurobarometer polls and an open public consultation via internet.

A thorough impact assessment concluded that the lack of binding EU legislation is likely to lead to postponement of taking key decisions, with potentially adverse environmental, economic and social impacts, including undue burdens on future generations and possibly distortion of

¹ The European Commission is the executive body of the European Union (EU) and represents the interests of the EU as a whole (as opposed to the interests of individual Member States). One of its tasks is to propose legislation.

competition in the electricity market. In contrast, binding EU legislation would result in a uniformly high level of safety of spent fuel and radioactive waste management EU-wide in the long term, without imposing undue burdens on future generations or compromising the ability of future generations to meet their own needs.

On these grounds, in 2010 the Commission proposed a legal instrument – a Directive² – to regulate the management of spent fuel and radioactive waste in the EU. After negotiations in the Council of the European Union on the Commission proposal and consultations with the European Parliament and the European Economic and Social Committee, Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste was adopted by the Council³ [2]. EU Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with the Directive 2011/70/Euratom by August 2013.

DIRECTIVE 2011/70/EURATOM - MAIN PROVISIONS

Subject-matter

This Directive establishes a Community framework for the responsible and safe management of spent fuel and radioactive waste to avoid imposing undue burdens on future generations. Through its implementation Member States will have demonstrated that they have taken reasonable steps to ensure that that objective is met.

The Directive ensures that Member States provide for national arrangements for a high level of safety supplementing the basic standards referred to in the Euratom Treaty as regards the safety of spent fuel and radioactive waste without prejudice to the Directive laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation [3]. It also ensures the provision of necessary public information and participation in relation to spent fuel and radioactive waste management while having due regard to security and proprietary information issues.

This Directive covers all stages of the management of spent fuel and radioactive waste from civilian activities.

National policy

The Directive reaffirms the ultimate responsibility of Member States for the management of spent fuel and radioactive waste generated in their territories. Member States are obliged to establish and maintain national policies on spent fuel and radioactive waste management based on the following principles:

- the generation of radioactive waste shall be kept to the minimum which is reasonably practicable, both in terms of activity and volume, by means of appropriate design measures

² Directives lay down certain end results that must be achieved in every Member State of the European Union. For that reason the national authorities have to adapt their laws within a given time period, but are free to decide how to do so within the scope of the Directive ("transposition").

³ The Council is the EU institution where the Member States' government representatives sit, i.e. the ministers of each Member State with responsibility for a given area. Among other things, the Council adopts legislative acts like Directives under the Treaty establishing the European Atomic Energy Community (Euratom Treaty).

and of operating and decommissioning practices, including the recycling and reuse of materials;

- the interdependencies between all steps in spent fuel and radioactive waste generation and management shall be taken into account;
- spent fuel and radioactive waste shall be safely managed, including in the long term with passive safety features;
- implementation of measures shall follow a graded approach;
- the costs for the management of spent fuel and radioactive waste shall be borne by those who generated those materials;
- an evidence-based and documented decision-making process shall be applied with regard to all stages of safe management of spent fuel and radioactive waste.

Each Member State remains free to define its fuel cycle policy. The spent fuel can be regarded either as a valuable resource that may be reprocessed or as radioactive waste that is destined for direct disposal. Where radioactive waste or spent fuel is shipped for processing or reprocessing to a Member State or a third country, the ultimate responsibility for the safe and responsible disposal of those materials, including any waste as a by-product, remains with the Member State or third country from which the radioactive material was shipped.

Radioactive waste must be disposed of in the Member State in which it was generated unless at the time of shipment an agreement has entered into force between the Member State concerned and another Member State or a third country to use a disposal facility in one of them. Some Member States consider that the sharing of disposal facilities is a potentially beneficial, safe and cost-effective option when based on an agreement between the Member States concerned. Shipment of radioactive waste for disposal in a third country, i.e. outside the EU, is possible under very strict conditions, such as for example:

- the country of destination has radioactive waste management and disposal programmes with objectives representing a high level of safety equivalent to those established by this Directive;
- the disposal facility in the country of destination is authorised for the radioactive waste to be shipped, is operating prior to the shipment, and is managed in accordance with the requirements set down in the radioactive waste management and disposal programme of that country of destination.

In the particular case of high level waste, including spent fuel considered as waste, these conditions represent a 'de-facto' ban on exporting such waste for disposal outside the EU, as deep geological repositories are not expected to be available in the near future in countries outside the EU.

The export provisions mentioned above do not apply to repatriation of disused sealed sources to a supplier or manufacturer and to shipment of spent fuel of research reactors to a country where research reactor fuels are supplied or manufactured, taking into account applicable international agreements, such as the Global Threat Reduction Initiative.

National framework

Member States are obliged to establish and maintain a national legislative, regulatory and organisational framework (national framework) for spent fuel and radioactive waste management that allocates responsibility and provides for coordination between relevant competent bodies. The national framework includes the following:

- a national programme for the implementation of spent fuel and radioactive waste management policy;
- national arrangements for the safety of spent fuel and radioactive waste management;
- a system of licensing of spent fuel and radioactive waste management activities and/or facilities;
- a system of appropriate control, a management system, regulatory inspections, documentation and reporting;
- enforcement actions that lead to improved safety;
- the allocation of responsibility to the bodies involved in the different steps of spent fuel and radioactive waste management;
- national requirements for public information and participation;
- the financing scheme(s) for spent fuel and radioactive waste management.

The national framework gives primary responsibility for the spent fuel and radioactive waste to their generators or, under specific circumstances, to a licence holder to whom this responsibility has been entrusted by competent bodies (e.g. a waste management organisation). It requires that adequate financial resources are available when needed for the implementation of national programmes, taking due account of the responsibility of spent fuel and radioactive waste generators.

At the same time, the prime responsibility for the safety of spent fuel and radioactive waste management facilities and/or activities rest with the licence holder and can not be delegated. Licence holders must provide for and maintain adequate financial and human resources to fulfil their obligations with respect to the safety of spent fuel and radioactive waste management. To guarantee the safety, each Member State is obliged to establish and maintain a competent regulatory authority in the field of safety of spent fuel and radioactive waste management and to assure its effective independence from undue influence on its regulatory function. The competent regulatory authority must be given the legal powers and human and financial resources necessary to fulfil its obligations.

Licence holders, under the regulatory control of the competent regulatory authority, regularly assess, verify and continuously improve, as far as is reasonably achievable, the safety of the radioactive waste and spent fuel management facility or activity in a systematic and verifiable manner. This must be achieved through an appropriate safety assessment, other arguments and evidence ('safety case' concept introduced). As part of the licensing of a facility or activity the safety demonstration has to cover the development and operation of an activity and the development, operation and decommissioning of a facility or closure of a disposal facility as well as the post-closure phase of a disposal facility. The extent of the safety demonstration must be commensurate with the complexity of the operation and the magnitude of the hazards associated with the radioactive waste and spent fuel, and the facility or activity. Licence holders have to establish and implement integrated management systems, including quality assurance, which give due priority for overall management of spent fuel and radioactive waste to safety and are regularly verified by the competent regulatory authority.

All parties have to make arrangements for education and training for their staff, as well as research and development activities to cover the needs of the national programme for spent fuel and radioactive waste management in order to obtain, maintain and to further develop necessary expertise and skills.

Member States are obliged to ensure that necessary information on the management of spent fuel and radioactive waste is made available to workers and the general public, and that the

public is given the necessary opportunities to participate effectively in the decision-making process regarding spent fuel and radioactive waste management in accordance with national legislation and international obligations.

The national framework has to be improved where appropriate, taking into account operating experience, insights gained from the decision-making process, and the development of relevant technology and research.

Member States are obliged periodically, and at least every 10 years, to invite international peer reviews of their national framework, competent regulatory authority and/or national programme with the aim of ensuring high safety standards.

National programmes

Each Member State is obliged to ensure the implementation of its national programme for the management of spent fuel and radioactive waste, covering all types of spent fuel and radioactive waste under its jurisdiction and all stages of spent fuel and radioactive waste management from generation to disposal.

The national programmes must set out how the Member States intend to implement their national policies for the responsible and safe management of spent fuel and radioactive waste to secure the aims of this Directive, and include the following mandatory elements:

- the overall objectives of the Member State's national policy;
- the significant milestones and clear timeframes for the achievement of those milestones in light of the overarching objectives of the national programme;
- an inventory of all spent fuel and radioactive waste and estimates for future quantities, including those from decommissioning;
- the concepts or plans and technical solutions for spent fuel and radioactive waste management from generation to disposal;
- the concepts or plans for the post-closure period of a disposal facility's lifetime;
- the research, development and demonstration activities that are needed in order to implement solutions;
- the responsibility for the implementation of the national programme and the key performance indicators to monitor progress towards implementation;
- an assessment of the national programme costs and the underlying basis and hypotheses for that assessment, which must include a profile over time;
- the financing scheme(s) in force;
- a transparency policy or process;
- if any, the agreement(s) concluded with a Member State or a third country on management of spent fuel or radioactive waste, including on the use of disposal facilities.

Member States are obliged to regularly review and update their national programmes, taking into account technical and scientific progress as appropriate as well as recommendations, lessons learned and good practices from peer reviews.

Member States are obliged to notify to the Commission their national programmes and any subsequent significant changes. The Commission may request clarification and/or express its opinion on whether the content of the national programme is in accordance with the Directive.

CONCLUSIONS

The EU approach of regulating the management of spent fuel and radioactive waste is anchored in the competence of the national regulatory authorities and in the internationally endorsed principles and requirements of the IAEA Safety Standards and the Joint Convention.

Member States have to report to the Commission on the implementation of Directive 2011/70/Euratom for the first time by 23 August 2015, and every 3 years thereafter, taking advantage of the review and reporting under the Joint Convention. On the basis of the Member States' reports, the Commission will submit to the European Parliament and the Council a report on progress made and an inventory of radioactive waste and spent fuel present in the EU territory and the future prospects.

Directive 2011/70/Euratom is a logical next step after the Council Directive 2009/71/Euratom on the nuclear safety of nuclear installations [4]. The EU is the first major regional actor providing a binding legal framework on nuclear safety and on responsible and safe management of spent fuel and radioactive waste, and thus is a real model to progress spent fuel and waste management in a safe and responsible manner.

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