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Accompanying document to the

revised proposal for a COUNCIL DIRECTIVE (Euratom)
on the Management of Spent Fuel and Radioactive Waste

IMPACT ASSESSMENT

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Disclaimer: This report commits only the Commission's services involved in its preparation and does not prejudge the final form of any decision to be taken by the Commission

Lead DG: DG ENER

Other involved services: SG, LS, DG RTD, DG JRC, DG ENV, DG SANCO, DG ECFIN, DG CLIMA

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1. PROCEDURAL ISSUES AND CONSULTATION OF INTERESTED PARTIES

1.1. Organisation and timing

The elaboration of a *revised proposal for legislation on the management of spent fuel and radioactive waste* is included in the Commission's agenda planning 2010 and the Commission action is planned to be adopted in October 2010 (item 2010/ENER/021).

The Directorate-General for Energy is the lead service on addressing the management of spent fuel and radioactive waste in the EU. For the purpose of elaborating the current Impact Assessment, an Inter-Services Steering Group was established with representatives of DG ENER, SG, LS, DG RTD, DG JRC, DG ENV, DG SANCO, DG ECFIN and DG CLIMA. The Group met twice - in November 2009 and in June 2010. Three draft Impact Assessments were elaborated and commented within the Group.

The Impact Assessment Board has assessed the draft Impact Assessment submitted to their attention in June and July 2010 and issued opinions on 16 July 2010 and 7 September 2010.

In line with these opinions, the draft impact assessment has been revised, in particular to

– better explain, in the problem definition section, the nature of the implementation problems with the current international framework (see sections 2.1.1, 2.1.3.2, 2.1.5, 4.2 and 4.3, annex 1),

– better explain the scale of the risks involved, the costs of storage and disposal of radioactive material, and how funding requirements for these costs could affect competition in the electricity market (see sections 2.3.3 and 2.4.5).

– explain more clearly how binding EU rules could address the problem and, in addition, analyses the subsidiarity aspects in greater detail (see sections 2.1.3.2, 2.1.5, 2.5.3, 4.2 and 4.3, annex 1).

– explain more clearly what would be required from Member States under the different policy options (see sections 2.1.3.2, 2.5.3, 4.3, 4.4, 4.5, annex 1)

– reformulate the section on social impacts to address issues concerning health and safety at work associated with storage and disposal activities (see sections 2.4.6, 1.2, 2.1.3.1 and 2.2)

– explain in more concrete terms how funding for future storage might distort competition in the internal market (see section 3.3.), and how the proposed options will improve this (see section 5)

– explain how the EU enforcement regime would work in practice (see sections 4.2. and 4.3.) and clarify the subsidiarity aspects of the proposed mechanisms for improving compliance (see section 2.5.3.).

1.2. Consultation and expertise

In 2003, the Commission proposed two Council Directives (Euratom) dealing respectively with the safety of nuclear facilities and with the management of spent nuclear fuel and

radioactive waste and, in 2004, resubmitted to the Council amended proposals[1]. After long discussions, the Council called in its June 2004 Conclusions[2] for an "extensive consultation" with stakeholders before any instrument in this field was developed in the framework of the Euratom Treaty.

Throughout the elaboration process of the 2003/2004 proposals for a Council Directive (Euratom) on the management of spent nuclear fuel and radioactive waste[1], a wide consultation on the value of a legislative framework covering the management of spent fuel and radioactive waste management legislation was carried out at the initiative of the Commission. This consultation was in addition to the consultations resulting from the legislative procedure provided for in the Euratom Treaty (the opinions of the Group of Experts set up by Article 31 of the Euratom Treaty and of the European Economic and Social Committee).

Following the June 2004 Council Conclusions[2], additional extensive stakeholders and public consultations have been carried out at EU level in compliance with the General Principles and Minimum Standards for Consultation of Interested Parties by the Commission[3]. Many contributions from different stakeholders have been received by the Commission, including:

– A detailed contribution from the Group of European Nuclear Safety Regulators (ENSREG), specifically set up to advice the Commission on nuclear safety and waste management matters. It is of key importance in view of the specific competence of ENSREG, which represents the national regulatory or safety authorities competent for the safety of nuclear installations and for the management of spent fuel and radioactive waste management, coming from the Member States with and without nuclear power programmes. This contribution was prepared by a dedicated working group, discussed and approved at the Plenary Meeting of ENSREG on 4 June 2010. It contains key principles and guidelines as a basis for the Commission to prepare legislation on management of radioactive waste and spent fuel management;

– replies to an open public consultation on "Approaches for a possible EU legislative proposal on the management of spent fuel and radioactive waste" via an on-line questionnaire on the European Commission website ("*Your Voice in Europe*");

– the results of the Special Eurobarometer surveys on European citizens' attitudes towards radioactive waste and nuclear safety;

– a position paper "Contribution to the Stakeholder Consultation Process for a Possible EU Instrument in the Field of Safe and Sustainable Spent Fuel and Radioactive Waste Management" elaborated under the auspices of the European Nuclear Energy Forum (ENEF), which was founded in 2007. The forum brings together relevant stakeholders in the nuclear field, such as the governments of all 27 EU Member States, the European Institutions including the European Parliament and the European Economic and Social Committee, the nuclear industry, electricity consumers and representatives of civil society;

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1 Initial 2003 Commission proposal (COM 2003/32 final) and revised 2004 version (COM (2004)526 final.

2 June 2004 Council conclusions on Nuclear Safety and Safe Management of Spent Fuel and Radioactive Waste, 10823/0.

3 COM(2002)704.

– the Technology Platforms for Sustainable Nuclear Energy (SNE – TP) and for Implementing Geological Disposal (IGD – TP);

– "Collective opinion of the Club of Agencies in the consultation process for a possible EU instrument in the Field of Safe and Sustainable Spent Fuel and Radioactive Waste Management". The Club of Agencies is a group of European radioactive waste management organisations, set up to exchange information on all aspects of radioactive waste management;

– the reports of the Council Working Party on Nuclear Safety (WPNS) after consulting the EU Member States on the safety of nuclear installations and of spent fuel and radioactive waste management in 2005 and 2006.

A dedicated study of Regulations Covering Radioactive Waste Disposal in EU countries, finalised in 2006, made recommendations to the Commission as to how waste disposal regulations might be better harmonised between the Member States.

The consultations show that there is a broad consensus at the EU level on the following:

– There is a need for EU legislation on the management of spent fuel and radioactive waste in the long term and its regulation;

– Each Member State is responsible for its own spent fuel and radioactive waste management policy. That policy should respect the fundamental principles for management of radioactive waste developed under the auspices of the International Atomic Energy Agency (IAEA)[4], should be based on scientific and technological progress, and should be implemented through transparent processes enabling the public to be properly informed and to be involved in decision making;

– Cooperation both between Member States and at international level could facilitate and accelerate decision making, through providing access to expertise and technology; EU Member States should seek to continuously improve their management of spent fuel and radioactive waste in order to ensure a high level of safety at all times. The internationally accepted principles for spent fuel and radioactive waste management, laid down in the IAEA Safety Standards and in the Joint Convention[5], form a common framework for achieving and maintaining a high uniform level of safe management of radioactive waste and spent fuel throughout the Community;

– Each Member State should put in place a national spent fuel and radioactive waste management programme for transposition of its national policy into clear provisions for implementation, including timeframes and milestones, and for subsequent decision-making. Such programmes should take a long-term view, cover all types of spent fuel and radioactive waste and describe all the stages of implementation. It should be a key tool for openness and transparency;

– Following 30 years of research, debates and peer reviews, it is broadly accepted at the technical level that deep geological disposal represents the safest and most sustainable

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4 The Principles of Radioactive Waste Management, Safety Fundamentals, Safety Series No. 111-F, Vienna, 1995.

5 Joint Convention of the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, http://www-ns.iaea.org/conventions/waste-jointconvention.htm.

option for the end-point of the management of high level waste and spent fuel considered as waste, and that movement towards the implementation of deep geological disposal should be pursued;

– The storage of spent fuel and radioactive waste, including long-term storage at or near the surface, is an interim solution but not a true alternative to disposal;

– The financing of all stages of management of spent fuel and radioactive waste should be the responsibility of the producers of spent fuel and radioactive waste;

– Peer reviews of radioactive waste management programmes are an excellent means of building on experience, confidence, trust and should lead to a steady improvement in the management of radioactive waste and spent fuel in the European Union.

Some stakeholders recognise the potential benefits of sharing facilities for the management of spent fuel and radioactive waste if based upon a voluntary agreement between the Member States concerned.

In the framework of the open public consultation, Greenpeace and other environmental non-governmental organisations expressed their opinions on possible European legislation on spent fuel and radioactive waste management. In general, they support legal initiatives which increase safety and transparency and ensure the application of the "polluter-pays-principle", conditional upon the phasing-out of nuclear power. However, in contrast to the majority of stakeholders, they reject the idea of disposal of radioactive waste as the end point and suggest instead monitored long-term storage.

One direct reply to the open consultation was also received from a Trade Union (*ver.di*, Germany) supporting binding legislation, but requesting to include in the legislative proposal a prohibition on the export of spent fuel and radioactive waste to non-EU Member States coupled with an obligation to use only reprocessing plants sited within EU. In addition, as a contribution to the 2010 European Economic and Social Committee (EESC) Conference on Nuclear Energy[6], Trade Unions (CGT Mines/Energy, CES) underlined that as a matter of respect for future generations all radioactive waste must be processed and solutions be found. They requested more democratic processes and more national and transnational transparency.

More detailed information about the stakeholders and public consultations, as well as of the external expertise is given in Annex 2. The opinions expressed in the public consultation have been taken into account in this Impact Assessment.

2. PROBLEM IDENTIFICATION AND ANALYSIS

2.1. The problem that requires action

2.1.1. Overview

All Member States have radioactive waste. Radioactive waste and spent fuel are generated in many beneficial activities, such as nuclear power production and radioisotope applications in medicine, industry, agriculture, research and education. Their specific nature (content of

[6] EESC Conference "Nuclear energy: opportunities and risks, View of European Civil Society and Stakeholders", 30 November 2009, Brussels.

radionuclides) requires arrangements for the protection of human health and the environment against the dangers arising from ionizing radiation.

In general, radioactive waste means radioactive material for which further use is not foreseen. The management of radioactive waste includes all activities that relate to its processing, storage and disposal.

Spent fuel is generated by the operation of nuclear reactors. There are two options for spent fuel management: spent fuel reprocessing to recover plutonium and uranium for possible re-use, or direct disposal of spent fuel if the spent fuel is considered as waste. Regardless of the option chosen, radioactive waste separated through reprocessing or spent fuel regarded as waste need to be disposed of.

Radioactive wastes are categorised into low-, intermediate-, and high-level waste depending on their level of activity. A distinction can also be drawn between short-lived and long-lived radioactive wastes.[7] The most hazardous and long-lived radioactive wastes, such as high level waste separated during spent fuel reprocessing or spent fuel considered as waste, require containment and isolation from humans and living environment for many tens of thousands of years whereas short-lived waste requires such containment and isolation for a period of up to three hundred years.

Following the internationally agreed principles and as recently confirmed in the 2008 Council Resolution on radioactive waste and spent fuel management[8], the ultimate responsibility for the safety of spent fuel and radioactive waste management rests with the Member States. This is fully in line with the obligations imposed on Member States in Chapter III of the Euratom Treaty concerning health and safety.

Those who benefit today from the use of nuclear energy and other applications of radioisotopes should take care of the spent fuel and radioactive waste they generate, as well as the waste expected from decommissioning of existing nuclear installations.

Given its longevity, radioactive waste introduces a new time dimension in the field of radiation risk management. Both safety and ethical issues are associated with this need for long-term risk management. The current generation has to plan the management of radioactive waste considering the possible future evolution up to several hundred years or even many thousands of years according to its own safety standards and thus to hand over a safe legacy. Then it is up to future generations to continue or to reconsider the approach taken by the current generation.

Whatever the future of nuclear power and other nuclear non-power applications, the implementation of disposal as the end point of managing radioactive waste is needed for assuring both safety and sustainability, as only disposal provides workers, the general public and the environment with protection from the hazards that the radioactive waste could pose over time.

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7 Commission Recommendation of 15 September 1999 on a classification system for solid radioactive waste, OJ L 265, 13.10.1999, p.37.

8 17438/1/08 REV1, 17.12.2008, "… Member States are responsible for their radioactive waste and spent fuel as well as for their associated national management policy; and that Member States shall set up a national radioactive waste and spent fuel management programme."

Disposal should not be confused with storage. Temporary storage of spent fuel and high level waste is an important stage in their overall management for technological reasons (heat removal and radiation protection). Storage is also needed until such time as disposal facilities become available. However, storage cannot replace disposal as the end point of the management of radioactive waste and spent fuel considered as waste. In the long term only disposal can guarantee protection against potential hazards, as it will eliminate the permanent and continuous human activities, such as control, retrieval and repackaging which otherwise would be required for an undefined storage time. Disposal with its passive safety means will minimise or remove the need for human action.

As will be shown in this Impact Assessment, the current situation of spent fuel and radioactive waste management in EU Member States is not satisfactory, especially with regard to long-term management and disposal, due to the following facts:

– existing EU legislation does not cover all aspects of this issue,

– the corresponding existing international convention shows weaknesses as to verification and enforcement[5],

– the international convention does not require national programmes for the management of all types of radioactive waste and spent fuel from generation through to disposal.

The potential cross-border impacts of unplanned radioactive releases into the environment as demonstrated by the Chernobyl disaster, as well as economic and social considerations require setting high standards and providing means beyond the scope and nature of the existing means.

An EU initiative is required to ensure in a transparent, verifiable and enforceable manner the conditions that Member States implement the obligations set out in the existing international convention.

Furthermore, beyond the requirements of this convention, an EU initiative should ensure that Member States develop and implement national programmes for the management of all types of radioactive waste and spent fuel, from generation to disposal. This will be reflected in Policy Option 2 of this Impact Assessment.

The overall objective of the initiative should be the achievement of a sustained political commitment for the safe management of spent fuel and radioactive waste, enhancing the protection of workers and the general public against the dangers of ionizing radiation beyond national borders and thus avoiding undue burdens on future generations.

This Impact Assessment does not cover:

– waste arising from extractive industries that may be radioactive, including uranium mining and milling waste, since in general it is regulated under the Treaty on the Functioning of the European Union and the aspects specific to radioactivity are regulated under the Euratom Treaty (see 2.1.3.1);

– authorised releases (discharges), since they are covered by the existing legislation under the Euratom Treaty, including the Basic Safety Standards Directive (see 2.1.3.1);

– radioactive waste and spent fuel which are outside the scope of the Euratom Treaty (not managed within civilian activities)[9].

2.1.2. Management of spent fuel and radioactive waste in the EU[10]

All Member States generate radioactive waste, irrespective of whether they have a national nuclear power programme or not. About 85 000 m^3 of radioactive waste are produced annually in the EU, mainly short-lived low and intermediate level waste, as well as very low level waste. About 280 m^3 are high level waste (i.e. vitrified residues from the reprocessing of spent fuel) and 5 100 m^3 are long-lived low and intermediate level waste.

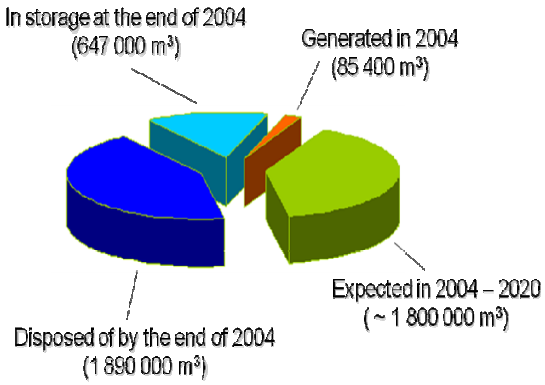
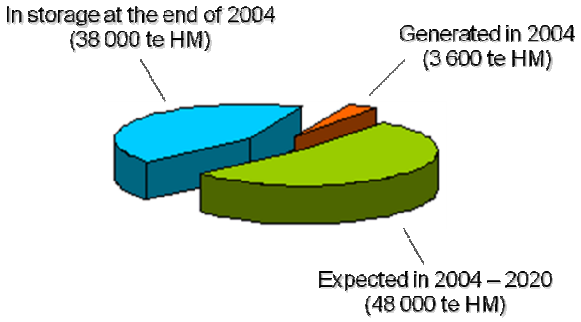


Fig.1. General data for radioactive waste in the EU [not including spent fuel] [10]

Fourteen out of the 27 Member States have nuclear power plants in operation, and a further two have nuclear power plants which are being decommissioned.[11]. Each Member State is at liberty to define its fuel cycle policy; it may consider spent fuel as a valuable resource for reprocessing, or consider it as waste for direct disposal. Some general data about current and expected quantities of spent fuel are presented below.



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9 The use of nuclear energy for military purposes falls out of the scope of the Euratom Treaty: See ECJ, Commission v United Kingdom C-61/03, C-65/04.

10 Report from the Commission to the European Parliament and the Council: Sixth Situation Report on Radioactive Waste and Spent Fuel Management in the European Union, COM(2008)542 final and Draft Commission Staff Working Document, Sixth Situation Report "Radioactive Waste and Spent Fuel Management in the European Union", Brussels, 8 September 2008, SEC(2008)2416, COM(2008)542 final

11 14 Member States have nuclear power plants in operation - Belgium, Bulgaria, Czech Republic, Finland, France, Germany, Hungary, the Netherlands, Romania, Slovakia, Slovenia, Spain, Sweden and the UK; Italy and Lithuania have only nuclear power plants under decommissioning.

Fig.2. General data for spent fuel in the EU[10] (in tonnes Heavy Metal)

The amount of the annual production of spent fuel in the EU is about 3 600 tonnes (Heavy Metal), of which at least 1 500 tonnes can be currently considered as being placed in long-term storage for possible direct disposal as waste.

Some Member States have only very small quantities of spent fuel originating from research reactors. Generally the management of the spent fuel is covered by 'take-back' agreements, under which the spent fuel is returned to the country of origin.

World-wide, there are at present no facilities for disposal of high level waste, including spent fuel considered as waste.

The accumulated high level waste and spent fuel subject to direct disposal are stored either in special centralised facilities or at the sites of operating nuclear power plants. A similar situation exists for other long-lived waste.

While short-lived waste is generally disposed of in surface or near-surface (underground) facilities in Member States, there are also Member States which have no disposal facilities for this type of waste, which arises not only from the nuclear power sector, but also from nuclear non-power applications, such as applications of radioisotopes in medicine, industry and research. As for disused sealed sources, most countries have arrangements in place whereby 'take-back' provisions must be incorporated into the supply contract. Nevertheless, disused sealed sources which cannot be accepted in facilities routinely used for disposal of short lived waste need special disposal solutions.

The financing of spent fuel and radioactive waste management is based on the "polluter-pays-principle" and funding mechanisms are in place or are under preparation in many Member States.[10,12]

More detailed information about the management of spent fuel and radioactive waste in Member States, in particular policies, practices and financing, is presented in Annex 3 and details on MS radioactive waste in Annex 4.

2.1.3. Legislative framework in force governing the management of radioactive waste and spent fuel

2.1.3.1. *Legislative framework at EU level*

The management of spent fuel and radioactive waste has been addressed at EU level mainly through a variety of legislative instruments for radiation protection under chapter III of the Euratom Treaty (see 2.5.1). Existing European legislation does not cover consistently all activities and facilities related to the management of spent fuel and radioactive waste. Nor does it cover other aspects, such as national policies and their implementation, public information and public participation in the decision making process.

At present, the Euratom Treaty based legislation covers the following aspects:

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[12] Communication from the Commission to the European Parliament and the Council: Second Report on the use of financial resources earmarked for the decommissioning of nuclear installations, spent fuel and radioactive waste, SEC(2007) 1654.

– Article 37 of the Euratom Treaty requires Member States to provide the Commission with general data relating to any plan for the disposal of radioactive waste;

– Council Directive 96/29/Euratom of 13 May 1996 laying down **basic safety standards** for the protection of the **health of workers and the general public** against the dangers arising from ionizing radiation[13], whose provisions have been supplemented by more specific legislation, such as, for example, medical application of ionising radiation[14], information in case of radiological emergency[15] or protection of outside workers[16]. This Directive applies to all practices which involve a risk from ionizing radiation emanating from an artificial source or from a natural radiation source in cases where natural radionuclides are or have been processed in view of their radioactive, fissile or fertile properties, including all activities of spent fuel and radioactive waste management;

– Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel[17] lays down a Community system of supervision and control of transboundary shipments of radioactive waste and spent fuel;

– Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations[18], imposes obligations on the Member States to establish and maintain a national framework for nuclear safety. This Directive only applies to spent fuel storage facilities and to storage facilities for radioactive waste that are on the site and are directly related to other nuclear installations. Thus, it **does not cover all types of facilities or aspects of the management of spent fuel and radioactive waste.**

In addition, there are EU Directives dealing with environmental assessment[19], implementing the Aarhus Conventions rights[20] and on the management of waste from extractive industries[21].

Also the following non-binding Recommendations apply to the management of spent fuel and radioactive waste:

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13 OJ L 159, 29.6.1996, p.1.

14 Council Directive 97/43/Euratom, OJ L180, 9/07/97, p. 22.

15 Council Decision 87/600/Euratom (OJ L371, 30/12/87, p. 76.); Council Directive 98/618/Euratom (OJ L 144, 15/5/1998, p. 1.).

16 Council Directive 90/641/Euratom (OJ L 349, 13.12.1990, p. 21.).

17 OJ L 337, 5.12.2006, p. 21.

18 OJ L 172, 2.7.2009, p. 18.

19 Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment, as amended by the Directive 97/11/EC, by the Directive 2003/35/EC and by the Directive 2009/31/EC (OJ L140, 5.6.2009, p. 114.); Directive 2001/42/EC of the European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (OJ L197, 21.07.2001 p. 30.).

20 Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC (OJ L 41, 14.02.2003); Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC (OJ L 156, 25.06.2003 p. 17.).

21 Directive 2006/21/EC of the European Parliament and of the Council of 15 March 2006 on the management of waste from extractive industries and amending Directive 2004/35/EC provides for measures, procedures and guidance on the management of waste from extractive industries (OJ L 102, 11.04.2006, p. 15). *While this Directive covers the management of waste from extractive industries which may be radioactive, it does not cover such aspects as are specific to radioactivity which are a matter dealt with under the Euratom Treaty.*

– Commission Recommendation of 6 December 1999 on the Application of Article 37 of the Euratom Treaty[22]

– Commission Recommendation of 24 October 2006 on the management of the financial resources for the decommissioning of nuclear installations, spent fuel and radioactive waste[23]. The focus lies on the adequacy of funding, its financial security and transparency in its use, and ensuring that funds are only used for the intended purposes;

– Commission Recommendation 2008/956/Euratom of 4 December 2008 on criteria for the export of radioactive waste and spent fuel to third countries[24].

2.1.3.2. Regulatory instruments at international level (IAEA)

IAEA Standards

One of the missions of the International Atomic Energy Agency (IAEA) is the development of safety standards for the protection of human health and the environment against ionizing radiation[25]. These standards, developed in cooperation with Euratom, OECD/Nuclear Energy Agency (NEA) and other international organizations, are revised periodically.

Although they do not have a direct legally binding nature, most of the States have adopted these standards in their national legal framework, and they are binding as regards the IAEA's own activities and the States' activities in operations assisted by the IAEA. Furthermore, they have provided the basis for all Codes of Conduct and Conventions under IAEA auspices.

The 1995 IAEA publication "The Principles of Radioactive Waste Management"4 defined the objective of radioactive waste management and the associated set of internationally agreed principles, which provided a common basis for the development of more detailed IAEA Safety Standards and a basis for national radioactive waste management programmes. These principles underlie the general safety requirements of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

In 2006 the IAEA updated its entire corpus of standards and published the Fundamental Safety Principles[26], which were jointly sponsored by Euratom, OECD/NEA and other international organisations. In the preparation of this document, all the safety principles established in earlier Safety Fundamentals publications, including those in radioactive waste management, were considered and consolidated into a coherent and consistent set of ten new principles. Some of the earlier principles that were found to be more appropriately expressed as requirements have been established as such in Safety Requirements publications[27,28]. During this transformation a full correspondence between the new requirements (respectively the earlier The Principles of Radioactive Waste Management[4]) and the current Fundamental Safety Principles is provided[26].

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22 OJ L324, 16.12.1999, p. 0023.

23 OJ L 330, 28.11.2006, p. 31.

24 OJ L338, 17.12.2008, p. 69.

25 Article III of the IAEA's Statute, para A6.

26 Fundamental Safety Principles, Safety Fundamentals No SF-1, IAEA, Vienna, 2006.

27 Predisposal Management of Radioactive Waste, General Safety Requirements Part 5, No. GSR Part 5, IAEA, Vienna, 2009.

28 Safety of Radioactive Waste Disposal Facilities, Specific Safety Requirements, SSR 5, IAEA, Vienna, 2010, to be published.

As stated by the Joint Sponsoring Organisations in the Preface of the 2006 Fundamental Safety Principles, *"Application of the Fundamental Safety Principles will facilitate the application of international safety standards and will make for greater consistency between the arrangements of different States. It is therefore desirable that all States adhere to and advocate these principles. The principles will be binding on the IAEA in relations to its operation and on States in relation to operation assisted by IAEA. States or sponsoring organisations may adopt the principles, at their own discretion, for application to their own activities."*

The Fundamental Safety Principles were reflected in Directive 2009/71/Euratom on nuclear safety.

All EU Member States are members of the IAEA and participate in the development and adoption of the IAEA's Standards.

Joint Convention

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention) was adopted in 1997 under the auspices of the IAEA and entered into force on 18 June 2001 with the following objectives:

– to achieve and maintain a high level of safety worldwide in spent fuel and radioactive waste management, through the enhancement of national measures and international co-operation, including where appropriate, safety-related technical co-operation;

– to ensure that during all stages of spent fuel and radioactive waste management there are effective defences against potential hazards so that individuals, society and the environment are protected from harmful effects of ionizing radiation, now and in the future, in such a way that the needs and aspirations of the present generation are met without compromising the ability of future generations to meet their needs and aspirations;

– to prevent accidents with radiological consequences and to mitigate their consequences should they occur during any stage of spent fuel or radioactive waste management.

Euratom and all EU Member States with exception of Malta are Contracting Parties to the Joint Convention.

This Convention is the first legally binding international treaty on the safety of spent fuel and radioactive waste management. Nevertheless, from the point of view of its enforcement the Joint Convention represents an incentive instrument, as **it does not entail any sanctions for non-compliance.** The Convention is not designed to ensure the fulfilment of obligations by the Contracting parties through control and sanction but is based on their common interest in achieving the objectives of the Convention. Failure to carry out obligations under the Joint Convention (e.g. submission of reports) has been observed on several occasions by the Commission.

In addition, the Joint Convention **does not require the development of national programmes for the long-term management of spent fuel and radioactive waste**, even though this is regarded as a key requisite for the successful implementation of national policies. Consequently, it also lacks specific requirements as to the elements of such national programmes; only the development of a national waste programme guarantees planning and implementation of disposal facilities (repositories).

Furthermore, the Joint Convention does not cover transparency and public involvement in decision making, which today are considered essential for ensuring that the public's concerns are addressed, particularly at the local level.

Membership of the Joint Convention entails three basic commitments - preparing and making available a National Report for review, submitting its National Report to peer review by the other Contracting Parties, and attending the review meetings.

– National Reports have to be submitted well before (typically half a year before) the three-yearly Review Meetings. They shall include a self-assessment of the steps and measures already taken and progress made in implementing the Convention's obligations, following general reporting guidelines. The report shall also address spent fuel management policy and practices, radioactive waste management policy and practices, as well as the criteria used to define and categorize radioactive waste.

– Contracting Parties may ask written questions on general or specific aspects of the Reports submitted by other Contracting Parties, to be answered in writing before a fixed deadline.

– Finally, Contracting Parties have to attend the Review Meeting, present their National Report in Country Group sessions and answer further oral questions. The main outcome of the oral discussion is recorded summarising in a few bullet points developments since the last Review Meeting, highlights, good practices and challenges identified during the oral session.

The Joint Convention does not contain provisions on public information or public participation concerning all aspects of radioactive waste management. The Review meetings are not open to observers or to the public. It is at the discretion of a Contracting Party to make the Report, the questions received and answers provided as well as the rapporteur's report publicly available on their national WEB page.

Beyond the lack of enforceability and the lack of specific requirements for national programmes, transparency and involvement, the practical implementation of the Joint Convention Process also shows weaknesses. Identified weaknesses include the following: concentrating mostly on formal compliance with the Joint Convention stipulations; review meetings are much too formal and superficial screening processes of submitted national reports; contracting Parties often tend to demonstrate their own self-perceived excellence; the review meeting peer review process is often approached in a spirit of self-defence; States do not always approach review meetings in a way which would provide real opportunities for improvement.

It can be concluded that the Joint Convention is only an incentive instrument based on Peer Reviews. Infringements cannot be followed up as foreseen in EU infringement procedures.

2.1.4. Concept development at NEA/OECD level

The Nuclear Energy Agency (NEA) at the Organisation for Economic Co-operation and Development (OECD) seeks to assist its member countries in developing safe, sustainable and societal acceptable strategies for the management of all types of radioactive materials, with particular emphasis on the management of long-lived waste and spent fuel and on decommissioning of disused nuclear facilities mainly through its Radioactive Waste Management Committee. The Committee is a unique multinational committee of specialists at the forefront in addressing both the technical and societal requirements for durable and

sustainable waste management and decommissioning solutions. It provides a forum where policy makers, regulators and implementing organisations can discuss issues of common interest and develop solutions that meet the diverse needs of its participants.

In its "*Collective Statement on Moving Forward to Geological Disposal of Radioactive Waste*"[29] and in respect of the high level waste and spent fuel considered as waste, the Committee states that:

"Disposal of these wastes in engineered facilities, or repositories, located deep underground in suitable geological formations is being developed worldwide as the reference solution in order to protect humans and the environment both now and in the future. Engineered geological disposal is thus seen as the radioactive waste management end-point providing safety without the need of renewed human intervention (…).

The overwhelming scientific consensus worldwide is that geological disposal is technically feasible. This is supported by extensive experimental data accumulated for different geological formations and engineered materials from surface investigations, underground research facilities; by the current state of the art in modelling techniques; by the experience in operating underground repositories for other classes of waste; and by the advances in best practice for performing safety assessment of potential disposal systems.

Disposal can be accommodated in a broad range of geological settings, as long as these settings are carefully selected and matched with appropriate facility design and configuration and engineered barriers (…).

Delaying work on geological disposal – i.e. by adopting a "wait and see" strategy – would require increasingly more demanding care for the waste and its storage facilities. Moving forward with implementation of geological disposal is, thus, desirable from the point of view of both ethics and safety. Sufficient information now exists to take the first steps and put a plan in place commensurate with the current generation's responsibility".

Despite this statement, no country in the world has yet a disposal facility in operation for high-level waste and spent fuel considered as waste, though many countries with significant civil nuclear power programmes are carrying out investigations and research with a view to implementing solutions at some stage in the future. In all cases, geological disposal is the only end-point option that is being actively pursued.

As regards the EU, there is a good likelihood of disposal facilities for high level radioactive waste in Finland, Sweden and France being in operation by 2025 (see Annex 3). In third countries, implementation schedules are less advanced, and in the USA additional investigations have been ordered by the President. It is important to note that a number of countries with stalled geological disposal projects have reviewed all options as part of a broad-based stakeholder consultation and/or associated expert solicitation, and geological disposal emerged from those processes as the only practicable long-term management strategy (e.g. Switzerland, Canada UK, Germany).

[29] ISBN 978-92-64-99057-9.

2.1.5. Conclusions and problem definition

All Member States generate radioactive waste and have to ensure that it is managed appropriately in order to ensure the protection of human health and the environment against dangers arising from ionizing radiation and to avoid leaving the waste for future generations. Waste management has to cover spent fuel and all types of radioactive wastes for all management stages from generation through to disposal.

The implementation of disposal as the end point of managing the existing and future radioactive waste is needed for assuring both safety and sustainability. The storage of spent fuel and radioactive waste, including long-term storage at or near the surface, is an interim solution but not a true alternative to disposal. The safe long-term management of spent fuel and radioactive waste is of key importance for protecting the health of European workers and the general public. To that end all Member States need to develop national programmes covering in particular also the transit from interim storage to disposal.

Key decisions have still to be taken in most Member States for managing spent fuel and radioactive waste up to the end point, especially for the planning and implementation of disposal. A "wait-and-see" policy should be avoided.

In this context, the existing international framework is not sufficient, in particular since it does not entail any sanctions for non-compliance and does not require the development of national programmes for the long-term management of spent fuel and radioactive waste.

An EU initiative could clearly contribute to the overall effort to address safety and public health concerns related to the management of spent nuclear fuel and radioactive waste. This could be achieved by:

– creating the conditions for implementation of the existing international agreements to which Member States have already subscribed, in particular by introducing EU infringement procedures in case of non-compliance, and

– going beyond the provisions of the international framework, by requiring the development of national programmes for the long-term management of spent fuel and radioactive waste.

2.2. Who is affected, in what ways, and to what extent?

The management of spent fuel and radioactive waste inevitably affects:

– workers exposed to ionising radiation in the field of spent fuel and radioactive waste management;

– European citizens, who (according to the special Eurobarometer studies) are concerned about the risks, related to radioactive waste, in particular the possible effects on the environment and health. This is particularly the case for:

– citizens living near potential or selected disposal sites. In Finland and Sweden, where the projects for geological disposal of spent fuel are most advanced and the public is not only well informed but also involved in the decision-making process, more than 60% of the citizens consider deep geological disposal the most appropriate solution for long-term management of high level waste whilst support at municipality level is even higher.

However, overall in the European Union, public opinion on deep underground disposal is rather divided;

– Governments, who are responsible for formulation and implementation of their national policies for long-term management of spent fuel and radioactive waste. Legal and organisational frameworks are needed for implementing the national policy;

– national regulators, who have to guarantee the safety of spent fuel and radioactive waste at all times;

– spent fuel and radioactive waste producers, including operators of nuclear power plants, who are responsible for ensuring the safe management of spent fuel and radioactive waste within their premises, and who should cover all costs for spent fuel and radioactive waste management up to disposal. Spent fuel and radioactive waste management costs, including for disposal, have to be seen as part of the cost of electricity production and should not lead to distortion of competition;

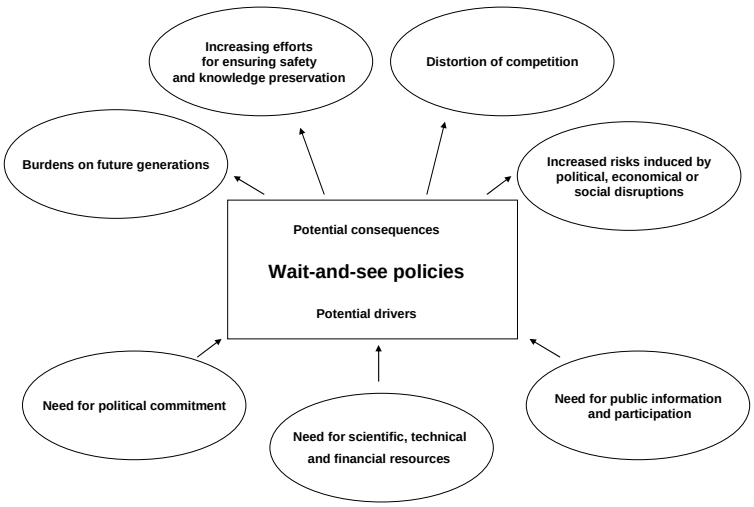
– waste management organisations, who are responsible for the safe management of spent fuel and radioactive waste in the long term, including planning and implementation;

– research and technical support organisations, who provide the needed scientific and technical support, including for technical solutions, safety case preparation and safety assessment. International cooperation makes sense only in the context of a sufficiently extensive national programme, otherwise mutual benefits are difficult to realise;

– consumers, who pay the price of electricity or of other nuclear non-power applications (e.g. in medicine, industry). The price they pay should reflect the full costs (including costs for disposal).

2.3. Underlying drivers of the problem

The underlying drivers of the problem, as well as possible impacts are illustrated in the following schema and are described below and in the baseline scenario provided in chapter 2.4.



2.3.1. Socio-political: need for political commitment and sufficient public information and participation in the decision-making

In recent decades there has been a growing awareness that socio-political aspects need to be considered when discussing the long-term management of spent fuel and radioactive waste and the implementation of disposal systems in particular. This has been underlined in different Eurobarometer surveys over the years[30]. Experience gained in a number of countries demonstrates that political commitment and public confidence are crucial when attempting to make progress in this regard.

The implementation of geological disposal requires a long-term political commitment, modern governance concepts, building on a step-by-step approach and early involvement of national and local stakeholders, to ensure sound consultations and broad acceptance. Such modern governance concepts have successfully laid the foundation of the Finnish and Swedish approaches. In contrast, other countries may be technically equally advanced, but have not made much progress towards implementation, mainly for reasons of political will and/or public acceptance.

The views and political power of the citizens determine policy in a democratic society. To date, the principal factor limiting progress of national programmes has been the lack of public support and confidence, mainly due to an insufficient involvement in the early stages of the decision-making processes at national and local level. If there is no national policy on spent fuel and radioactive waste management, public acceptance of disposal solutions is low and vice versa. This might explain why the political willingness and motivation to take decisions in this field are often weak.

Although there is a widespread recognition that the critical path towards implementation of disposal facilities is now determined by the need for public confidence rather than by technical issues, it has to be pointed out that geological disposal is a complex and multidisciplinary issue. From a technological standpoint, geological disposal does not represent an insurmountable challenge, although the long-time scales involved imply that inevitably there are uncertainties in the models and in the data to be used in the performance and safety assessment of the facilities. It is important to gain the trust of public, stakeholders and decision-makers that geological disposal can be demonstrated to be a safe long-term waste management solution: a lack of early public and stakeholders' involvement in the process undoubtedly leads to delays in implementation in relation to the plans initially foreseen.

Also, the idea of shared repositories, recognised as being potentially beneficial for Member States with small nuclear programmes, requires political and public acceptance in the Member States concerned.

2.3.2. Need for sufficient scientific and technical resources

In quite a number of Member States there are still deficits in the scientific and technical resources related to the development of waste management programmes, in particular with regard to the identification of suitable geological disposal as the end point.

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[30] Special Eurobarometer 271 "Europeans and nuclear safety" EC, February 2007; Special Eurobarometer 324 "Europeans and nuclear safety", EC, March 2010; Special Eurobarometer 297 "Attitudes towards radioactive waste", EC, June 2008.

Studies funded under the European Research Framework Programmes have contributed to progress in these areas through cooperation, joint programmes and transfer of knowledge and technology. The newly created Technological Platform for Implementing Geological Disposal is a tool supporting confidence-building in the safety and implementation of deep geological disposal facilities.

2.3.3. Need for sufficient financial resources

The timely planning and implementation of all steps necessary for the safe management of spent fuel and radioactive waste up to disposal strongly depends on careful and continuously updated cost assessments and ensuring the necessary financing. In accordance with the polluter-pays principle, nuclear operators should set up adequate funds on the basis of the revenues obtained from their nuclear activities. These funds should be properly managed and protected, in order to make sure that they are available when costs arise.

The financial provisions for the management of spent fuel and radioactive waste should also take into account radioactive waste produced outside commercial activities. Therefore, all Member States, independent of whether they produce nuclear energy, should ensure that adequate financial resources will be available when needed for the management of all types of radioactive waste. For this reason, it is necessary that cost estimations and financial provisions cover all types of radioactive waste.

Interim storage and especially disposal imply important cost depending on the chosen technical solutions, the category and volume of the radioactive waste as well as the foreseen periods of operation. National programmes therefore have to aim at an optimisation between all parameters, also considering radioactive doses to workers and the overall objective to avoid undue burdens and risks for future generations. Given the long implementation and operation times, considerations have also to take into account the uncertainties as to long-term political and social factors. Cost estimates should be transparent enabling stakeholders and the public to see boundary conditions and coverage.

Concrete cost data for interim storage and geological disposal is available only for a few Member States. The data provided in the tables below is intended to give an indication of the order of magnitude of these costs.

Interim Stores for spent fuel and high level waste			
	Bulgaria[i]	Lithuania[ii]	Spain[iii]
Capacity (no of nuclear power reactor units covered by storage capacity)	4[iv]	2[v]	9[vi]

Investment cost (mio €)	125	193	540
Operating cost (mio €/yr)	not known	not known	3-9[vii]

i Source: EBRD
ii Source: EBRD
iii Source: data provided by the web-page of Spanish Ministry of Industry, Tourism and Trade www.emplazamientoatc.es (costs of building CIS) and by ENRESA (estimated operational costs).
iv On-site interim store, start of operation 2011, operating time 50 year
v On-site interim store, start of operation 2010, operating time 50 years
vi Central interim store, start of operation planned 2015, operating time 60 years
vii Depending on operating phase

Geological disposal projects		
	Sweden[i]	Finland[ii]
Capacity (no of nuclear power reactor units covered by disposal capacity)	10	5
Investment cost[iii] (mio €)	2,035	870
Total operating cost (mio €)	1,870	2,140
Operating cost (average, mio/yr)	41[iv]	24[v]

i Source: Technical Report-09-23: Plan 2008 - Cost starting in 2010 for the radioactive residual products from nuclear power, basis for fees and guarantees in 2010 and 2011, Reference case, SKB, 2008,
ii Source: Assessment of Financial Provisions for Nuclear Waste Management - Long-Term Perspective from Finnish Viewpoint, Eero Patrakka, Jussi Palmu, Kimmo Lehto, Posiva Oy, Finland, Euradwaste 2008,
iii Incl. above ground facilities, sealing and closure
iv incl waste canisters, 90 years of operation
v 46 years of operation

Expressed in terms of electricity generating cost, disposal cost as deducted from the Swedish and Finnish estimates range between **0.14-0.16 Euro cents/kWh or 3.5-4.0 percent of the assumed total generating cost** of 4 Euro cents/kWh (the actual figure is commercially protected sensitive information).[31]

In conclusion, the costs of interim storage appear to be significantly lower than those of a geological repository. This is in particular true for countries with relatively small amounts of radioactive waste, which are aiming to run disposal facilities for only a short period of time in

[31] An analysis by the United Kingdom Department of Trade and Industry showed that waste management and decommissioning costs for nuclear power plants represent only 3% of overall nuclear generation costs ["*The role of nuclear power in a low carbon UK economy*", May 2007, DTI/Pub 8519/4k/05/07/NP. URN 07/970].

order to minimise costs. However, these pure cost considerations are neglecting safety risks which are increasing over time and may result in considerable damages.

Compared to storage, disposal with its passive safety features through technical and geological barriers does not require human action and thus enhances safety by orders of magnitude.

The timely collection of sufficient funds is a crucial factor for successful implementation of disposal: the case of Finland, with concrete commitment of all actors concerned and a timely accumulation of the funds, demonstrates this. In the Finnish case, where licensees are responsible for long-term waste management, the assets required for the management of wastes produced in nuclear power plants are collected in advance from the waste producers and transferred to the State Nuclear Waste Management Fund. An external fund serves as reserve for future costs. The Fund does not pay for the waste management activities but only ensures the safekeeping of the money corresponding to the costs of the remaining measures.

One way to reduce costs and to avoid long-term interim storage is by increasing cooperation in support of national approaches through the development of shared facilities for spent fuel and radioactive waste management. While shared repositories might look appealing in terms of economy of scale, it is clear that a Member State must be willing to host such a centre. Furthermore, Member States could delay taking their decisions due to the expectation that other Member States might construct a joint repository.

The R&D cooperation between Finland and Sweden, which does not involve sharing of repositories, is a good example of how costs can be reduced through cooperation.

2.4. Foreseen evolution of the problem

2.4.1. National frameworks

In the absence of Community rules in the field of spent fuel and radioactive waste management, differences and gaps in national legal frameworks are expected to remain. This applies for instance for the requirement for strong and independent regulatory bodies, provided with sufficient financial and qualified human resources. Without an EU legislative instrument, most of the Member States would not face the obligation to develop national policies and implementing programmes for disposal.

2.4.2. Management of spent fuel and radioactive waste

The management of low and intermediate level short-lived waste is now at the level of industrial maturity. Seven of 16 Member States with nuclear power plants in operation or under decommissioning currently operate disposal facilities to deal with this category of waste. Although siting has proven to be a challenge in some Member States, it is expected that disposal facilities will be commissioned by about 2020 in most Member States with nuclear power plants. However, most countries without nuclear power programmes still need to develop disposal facilities for this type of waste.

The implementation of geological disposal, as the safest and most sustainable end-point of managing high level waste and spent fuel considered waste, as well as other long-lived waste will continue to constitute the main challenge for the years to come. Some Member States already took well-defined political decisions and schedules – Finland, Sweden and France. It is likely that by 2025 these countries will have operational deep geological disposal facilities. Germany, as well as Belgium and the UK will possibly follow. Many other Member States

will probably not set any targets dates for operational geological disposal facilities, nor will they establish concrete national programmes for their development and implementation.

As a consequence, there is a danger that the question of disposal is left open as a hostage to speculation concerning future societal, scientific or technological developments.

Long-term interim storage will require continuing and even increasing efforts to ensure safety, including technical means, preservation of knowledge and financing. Due to the ageing of materials (e.g. radioactive waste packages, buildings and systems) there are continuous and increasing needs of maintaining the store structure and all infrastructure for handling and inspecting packages, the adequate control of the store environment (e.g. temperature, humidity etc), the monitoring of packages for possible degradation, security, protection of the site from natural events, repackaging of waste items when judged necessary, staff training, regulatory inspections and securing financing.

Finally, it is expected that without EU action a comprehensive national strategy and detailed planning with clear allocation of responsibilities will continue to be missing in most Member States or to be not elaborate enough. Therefore, there might be further delays in the planning and implementation of all steps of the management of spent fuel and radioactive waste until disposal unless an obligation to set up comprehensive national programmes is introduced in all EU Member States.

2.4.3. Financing

It is expected that in the absence of comprehensive national programmes, covering all waste types and all management stages from generation through to disposal, a sufficiently detailed basis for estimating long-term cost as input to build up adequate waste management funds will continue to be difficult or even impossible.

2.4.4. Environmental impact

For the purposes of the current Impact Assessment the analysis mainly addresses the safety-related impact, i.e. the protection of the health of workers and the general public against the dangers arising from ionising radiation emanating from spent fuel and radioactive waste, including contamination of water, air and soil. Other important aspects of environmental protection go beyond the scope of the Euratom Treaty (e.g. biological, chemical and other hazards that may be associated with spent fuel and radioactive waste management).

As described in chapter 2.4., long-term interim storage requires continuous and even increasing human action, oversight and financing. Given the long time-spans involved, uncertainties increase as to political commitments, financing, keeping of know-how, occurrences of social conflicts, etc. As a consequence, there is an ever increasing risk for a degradation or even disruption of the degree of safety of long-term interim storage facilities and the implementation of disposal with potential negative impacts on the environment in case of failing waste packages and containment structures. Cross border effects are possible as well, for instance in case surface and ground water systems become contaminated. It is impossible to quantify the likelihood and extent of such risks as it would require speculations about future political, economical and societal developments. In this context it is worth noting that insurance companies only offer very limited protection against environmental damages of this kind.

In addition, unjustified extension of the duration of long-term interim storage unduly increases the overall risk of accidents incl. airplane crashes, fires, natural events (e.g. earthquakes, flooding), terrorist attacks etc, potentially resulting in damaged waste packages and storage buildings and subsequent releases of radioactivity to the environment, affecting workers, the general public and the environment. If plants are designed, secured and maintained properly, such risks are normally low but cannot be completely neglected, especially when assuming adverse economical, political or societal developments.

In conclusion, without EU action there is an increasing risk of a negative environmental impact over time. This will place undue burdens and threats on future generations.

2.4.5. Economic impact

As demonstrated in chapter 2.3.3., the costs of disposal of radioactive waste and spent fuel, if regarded as waste, are in the order of several billion Euros, equivalent to 3.5-4.0% of the electricity production cost in the case of Finland and Sweden. The absence of national frameworks and programs with appropriate funding systems and cost estimates ensuring the availability of adequate funds for spent fuel and radioactive waste management when needed will bring along the potential for significant distortions of the internal electricity market. In countries without disposal projects, electricity companies might have undue commercial advantages over their competitors in other Member States. For instance, in the latter Member States, the contribution of special levies for the purpose of funding the management of radioactive waste could lead to differences in electricity prices and thus influence cross-border trade and competition in the EU electricity internal market.

The lack of a funding system might lead to a situation where tax payers would have to pay for the management of waste produced and left by the previous generations, possibly in the order of billions of Euros, violating the polluter-pays principle. This can be especially the case in case polluters have ceased to exist at the time additional funding is needed and the responsibility has been passed to the State.

The lack of adequate and timely funding, combined with a lack of political commitment and oversight by regulatory authorities, might lead to a situation in which the activities required to ensure the safety of storage and disposal installations are no longer ensured. In the worst case, this might result in accidental releases of radioactivity to the environment as described before. Depending on the extent of the release, remediating the consequences might entail high cost, including the clean-up of contaminated areas and the treatment of induced negative health impacts on workers and citizens. As many environmental risks cannot be insured, it is very likely that the consequence of such releases have to be covered by tax payers. In the absence of concrete figures for such events, the cost of current remediation activities, although not necessarily directly comparable, might serve as examples. The remediation of uranium mining legacies from the former GDR German Wismut mine is paid by the state and is estimated at a total of 6.2 billion Euros. Preliminary cost estimates for the retrieval of radioactive waste packages from the endangered German Asse salt mine were of the order of 3.5 billion Euros.

As shown in chapter 2.3.3., the costs of long-term interim storage are considerably lower when compared to a geological repository. This has to be contrasted with the potential economic risk such an approach will entail. As set out before, it would become increasingly costly and difficult to ensure the necessary know-how, expertise, scientific and technical infrastructure for operating and maintaining long-term interim storage facilities and to

continuously maintain and improve safety. This would be particularly true for countries which decide on a phase-out policy.

In conclusion, the continuation of the current situation has a potential for a significant negative economic impact with cost and risks increasing over time, putting significant economic burdens on future generations and potentially leading to a distortion of competition.

2.4.6. Social impact

The social impact of the different options relates primarily on risks to workers and other people that may be exposed to or otherwise come in contact with nuclear waste and radioactive material.

More specifically and as explained in section 2.2, these issues particularly affects workers exposed to ionising radiation in the context of spent fuel and radioactive waste management, but also citizens at local or regional level living more or less close to sites for managing radioactive waste and spent fuel.

As explained above in 2.4., an unjustified extension of the duration of interim storage of spent fuel and radioactive waste instead of disposal requires continuous human actions for control, maintenance, repackaging of waste etc. Such activities are connected with workers' exposure to radiation and although being in accordance with the basic safety standards for radiation protection, they do not comply with the fundamental protection principles of justification and optimisation, as disposal with its passive safety feature would avoid such exposures once waste packages have been emplaced and shielded appropriately (e.g. by backfilling of repository drifts).

Additional radiation doses might occur for workers in case of remediating the consequence of accidents, fires, natural events, degradation of waste packages etc. In case of unplanned radioactive releases to the environment, also the health of the general public might be affected by the contamination of waters, soils and air. As stated previously, the potential extent of such effects is very difficult to predict but could reach significant dimensions.

Therefore a key objective of this initiative is to ensure that workers and the general public are protected against dangers arising from ionizing radiation now, in the future and beyond national borders without imposing undue burdens on future generations and compromising the ability of future generations to meet their own needs (see section 3.2 below).

As regards the protection of workers and other people that may be exposed to or otherwise come in contact with nuclear waste and radioactive material, the report has taken into account the existing health and safety at work legislation (see section 2.1.3.1 - Basic Safety Standards) and also the comments from relevant sectoral social partners (see section 1.2, in particular the contributions received from trade unions during the open consultation process and a recent conference organized by the European Economic and Social Committee).

2.5. Community right to act

2.5.1. Euratom Treaty legal basis[32]

Civil nuclear activities are regulated in the European Union by the Euratom Treaty, signed in 1957. The Euratom Treaty contains provisions allowing the Community to regulate the use of nuclear energy by the Member States, in particular those governing health protection (Chapter 3) and nuclear safeguards (Chapter 7).

The competence of the European Atomic Energy Community to regulate in the field of the health protection against ionizing radiation is explicitly recognised by the Euratom Treaty. In particular, several Articles of the Euratom Treaty mandate the Community to establish "… safety standards to protect the health of workers and of the general public…" Based on the landmark ruling of the European Court of Justice in the Case C-29/99, the existing basic safety standards aiming mainly at the protection of the health of workers and the general public against the dangers arising from ionizing radiations can be "supplemented" in the sense of the Euratom Treaty with safety requirements governing the safe management of radioactive waste and spent fuel. This competence has been already put in practice.

The adopted legislation under the Euratom Treaty, covering aspects of spent fuel and radioactive waste management, is described under section 2.1.3.1 above.

2.5.2. Competence recognised by the Council of the European Union, by the European Parliament and by European Economic and Social Committee

As regards radioactive waste and spent fuel management, the Council and the European Parliament called for a European framework as follows:

– In its Conclusions of 10 November 2009 on the Report by the ENSREG[33], the Council "Calls on … the Commission to continue their cooperative work within ENSREG,…, with the prospect of developing a Community approach in this field, …; further invites the Commission to make full use of ENSREG expertise in the case of proposals for legally binding instruments in the field of safe management of spent fuel and radioactive waste being considered";

– In 2007 the European Parliament**,** in its Resolutions, states that it "regrets the absence of a legislative corpus on harmonised standards for nuclear safety, the management of radioactive waste"[34] and "calls on the Commission and the Member States to finally make progress on the issue of final disposal"[35]

– In the 2007 Report on Assessing Euratom – 50 Years of European nuclear energy policy[36], the European Parliament "invites the Commission to review the relevant drafts of its legislative proposal and submit new proposals for Directives on the safety of nuclear

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32 The Lisbon Treaty, which entered into force on 1 December 2009, amends the Euratom Treaty by its Protocol No 2. The Euratom provisions continue to have their full legal effect and Euratom keeps its own legal personality. The amendments are only intended to adapt the Euratom Treaty to the new rules laid down in the Lisbon Treaty, in particular in the institutional and financial fields.

33 14471/09 ATO 107.

34 European Parliament resolution on Assessing Euratom – 50 Years of European nuclear energy policy of 10 May 2007.

35 European Parliament Resolution of 24 October 2007 on conventional energy sources and energy technology (2007/2091(INI)).

36 A6-0129/2007.

facilities, on waste management, and on closure and decommissioning of nuclear facilities taking into account the 'polluter-pays' principle". It also "urges the Commission and Council to look into this question with all due speed" and asks to be consulted in this work;

– The European Economic and Social Committee: "see an urgent need for Member States utilising nuclear power to put in place national plans for management of nuclear fuel and radioactive waste. Anything else is to be seen as irresponsibly passing on the present generations' obligations to next generations"[37]

2.5.3. Subsidiarity

Some Member States have established plans for the disposal of radioactive waste. All EU Member States are members of the IAEA and participate in the adoption of the IAEA's standards. Nevertheless, (as explained in 2.1.3.2.) these standards are not enforceable, and their incorporation into national legislations is voluntary. Moreover, the Joint Convention does not entail any sanctions for non-compliance. The IAEA Standards and the Joint Convention therefore do not guarantee a consistent and coherent approach to safety at EU level. The existing European legislation (described in 2.1.3.1.) does not cover all activities and facilities related to the management of spent fuel and radioactive waste in the long term, nor does it cover aspects such as national policies and their implementation, public information and public participation. To sum up, the spent fuel and radioactive waste management at present remains a national responsibility and the actions at national level in most Member States are not sufficient to achieve progress up to the end point of this management.

The development of EU legislation on spent fuel and radioactive waste management would be a logical step following the unanimous adoption by all 27 EU Member States of the Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations. While the nuclear safety of on-site storage facilities for spent fuel and some radioactive waste is covered by this Directive, all other facilities for spent fuel and radioactive waste management, such as treatment, encapsulation and disposal facilities remain out of its scope of application. Hence, there is a need to supplement the existing Community framework on nuclear safety with a similar one for safe management of spent fuel and radioactive waste to cover all activities and facilities related to the management of spent fuel and radioactive waste in the Community[38].

The basic approach for proposing a Community framework on spent fuel and radioactive waste management should be similar to the one followed with the nuclear safety Directive. This Directive is anchored on the competence existing in the Member States' regulatory authorities, as well as on the internationally endorsed principles of the Convention on Nuclear Safety and of the IAEA Safety Fundamentals[26]. In addition, Member States retain the right to impose at national level more stringent safety measures than those provided for in the Community legal framework.

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37 Opinion on PINC, 2007.

38 Such a two-step approach has been used at IAEA level with the consecutive development of the Convention on Nuclear Safety and the Joint Convention on Safety of Spent Fuel Management and on the Safety of Spent Fuel and Radioactive Waste Management. It is stated in the preamble (ix) of the Nuclear Safety Convention that "Affirming the need to begin promptly the development of an international convention on the safety of radioactive waste management as soon as the ongoing process to develop waste management safety fundamentals has resulted in broad international agreement".

The new approach for a Community framework on radioactive waste management is based on the same principles and fully addresses the concerns expressed by EU Member States vis-à-vis the earlier proposal submitted by the Commission in 2003/4, which has not found a majority in Council since. That proposal was made as part of a package of Directives on nuclear safety and waste management. It was especially criticized for non-respect of the subsidiarity principle as it was very descriptive:

First, the "package" proposal contained a common unique EU funding system building on segregated external funds for decommissioning, not taking national specificities into account. Second, it foresaw tight and uniform deadlines for the start of the disposal operation, following a "one size fits all" approach. As an example, the year 2018 was given as deadline for having an operational deep geological disposal facility, a deadline which even the most advanced Member States with already well established disposal programmes could impossibly achieve (Finland is planning to have its deep geological repository operational in 2020, Sweden in 2023). Third, it was imposing Commission inspections on national regulators by a Community body of inspectors which was seen by Member States as a violation of the subsidiarity principle. Fourth, there was insufficient stakeholder consultation before proposing the Directive.

In contrast, the revised approach does not contain any excessive measures that might be contrary to the subsidiarity principle. Unlike the 2003/4 proposals, there is ample room for flexibility in respect of national specificities, such as the timing of disposal, and should new challenges arise, a substantial margin of discretion for the Member States in the practical implementation. However, the Commission – in line with the internal market and competition principles – would have the power to intervene with the objective to amend the national waste management programme and thus would prevent a potential distortion of competition. The responsibility for safety inspections remains fully with national regulators. Instead of being excessively descriptive and detailed, the new approach builds on the competence existing in Member States' regulatory authorities and on the internationally endorsed principles of the Joint Convention and IAEA standards.

Policy option 2 includes the obligation for Member States to set up national programmes for spent fuel and radioactive waste management with specific requirements including contents, scope, implementation and review. This requirement, while being very effective in bringing countries that lag behind in this field up to the level of the leading ones, allows for a lot of flexibility in devising the national plans provided that the main principles, such as coherence, are fulfilled. In this, it contrasts sharply with the tight and uniform deadlines for the start of the disposal operation featured in the 2003/4 proposals mentioned before. The additional administrative burden would be low for Member States which already apply the pertinent provisions of the Joint Convention.

The added value of making these principles legally binding for EU Member States is that there would be legal certainty about these rules' enforceability: Concerned citizens and organisations that feel unsafe about the management of spent fuel and radioactive waste could turn to the Commission, which could start investigations or infringement procedures if justified. Ultimately, cases could be brought to the European Court of Justice.

It can be concluded that the safety of spent fuel and radioactive waste management is clearly an area where it makes sense to complement national legislation by legislation at EU level due to its cross-border aspects (e.g. through contamination of air, soil and water). Protection

beyond national borders is an internationally accepted principle laid down in the Euratom Treaty (particularly Article 37 in respect of disposal of radioactive waste).

It should be underlined that the IAEA is supporting this EU approach as model for third countries and regions.

To sum up, the development of an EU legislative framework in the field of spent fuel and radioactive waste management is in line with the subsidiarity principle, in particular since it provides added value compared to national and international approaches without any undue or excessive interference with national competences.

3. OBJECTIVES

3.1. General policy objectives

The general policy objective is to achieve and maintain the management of spent fuel and radioactive waste as an integral part of the safe and sustainable use of nuclear energy for nuclear power production and of ionising radiation in medicine, industry, agriculture, research and education.

In particular this entails establishing a common framework aiming at achieving and maintaining a high uniform level of safe management of radioactive waste and spent fuel throughout the Community by recalling internationally accepted safety principles (such as laid down in the IAEA Safety Fundamentals[39] and the Joint Convention[40]), and providing requirements for the establishment of national programmes for the management of radioactive waste and spent fuel, including development of repositories.

In the EU and worldwide there is a growing recognition of the need for a responsible use of nuclear energy, covering safety and security. This was recently highlighted at the highest political levels, in particular at the Paris conference on access to civil nuclear energy, held in Paris on 8-9 March, the Washington nuclear security summit on 12-13 April, and the Non Proliferation Treaty Review Meeting in New York, held in May this year.

The Common Position of the European Union for the 2010 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons[41] clearly underlined "the importance of continuing international cooperation in order to strengthen nuclear safety, safe waste management, radiological protection and civil nuclear liability and calling upon states that have not yet done so to accede to all the relevant conventions as soon as possible and to implement fully the ensuing commitments".

3.2. Specific objectives

The specific objectives in respect of achieving the general policy objective are:

– to achieve a sustained political commitment for the long-term management of spent fuel and radioactive waste;

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39 Fundamental Safety Principles, Safety Fundamentals No. SF-1, IAEA, Vienna, 2006.

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

41 Council Decision 2010/212/CFSP.

– to ensure that workers and the general public are protected against dangers arising from ionizing radiation now, in the future and beyond national borders, without imposing undue burdens on future generations or compromising the ability of future generations to meet their own needs;

– to ensure a transposition of the political decisions into clear provisions for implementation of all steps on radioactive waste and spent fuel management from generation to disposal;

– to achieve and maintain continuing improvement of the management system, based on stepwise decision-taking and social acceptance;

– to ensure adequate, available when needed, and transparently managed financial resources in accordance with the polluter-pays principle.

3.3. Consistency with other policies and objectives

The specified objectives are consistent with one of the key objectives of the Europe 2020 Strategy for smart, sustainable and inclusive growth[42] which aims at a "Resource efficient Europe". This objective requires a gradual shift towards a low-carbon economy.

In view of the role of the nuclear power production, representing today 2/3 of the low-carbon electricity produced, along with renewable energies and carbon capture and storage, the current proposal will contribute to achieving the European goals for clean energy and fighting climate change. The safe and sustainable management of spent fuel and radioactive waste is as important for the existing spent fuel and radioactive waste accumulated over decades as it is for the future use of nuclear power, including long-term operation of the existing nuclear power plants and construction of new ones.

The specified objectives are fully in line with those of the Basic Safety Standards Directive[43] and of other legislation in the area of radiation protection and nuclear safety, and thus in general with the public health and environmental protection policies.

They are also consistent with the internal market and competition objectives. Constructing disposal facilities requires important investment. Without a Community framework for spent fuel and waste management the diversified situation in the European Union would continue, where some Member States are already planning and making financial provisions for disposal facilities, but others have even not started to do so. Such a situation clearly leads to distortion of competition (see also 5.3.).

4. POLICY OPTIONS

4.1. *Policy option 0:* consists in keeping the current situation unchanged ("do nothing").

This is the business-as-usual scenario, presented in chapter 2.4.

4.2. *Policy option 1:* consists in strengthening the internationally accepted principles and requirements, laid down in the IAEA Safety Standards and the Joint

[42] COM(2010)2020.
[43] OJ L 159, 29.6.1996, p. 1.

Convention[5], for management of radioactive waste and spent fuel throughout the Community, by rendering them both legally binding and enforceable at EU level.

This option consists in establishing at EU level general requirements for a Community framework for spent fuel and radioactive waste management, as well as of a set of associated requirements for implementation at national level (national framework). The legislation would have the structure as shown below, i.e. general requirements and implementation requirements, including

– the generation of radioactive waste to be kept to the minimum practicable, in terms of both its activity and volume, by means of appropriate design measures and operating and decommissioning practices, including recycle and reuse of conventional materials;

– the interdependencies among the different steps in spent fuel and radioactive waste generation and management to be taken into account;

– to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;

– to aim to avoid imposing undue burdens on future generations;

– an acceptable level of protection of human health, air, water and soil to be provided now and in the future, taking into account the possible effects beyond national borders;

– appropriate means for information for consultation of stakeholders to be established;

The associated requirements for a national framework for spent fuel and radioactive waste management allocate responsibilities and provide for coordination between relevant state bodies in the long term, including:

– formulation of a national policy or strategy for spent fuel and radioactive waste management in long term;

– adoption of a national programme for implementation of the national policy or strategy on spent fuel and radioactive waste management;

– adoption of national requirements for safety of the management of spent fuel and radioactive waste, including for the approach to safety;

– provision of a system of licensing of spent fuel and radioactive waste management activities and facilities, appropriate institutional control, regulatory inspections, documenting and reporting, and enforcement actions;

– a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management;

– establishment and maintaining of a competent regulatory authority in the field of the safety of spent fuel and radioactive waste management;

– ensuring that the prime responsibility for safety of spent fuel and radioactive waste management rests with the licence holder;

– arrangements for education and training providing necessary expertise and skills;

– assurance of adequate financing, taking due account of the responsibilities of radioactive waste producers to cover all costs for radioactive waste management;

– provisions for quality assurance;

– ensuring public information and participation in decision-making;

– provisions for peer reviews of the national framework and competent regulatory authority.

This option revises the approach taken by the 2004 amended proposal for a Directive on the management of spent fuel and radioactive waste[1], considering relevant recent developments, such as new European legislation, recommendations of the Council and the European Parliament, development of the concept of geological disposal and related policy (shift from a priority option to the safest and most sustainable one), as well as lessons learned in respect of subsidiarity and proportionality.

This policy option would facilitate a Community control on key safety aspects of the spent fuel and radioactive waste management. If, for example, a Member State had not established a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and radioactive waste management, or if it had not established a competent regulatory authority in this field, the Commission could take enforcement actions (infringement procedures) to request the achievement of these requirements by the Member State.

However, the enforcement under policy option 1 could not easily be extended to missing elements of the national programme – which is the core of spent fuel and radioactive waste management –, as policy option 1 does not define the scope and content of such a national programme. Thus, policy option 1 is lacking a clear benchmark for an infringement procedure.

4.3. *Policy option 2* goes beyond policy option 1 by establishing in addition specific requirements for national programmes for radioactive waste and spent fuel management throughout the Community.

This option includes the approach proposed by policy option 1. In addition, it foresees a third set of conditional requirements for scope, contents and review of national programmes for spent fuel and radioactive waste management. The national programme may be a reference document or a set of documents and it should be regularly updated. A deadline for the establishment of the national programmes is foreseen. Legislation would include the requirements set out below.

The national programme should cover all types of spent fuel and radioactive waste, within the scope of the revised proposal, all the stages of their management from generation to disposal, and should include:

– inventory of spent fuel and radioactive waste – to cover existing and foreseen spent fuel and radioactive waste arising in order to guide solutions;

– plans and technical solutions for management of all types of spent fuel and radioactive waste from generation to disposal;

– plans for the period after closure of disposal facilities, including institutional control;

– skills and programmes for research and development;

– time schedule - specifying the main milestones and time schedule and defining indicators for achievements;

– cost assessment of all activities up to disposal;

– financing of the programme, including the principles and obligations to cover all costs related to the spent fuel and radioactive waste management;

– scope of responsibilities and decision-making process – providing the continuity in the long term;

– legal framework - providing information which may be used to review the adequacy of the existing legal framework to cover future activities in order to plan future developments as necessary.

It also contains provisions for peer reviews comparing the arrangements for establishment and implementation of the national programmes on spent fuel and radioactive waste management and identifying best practices.

Draft national programmes would have to be sent for comment to the Commission before adoption.

This option would permit to request from Member States not only the fulfilment of the safety requirements described in option 1 (for example, the establishment of a competent regulatory authority), but also the design and periodic review of national programmes for the management of their spent fuel and radioactive waste. This would lead to improvements in Member States' planning solutions for the management of their spent fuel and radioactive waste, including institutional control after disposal.

The *drafting and regular update* of national programmes would be a mandatory element of the proposal. Given its detailed requirements, it provides the Commission with a clear benchmark for the initiation of enforcement measures against Member States failing to draft, review and update them, or against Member States whose national programmes did not cover the mandatory elements.

In practice, the enforcement regime under this policy option, in addition to the elements already described for policy option 1, would be as follows:

– Each Member State would have to develop by a given deadline a national spent fuel and waste management programme which has to cover all elements as outlined above.

– Each Member State is obliged to notify its draft national programme to the Commission by a given deadline.

– In case a Member State does not submit to the Commission a national programme by the given deadline or disregards Commission requirements to cover missing mandatory elements, the Commission could open infringement proceedings.

4.4. Other options discarded at an early stage

The option of **reinforcing a multilateral and international approach through the IAEA** was considered as an option of poor effectiveness. As it is mentioned above, the Joint Convention is the first legally binding international treaty on the safety in spent fuel and radioactive waste management, but represents only an incentive instrument and thus cannot entail any sanctions for non-compliance (see 2.1.3.2.). Amending the Convention would be a lengthy and very complex process as it would require consensus between 56 Contracting Parties in an intergovernmental procedure.

In a context of renewed interest in nuclear energy, the IAEA fully supports the EU's move to make the international safety standards legally binding and enforceable. By providing binding legal force to some key aspects of the main international nuclear safety standards, including in the area of nuclear waste management, Europe becomes a real model for the rest of the world. The IAEA and the Commission are committed to promote such regional approach in other parts of the world.

4.5. Instruments

The possible instruments for implementation of the developed policy options and their effectiveness are considered below.

The option of using **a non-binding instrument** is considered ineffective and inconsistent because of the following considerations:

– Recommendations already exist at EU level, formulated in Conclusions and Resolutions of the Council and the Parliament (see 2.5.2.);

– The same considerations for poor effectiveness as those mentioned above in respect of the option of strengthening multilateral international approach through IAEA (see 4.4.).

The options of proposing **a binding instrument** include amending the Nuclear Safety Directive, through a revision of the 2004 amended proposal for a Council Directive (Euratom)[1], or the development of a new instrument.

The option of amending the Nuclear Safety Directive is considered ineffective. First of all, this Directive has not yet been transposed into Member States' legislation (due by July 2011). During the negotiations on this Directive the possibility of including all spent fuel and radioactive waste management facilities in its scope (as nuclear installations) was discussed and rejected by all Member States in view of its objectives. Also at the international level, two Conventions deal separately with the safety of nuclear installations (the Convention on Nuclear Safety) and with the safety of the management of spent fuel and radioactive waste (the Joint Convention). The Nuclear Safety Directive aims at strengthening internationally accepted safety principles laid down the IAEA Safety Standards and the Convention on Nuclear Safety, and the reporting under this Directive respects that under the Nuclear Safety Convention[44]. Another consideration is that this Directive is focused only on nuclear safety. Even if such an amendment is possible, it could not include the requirements in respect of the

[44] "Article 9. Reporting: 1. Member States shall submit a report to the Commission on the implementation of this Directive for the first time by 22 July 2014, and every three years thereafter, taking advantage of the review and reporting cycles under the Convention on Nuclear Safety".

political and social aspects of spent fuel and radioactive waste management, including for sustainability. In this context, such an approach could not achieve the specified objectives nor would it be the consistent with other policies and objectives, as described in section 3.3.

A revised proposal for a Directive based on the 2004 amended proposal is considered the most relevant approach, in view of the above and of the fact that the developed policy options revise the approach taken by the 2004 amended proposal for a Council Directive (Euratom) on the management of spent fuel and radioactive waste[1].

5. ANALYSIS OF IMPACTS

5.1. Policy option 0

The analysis of the impact of this option is presented above in 2.5.

5.2. Policy option 1

5.2.1. Environmental impact

Policy option 1 would provide benefits in the short term, providing Member States a framework for a uniform approach to safety at EU level. It would cover all activities and facilities related to the management of spent fuel and radioactive waste management and would provide an outline reference for the elements of their national frameworks.

As an important factor, it would strengthen national regulatory authorities by ensuring that they are provided with sufficient human and financial means to successfully carry out their duties. They would furthermore be provided with a driving role in implementing common European rules on the safety of spent fuel and radioactive waste management.

Policy option 1 brings added value with regard to the requirements for national policies, adoption of national requirements for their implementation and the clear allocation of responsibilities. It would overcome approaches being based mainly on long-term storage without plans and solutions/concepts for disposal.

Long-term interim storage with its inherent risks could therefore still be part of national programmes, but in the context of more endurable national commitment towards safe long-term solutions reducing the environmental risks linked to "wait-and-see" approaches.

Within this framework the subsidiarity principle would be fully respected by recognising the sovereign right of Member States to decide on their spent fuel management policy and to regulate the safe management of spent fuel and radioactive waste.

Another environmental aspect concerns the sustainable use of materials (resources) via the requirement to keep the generation of radioactive waste to the minimum practicable in terms of activity and volume. This should be done by means of appropriate design measures, operating and decommissioning practices, including recycle and reuse of conventional materials. This aspect is also connected to the economic and social impacts.

In conclusion, policy option 1 would have a positive environmental impact at least for the shorter term. In the longer term, unjustified delays in the decision-making process and the

implementation of long-term interim storage cannot be excluded under this policy option (see 2.5.1.).

5.2.2. Economic impact

Strengthening the objectives of the existing Commission Recommendation on the management of the financial resources for the decommissioning of nuclear installations, spent fuel and radioactive waste management[24] would provide benefits as it guarantees financing for the management of spent fuel and radioactive waste in accordance with the polluter-pays-principle.

However as policy option 1 does not have detailed requirements for the content of national programmes, there is no benchmark available against which the content provided by the MS could be checked, and more specifically financing of disposal facilities may completely be missing which would lead to a clear distortion of competition.

The requirements of policy option 1 would provide improved planning security and long-term perspectives for all parties involved, facilitating financial planning and ensuring know-how, expertise, as well as a scientific and technical infrastructure.

They would furthermore help to reduce the long-term political, economical or social financial risks linked to "wait-and-see" approaches potentially leading to the consequences described in 2.4.5 above.

Policy option 1 is anchored on the competence existing in the Member States' regulatory authorities, as well as on the internationally endorsed principles for spent fuel and radioactive waste management which underlie in the Joint Convention and of the IAEA Safety Standards. The Member States have to fulfil their obligations under this Convention. On the basis of the analysis of their national reports under the Joint Convention, no additional burden is expected to be imposed on the Member States.

In conclusion, policy option 1 would have a positive economical impact at least for the shorter term. In the longer term, unjustified delays of the decision-making process, and the implementation of long-term storage with its potential negative economic impacts cannot be completely excluded under this policy option (see 2.4.5.).

5.2.3. Social impact

A uniform approach to safety at EU level and in particular the strengthening of national regulatory authorities would further enhance the protection of workers and the general public as required in the Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the **health of workers and the general public** against the dangers arising from ionizing radiation.[12]

In the longer term, unjustified delays in the decision-making process and long-term storage with its potential negative health impact on workers and the general public cannot be excluded under this policy option.

5.2.4. Administrative burden and other impacts

This policy option makes existing obligations from the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management enforceable

within the EU framework. Therefore, no increase in administrative burdens for industry is to be expected.

As far as Member States are concerned, there may be a very limited additional burden due to the new requirement of reporting to the Commission, but advantage can be taken of the already obligatory reporting under the Joint Convention. The obligation to invite a peer review regularly will incur some additional costs to those Member States which have not yet introduced the practice of inviting peer reviews as they will have to carry out a self-assessment beforehand. A certain limited administrative burden will result from the implementation of the Directive into national law.

On the whole, the additional administrative burden will be very limited and will only fall upon the Member States and the Commission. An estimation of the resulting costs is difficult as they depend on the individual situation and concrete implementation.

5.3. Policy option 2

5.3.1. Environmental impact

This policy option, with its specific requirements concerning the national programmes, such as for milestones and timeframes, would ensure planning and implementation of all steps of spent fuel and radioactive waste management, including timely disposal, as well as continuing improvement of the management system, based on a stepwise decision making. Unjustified delay would be prevented through providing indicators for implementation. Furthermore, it would ensure state-of-the-art solutions, as the national programmes shall be reviewed regularly and updated according to the evolution of managerial, social, economic, technical and scientific aspects. Thus it would ensure the safety of spent fuel and radioactive waste management now, in the future and beyond national borders without imposing undue burdens on future generations.

Compared to policy option 1, policy option 2 would provide positive environmental impact even in the long term from the point of view of both safety and sustainability.

5.3.2. Economic impact

Developing disposal facilities involves significant investments as shown in chapter 2.3.3. This has to be seen vis-à-vis the substantial increase in safety and thus a much better protection of workers, public and environment in the long term.

This option would provide benefits through its detailed requirements for national programmes. Among others, the national spent fuel and radioactive waste management programme has to provide a detailed cost estimate for all waste management steps up to disposal including the associated activities, such as research and development. The national waste management programme has also to provide information on the financing of the programme. The national programme is therefore the basis for a corresponding fund collection regime. Should a national programme consider only long-term interim storage, but no disposal, a utility would save a considerable amount of money which it could then use for other investment and to strengthen its market position in relation to a competitor in another Member State where funding of a disposal facility is foreseen as a mandatory element. Such a situation would be a clear distortion of competition. As shown in chapter 2.3.3., such a cost advantage could be in the order of 3.5-4.0 percent of the assumed total generating cost. Keeping the national programmes updated and subject to peer reviews would increase the

transparency and quality of the funding mechanisms of spent fuel and radioactive waste management and decommissioning, and thus would further help to prevent market distortions. In conclusion, this policy option would ensure that the electricity price reflects the full costs and all producers are equally treated. It would create a level playing field in which all actors involved have similar obligations and rights, managed in a transparent way.

The requirement to provide the underlying assumptions behind the calculations of the costs of the solutions proposed, as well as a time cost profile, would improve the cost/benefits analysis of the activities proposed and the assessment of the needs of financing through benchmarking, transparency, and monitoring on EU level. Furthermore, this requirement would guarantee the allocation of responsibilities for undertaking cost assessment.

In conclusion, policy option 2 would provide a positive economic impact, even over the longer term.

5.3.3. Social impact

In addition to the positive short-term impact offered by policy option 2, this policy option would entail a better protection of workers and the general public against the dangers of ionising radiation. This would occur in the long term by avoiding an unjustified prolongation of interim storage of spent fuel and radioactive with its need for continuous human actions for control, maintenance, repackaging of waste, etc. It would ensure that the fundamental protection principles of justification and optimisation are applied in accordance with the basic safety standards for radiation protection.

The policy option would also much better protect workers and the general public in the long term against additional radiation exposure that might occur as consequence of accidents, fires, natural events, degradation of waste packages etc..

In conclusion, policy option 2 would guarantee positive social impact in the long term.

5.3.4. Administrative burden and other impacts

In principle, what has been said for policy option 1 applies here too (please see under 5.2.4.). In addition, policy option 2 includes the obligation for Member States to set up national programmes for spent fuel and radioactive waste management with specific requirements including contents, scope, implementation and review. The additional administrative burden would be low for Member States which already implement the pertinent provisions of the Joint Convention, although it lacks detailed requirements to this end. Member States which do not yet have a national programme have a larger burden to bear, but this is justified by the benefits of having such a programme about what to do with one's radioactive waste.

6. COMPARING THE OPTIONS

By comparing the individual impacts per option, the following conclusions can be drawn from the Impact Assessment:

Policy option 0 cannot be accepted, taking into consideration the fact that the absence of a Community approach to spent fuel and radioactive waste management would be prejudicial to EU citizens and to the interest of the Member States. Despite a certain degree of harmonisation, not all Member States have policies on spent fuel and radioactive waste management in the long term that reflects the existing legal and institutional frameworks in

this area. The existing approaches and practices on spent fuel and radioactive waste management still vary from one Member State to another and this diversity of measures does not allow the Community to satisfy itself that the relevant requirements of the Euratom Treaty are applied in the most effective way in the long term.

Policy option 0 does not address the underlying problem of the 'wait-and-see' policy. It entails the risk of negative economic, social, and environmental impacts increasing over time and will put undue burdens and threats on future generations. This policy option is therefore not at all effective in achieving the objectives.

Policy option 1 was considered for strengthening the principles and requirements of the main international instruments adopted at IAEA level (such as the IAEA Safety Standards and the Joint Convention) for management of radioactive waste and spent fuel throughout the Community. It makes the internationally accepted principles and requirements for radioactive waste and spent fuel management legally binding and enforceable at EU level. Such an approach will contribute to improving the safety of spent fuel and radioactive waste management at EU level and in particular to the establishment of equal requirements for the safety of all spent fuel and radioactive waste management facilities.

However, policy option 1 does not fully tackle the underlying problem of the 'wait-and-see' policy since, in the longer term, unjustified delays to the decision-making process and unjustified long-term storage cannot be excluded under this policy option. Policy option 1 would only have positive economic, social, and environmental impacts for the shorter term.

Policy option 1 would also not provide clear and detailed requirements for the content of national programmes and thus is lacking a benchmark for an infringement procedure in case of essential elements missing in the programmes submitted to the Commission.

Thus this policy option is not effective as it does not fully contribute to achieving the objectives on long term.

Policy option 2 goes beyond option 1 with additional specific requirements for the national programmes for spent fuel and radioactive waste management, including contents, scope, implementation and review, assures achievement of the general policy objective, as defined in this Impact Assessment. This option increases the transparency in the decision-making process not only on the formulation of the national policies, but also in their implementation through national programmes. The economic, social, and environmental impacts are positive in particular in the long run. The administrative burdens are expected to be low in Member States which already comply with the provisions of the Joint Convention. In summary, this policy option is very effective in achieving the objectives. In addition, it is strongly supported by the stakeholders and the general public through:

– the key principles and guidelines provided by the Group of European Nuclear Safety Regulators;

– the position paper "Contribution to the Stakeholder Consultation Process for a Possible EU Instrument in the Field of Safe and Sustainable Spent Fuel and Radioactive Waste Management" elaborated under the European Nuclear Energy Forum;

– the "Collective opinion of the Club of Agencies in the consultation process for a possible EU instrument in the Field of Safe and Sustainable Spent Fuel and Radioactive Waste Management";

– the open public consultation "Approaches for a possible EU legislative proposal on the management of spent fuel and radioactive waste".

It also complies in the utmost degree with the conclusions and resolutions of the Council and position of the European Parliament. This policy option is also the only one that provides for an adequate and responsible policy, providing not only for a high level of safety but also for beneficial effects on the environmental, social and economic levels.

Following the successful adoption of the Council Directive 2009/71/Euratom on nuclear safety in June 2009, it will constitute the second pillar of the most advanced legal framework for safe use of nuclear energy.

Only policy option 2 makes the internationally accepted principles and requirements for radioactive waste and spent fuel management legally binding and enforceable at the EU level and introduces an obligation to set up coherent national programmes for Member States which have not yet done so. Furthermore, policy option 2 provides clear and detailed requirements for the content of national programmes, offering a benchmark for an infringement procedure in case of missing mandatory elements.

It also makes these obligations enforceable through the clear and strong control mechanisms of the EU (e.g. infringement proceedings by the Commission, referral to the European Court of Justice (ECJ) in case of non-compliance, obligation of Member States to comply with ECJ rulings).

In the framework of the above considerations, **Policy option 2** appears to be the preferred one, as it addresses the problem in an effective way, guarantees achievement of the political objective and complies with the stakeholders and public expectations to the highest extent.

It can be concluded that option 0 increases the risks over time, option 1 reduces the risks and option 2 eliminates them to the extent possible with reasonable expected economic, social, environmental and administrative impacts.

7. MONITORING AND EVALUATION

The indicators of progress towards meeting the objectives are:

– status of implementing the requirements for a national framework for spent fuel and radioactive waste management, allocating responsibilities and providing for coordination between relevant state bodies in the long term, specified in 4.2, and

– status of implementing the requirements for scope, contents and review of national programmes for spent fuel and radioactive waste management, specified in 4.3.

Member States would report to the Commission on the implementation of these requirements, taking advantage of the review and reporting cycles under the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, and thus no additional administrative burden is expected. In addition, Member States would submit draft national programmes to the Commission for comment before adoption.

On the basis of the Member States' reports and their notifications of national programmes, the Commission will submit a report to the Council and the European Parliament on progress made.

ANNEX 1: COMPARATIVE TABLE

IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management – Euratom legislative instrument (Directive) covering the Management of Radioactive Waste and Spent Fuel (Policy options 1 and 2 of the Impact Assessment)

Criteria	Joint Convention	Euratom legislative instrument (Directive) - Policy options 1 and 2 of the IA -
I. Main criterion		
Legal enforceability	• Legally binding instrument ("*pacta sunt servanda*" - see Article 26 of the Vienna Convention on the Law of the Treaties). • However, in terms of enforcement, the Joint Convention does not provide any tools. It does not contain sanctions, penalties or other types of mechanisms (e.g. financial or technical assistance). • "Incentive" character of the Joint Convention (explicitly acknowledged in its Preamble (vi)), similar to the Convention on Nuclear Safety. • The Joint Convention relies on the common interest of all Contracting Parties to achieve its objectives. It is designed to obtain compliance *bona fide* through voluntary cooperation and "peer pressure" rather than by means of control and sanction. • Fundamental role of the peer-review mechanism that entails the following fundamental obligations for the	• Legally binding for the EU Member States – as to the result to be achieved but leaving to the national authorities the choice of form and methods (see Art. 288(3) TFEU, applicable to Euratom Treaty. • In terms of enforcement, the founding Treaties (and the jurisprudence of the Court of Justice of the EU) offer clear and strong control mechanisms for ensuring the correct transposition and further implementation of a Directive. • The Commission has several control prerogatives (for fulfilling its responsibility of monitoring the implementation of Community *acquis.* General: – Commission right to issue recommendations on the draft national legislative measures aiming to transpose Community *acquis* adopted on the basis of Articles 31 and 32 of the Euratom Treaty within 3 months from their notification. The Member States

	Contracting Parties: – To submit in advance to all other Contracting Parties a National Report describing how it implements the obligations of the Joint Convention; – To seek clarification on the National Reports of other Contracting Parties through a system of written questions and answers; and – To present and discuss its National Report during a Review Meeting comprising country group sessions and plenary sessions. • Very significant margin of discretion for the Contracting Parties' self-assessments (according to the IAEA Guidelines regarding National Reports under the Joint Convention "*each Contracting Party has the right to submit a National Report with the form, length and structure it believes necessary to describe how it has implemented its obligations under the Convention").* • The other Contracting Parties have to rely on the accuracy and completeness of the information provided by each Contracting Party and in its answers to the questions asked. • Several weaknesses of the peer-review process have been identified in terms of effectiveness and efficiency.	should not adopt the national measures until the Commission has sent its recommendations or before the 3 months' timeframe elapses (see Article 33(3 and 4) of the Euratom Treaty and the Commission Recommendation on the application of Article 33 of the Euratom Treaty). – Commission right to open <u>infringement procedures</u> against the Member States that failed to transpose a Directive / have not properly transposed or implemented the provisions of a Directive. This procedure comprises several stages, possibly culminating with the referral of the case to the Court of Justice of the EU (see Articles 258 and 260 TFEU, applicable to the Euratom Treaty). – Commission competence to issue a <u>reasoned opinion</u> in case of an action brought by a Member State against another Member State to the Court of Justice of the EU for failure to fulfil an obligation under Community law (see Article 259 TFEU, applicable to the Euratom Treaty. <u>Specific</u> – In addition to the control competencies above, generally applicable to all Directives, in the specific case of a Directive governing the management of spent fuel and radioactive waste (as proposed under Policy option 2), a <u>notification mechanism to the Commission of the national programmes can be envisaged.</u>

		• It should be also noted that a Member State can bring an action before the Court of Justice of the EU (after bringing the matter before the Commission) against another Member State for failure to fulfil an obligation (see Article 259 TFEU, applicable to the Euratom Treaty). • The Court of Justice of the EU has several competencies: – Right to determine whether a Member State has fulfilled its obligations under EU law in actions for failure to fulfil obligations. If the Court finds that an obligation has not been fulfilled, the Member State must bring the failure to an end without delay. If, after a further action is brought by the Commission, the Court of Justice finds that the Member State concerned has not complied with its judgment, it may impose on it a fixed or periodic financial penalty. However, if measures transposing a Directive are not notified to the Commission, it may propose that the Court impose a pecuniary penalty on the Member State concerned, once the initial judgment establishing a failure to fulfil obligations has been delivered (see Article 260 TFEU, applicable to the Euratom Treaty). – Right to clarify a point concerning the interpretation of EU law. The Court's reply is not merely an opinion, but takes the form of a judgment or reasoned order. The national court to which it is addressed is, in deciding the dispute before it, bound by the interpretation given. The Court's judgment

		likewise binds other national courts before which the same problem is raised. It is thus through references for preliminary rulings that any European citizen can find clarification of the interpretation of EU rules which affect him (see Article 267 TFEU, applicable to the Euratom Treaty). • Directives have a direct effect for European citizens, as recognised in the case-law of the Court of Justice of the EU (see for instance the Case 8/81, according to which "Particularly in cases in which the Community authorities have, by means of a Directive, placed Member States under a duty to adopt a certain course of action , the effectiveness of such a measure would be diminished if persons were prevented from relying upon it in proceedings before a court and national courts were prevented from taking it into consideration as an element of Community law. Consequently, a Member State which has not adopted the implementing measures required by the Directive within the prescribed period may not plead, as against individuals, its own failure to perform the obligations which the directive entails. Thus, wherever the provisions of a Directive appear, as far as their subject-matter is concerned, to be unconditional and sufficiently precise, those provisions may, in the absence of implementing measures adopted within the prescribed period, be relied upon as against any national provision which is incompatible with the Directive or in so far as the provisions define rights which individuals are able to assert against the State".

II. Additional criteria		
Specificity of content for the EU	• Generally applicable worldwide principles and requirements in the area of spent fuel and radioactive waste management (nibs. according to the latest status of ratifications of 29 April 2010, there are 56 Contracting Parties to the Joint Convention). –	• Based upon, endorsing and fully recognising the generally worldwide principles and requirements of the Joint Convention. • In addition, possibility to go beyond these international requiremenents and include provisions specifically addressed to the EU Members States, e.g: – Requirements to adopt national programmes for the management of spent fuel and radioactive waste and notify them to the Commission (element specific for policy option 2; – Provisions related to transparency and public involvement; – Provisions transforming the voluntary international peer-review system into a legally binding EU requirement. • Need to ensure consistency with the Nuclear Safety Directive.
Consultation of stakeholders and citizens in the elaboration and adoption	• No possibility for all stakeholders and citizens to express their views during the elaboration of the Convention. • Drafted by a Group of Legal and Technical Experts.	• Stakeholders and citizens are consulted and directly involved throughout the entire decision-making process leading to the adoption of a Directive, through various mechanisms e.g: – Eurobarometer surveys;

process	• Adopted on 5 September 1997 by a Diplomatic Conference of States convened by the IAEA.	– Open public Internet consultation (see the Commission Communication on General Principles and Minimum Standards for Consultation of Interested Parties by the Commission); – Expert groups (e.g. WPNS, ENSREG); – Platforms for stakeholders' dialogue (e.g. ENEF); – Opinion of the European Economic and Social Committee (represents civil society, employers and employees) on the Commission proposal (see the Article 31 of the Euratom Treaty special legislative procedure); – Opinion of the European Parliament (represents the EU's citizens and is directly elected by them) on the Commission proposal (see the Article 31 of the Euratom Treaty special legislative procedure).
Transparency	• The Joint Convention does not comprise provisions on public information. • Moreover, as regards the Review process, although the Contracting Parties to the Joint Convention are encouraged to publish their National Reports (as well as questions and comments received from other Contracting Parties and responses thereto), there is no formal obligation in this sense. Contracting Parties have the ultimate responsibility of deciding whether or not the information supplied is to be deemed confidential. The only document that is formally intended to be made	• Following the model of the Nuclear Safety Directive, one of the requirements of a Directive dealing with the management of spent fuel and radioactive waste would be related to public information. Consequently, Member States would have the obligation to ensure that the information on the management of spent fuel and radioactive waste is regularly made available to the public. • Secondly, as in the Nuclear Safety Directive, a Directive on the management of spent fuel and radioactive waste would require Member States to submit regular implementation reports to the Commission (taking advantage of the reporting

	public is the Summary Report of the meeting, presenting major issues, possibly by combining significant points made in the Rapporteurs' reports that summarized the country group discussions (see the IAEA Guidelines regarding the Review Process under the Joint Convention).	under the Joint Convention). Based on these reports, the Commission would submit an overview report to the Council and the European Parliament on progress made with the implementation of the Directive. • Thirdly, the Directive would require Member States to report the outcomes of the international peer-reviews not only to the Commission, but also to all the other Member States, whenever these are available.
Public participation in the decision-making process	• The Joint Convention does not comprise provisions on public participation.	• One of the objectives envisaged by a Directive would be to ensure the public participation in the decision-making process.
Amendment procedure	• The Convention provides for an amendment procedure, which would require consensus, or, in its absence, convening a Diplomatic Conference which requires two-thirds majority vote of the Contracting Parties present and voting at the meeting, provided that at least one half of the Contracting Parties are present at the time of voting) (see Article 41 of the Joint Convention). • In the light of the above, due to the required quorum rules, the EU has no command of the amendment of the Convention (in the theoretical case when new evolutions at EU level would arise and require an amendment or the introduction of additional provisions in the Joint Convention).	• In the case of EU legislation, if needed, the amendment procedure is internal to the EU (does not depend on the consent of third countries).

Conclusions of the comparative table

Criteria	Joint Convention	Euratom legislative instrument (Directive) - Policy options 1 and 2 -
Legal enforceability	-	+
Specificity of content for the EU	-	+
Consultation of stakeholders and citizens in the elaboration and adoption process	-	+
Transparency	+	++
Public participation in the decision-making process	-	+
Amendment procedure	-	+

ANNEX 2: CONSULTATION AND EXPERTISE

1. Stakeholders consultation

1.1. High Level Group on Nuclear Safety and Waste Management (ENSREG)

The High Level Group on Nuclear Safety and Waste Management[45] was established on 17 July 2007 by a Commission decision (2007/530/Euratom)[46]. The Group composed of senior officials from national regulatory or safety authorities competent on the safety of nuclear installations and of spent fuel and radioactive waste management and a Commission's representative, later adopted the acronym **ENSREG** (European Nuclear Safety Regulators Group). The Group's mandate is to advise and assist the Commission in progressively developing a common understanding and eventually Europeans rules in the field of the safety of nuclear installation and the safety of the waste management. Its establishment was endorsed by the European Council[47] and supported by the Council[48] and the European Parliament[49]. The first conclusions and recommendations of the Group were reflected in the Council Resolution of 16 December 2008 on Spent Fuel and Radioactive Waste Management.

In July 2009 the first ENSREG's report[50] was submitted to the Commission, and transmitted to the European Parliament and the Council in September. It was reflected by the Council in its Conclusions of 10 November 2009[51]. In its report, the Group encourages "the development of a national programme for waste management in each EU Member State and the adoption of an instrument defining the basics of and guidelines for the contents of such programmes in Europe", underlines "the importance for the EU to promote improvement of regulatory effectiveness and to provide leadership on peer reviews", and recommends that "the Commission should promote wider use of best practices". In respect of the management of spent fuel and radioactive waste, the report is based on seven documents dealing in details with different aspects of the issue and providing conclusions and recommendations[52]:

– Identification of difficulties and challenges for progress in spent fuel and high-level waste management;

– Better use of the Joint Convention process in the European Union;

– Guidelines for the content and objectives of national programmes for the management and the safety of radioactive waste and spent fuel;

– International peer reviews and regulatory effectiveness;

– Identification and enhanced use of best practices in the context of continuous improvement in waste safety in the EU countries;

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45 http://ec.europa.eu/energy/nuclear/ensreg/ensreg_en.htm

46 OJ L 195/44 of 27.07.2007

47 European Council of 8-9 March 2007

48 Council Conclusions of 8 May 2007 on Nuclear Safety and Safe Management of Spent Nuclear Fuel and Radioactive Waste, 8784/07

49 European Parliament resolution on Assessing Euratom – 50 Years of European nuclear energy policy of 10 May 2007

50 Report of the European Nuclear Safety Regulators Group, July 2009

51 Council conclusions on the report by the Europeans Nuclear Regulators Group, 10 November 2009

52 http://circa.europa.eu/Members/irc/tren/nuclear_safety_and_waste/library?l=/general_archive/public

– Better exchange of information on waste safety experience;

– Waste safety reviews of new nuclear power plants.

In June 2010, ENSREG sent to the Commission a detailed contribution, which contains key principles and guidelines as a basis for the Commission to prepare legislation on radioactive waste and spent fuel management. This contribution was prepared by a dedicated working group, discussed and unanimously adopted at the plenary meeting of ENSREG on 4 June 2010.

1.2. European Nuclear Energy Forum (ENEF)

The European Nuclear Energy Forum (ENEF)[53] is another initiative of the European Commission endorsed by the EU heads of state and government in March 2007[47]. It is a unique platform for a broad discussion on the opportunities and risks of nuclear energy, including spent fuel and radioactive waste management, as well as on transparency issues. Founded in 2007, ENEF gathers all relevant stakeholders in the nuclear field, such as governments of all 27 EU Member States, European Institutions including the European Parliament and the European Economic and Social Committee, nuclear industry, electricity consumers and the civil society.

The Conclusions of the second plenary meeting (May 2008) emphasised the Forum's strong support for the adoption of European legislation on waste management based on common fundamental safety principles stating furthermore that "if it succeeds in adopting such a legal framework, Europe can become a real model also for possible nuclear newcomers, ensuring that they take all necessary measures for ensuring the highest safety and security levels before developing nuclear infrastructure".

The fourth plenary meeting (May 2009) underlined in its conclusions that "guidance for national roadmaps and European actions for the successful implementation of geological waste repositories concentrating on the possible drivers for advancing the issue in the EU will continue to be in the focus of the Forum". Roadmap to Successful Implementation of Geological Disposal in the EU, EUR 24301 EN[54], was elaborated under the Forum and sent to the Commission "as a stakeholder contribution" to this Impact Assessment in December 2009. The document is based to a large extent on the positive progress that has been made in a number of Member States and one of its main conclusions is that it is essential "to take the necessary political and technical decisions and develop a roadmap for the long-term management of radioactive waste, including specific routes, milestones and endpoints". It also concludes that the EU can provide an added value in the interest of the European citizens and that the EU institutions should have a role in proposing instruments for establishment of national programmes for the safe long-term management of spent fuel and all types of radioactive waste, with clearly defined milestones and disposal routes, ensuring the presentation of these programmes to the public and where appropriate to international peer review, and in ensuring an equivalent high level of safety in radioactive waste management in all Member States through a set of common rules and research-based approaches.

During the elaboration of the Roadmap paper, two NGO's - **Sortir du Nucléaire** and **Friends of the Earth** commented the draft document before leaving the Forum. They felt that

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53 http://ec.europa.eu/energy/nuclear/forum/forum_en.htm

54 http://ec.europa.eu/energy/nuclear/forum/risks/waste_disposal_en.htm

geological disposal would not avoid the burden on future generations and that the best way to lessen it, in the current state-of-the-art, was stopping producing nuclear waste by phasing out nuclear energy. They underlined the importance of proper funding by waste generators, a proper investigation of repository sites, reviewed by independent experts, and the involvement of citizens in the decision-making process while at the same time doubting the suitability of geological disposal as long-time solution without suggesting alternative solutions. As to EU legislation, Friends of the Earth suggested deadlines for implementing waste management solutions.

A position paper "Contribution to the Stakeholder Consultation Process for a Possible EU Instrument in the Field of Safe and Sustainable Spent Fuel and Radioactive Waste Management" was elaborated under the Forum in April 2010[54]. It states that "the EU needs to develop a common legislative framework governing the management of spent fuel and radioactive waste…. Taking into account the broad range of situations in this matter in the different MS, we support the adoption of a legally binding EU instrument". The document justifies the need of a legally binding instrument at EU level, as well as the scope and essential elements, including national programmes, technology and financing, of such an instrument. In respect of the final solutions, it is stressed that "Technical solutions exist for the final disposal of all types of radioactive waste (LLW, ILW, HLW and spent fuel if regarded as waste). While the implementation of such solutions is progressing well for low and intermediate level waste in most MS, the implementation of geological disposal is still posing a challenge in many MS, although this is recognised as the only proven, practicable solution for the disposal of HLW and spent fuel, if regarded as waste. Therefore, the EU instrument must clearly require deep geological disposal for high level waste and spent fuel, if regarded as waste, as part of the national programme if applicable".

1.3. Technology Platforms

The **Sustainable Nuclear Energy Technology Platform (SNE – TP)**[55] was launched in September 2007. It aims at promoting the research, development and demonstration of European nuclear fission technologies and gathers more than 70 organisations (research organisations, utilities, vendors, technology providers, technical safety organisations, universities, consultancy companies and non-governmental organisations).

In May 2009, the first edition of the Strategic Research Agenda (SRA) was produced as a result of the contributions from nearly 200 scientists and the engineers from some 70 member organisations of SNE-TP and the feedback obtained from an open public consultation. The objective of the SRA is to provide decision makers as well as the scientific community with clearly identified technological road-maps for fission technologies. It is stated in the SRA that:

– "Several EU countries have implemented commercially available solutions which allow handling low and intermediate level waste";

– "The present solution for high level waste is to properly condition them inside isolating and protecting packages that are then disposed of in a deep underground geological repository";

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55 SNETP, Strategic Research Agenda, May 2009, www.SNETP.eu

– "there is a clear consensus today that a sustainable nuclear fuel cycle is mainly linked to the durability of the solutions addressing the two following issues: optimum use of natural resources, nuclear waste minimization. These two objectives must be pursued while maintaining or increasing at the same time the safety and the economic competitiveness and ensuring the non-proliferation of the technologies".

The **Implementing Geological Disposal Technology Platform (IGD – TP)**[56] was launched in November 2009, as a tool to support the confidence-building in the safety and implementation of deep geological disposal solutions. It will facilitate access to expertise and technology, interact with the stakeholders, and communicate the results to the benefit of all of Europe. The vision of the platform members (waste management organisations) is that by 2025, the first geological disposal facilities for spent fuel, high level waste, and other long-lived radioactive waste will be operating safely in Europe. Their commitment is:

– to build confidence in the safety of geological disposal solutions among European citizens and decision-makers;

– to encourage the establishment of waste management programmes that integrate geological disposal as the accepted option for the safe long term management of long-lived and/or high level waste;

– to facilitate access to expertise and technology and maintain competences in the field of geological disposal for the benefit of Member States.

1.4. Club of Agencies

The Club of Agencies is a group of European radioactive waste management organisations, set up to exchange information on all aspects of radioactive waste management. As waste management belongs to the core of their activities, the Club is very much interested in the developments on the subject of a possible EU instrument on waste management. In May 2010 a collective opinion of the Club of Agencies was sent to the Commission as a stakeholder contribution to the consultation process to this Impact Assessment, and is presented below.

[56] IGDTP, Vision document, October 2009, www.igdtp.eu

Collective opinion of the Club of Agencies in the Consultation Process for a Possible EU Instrument in the Field of Safe and Sustainable Spent Fuel and Radioactive Waste Management

1. The Club of Agencies (CoA) is a group of European radioactive waste management organisations, set up to exchange information on all aspects of radioactive waste management.

2. The club has 17 members:
   Belgium, ONDRAF/NIRAS
   Bulgaria, SE RAW
   Czech Republic, RAWRA
   Finland, Posiva Oy
   France, ANDRA
   Germany, DBE
   Hungary, PURAM
   Italy, Nucleco
   Lithuania, RATA
   Netherlands, COVRA
   Poland, ZUOP
   Romania, AN&DR
   Slovenia, ARAO
   Spain, ENRESA
   Sweden, SKB
   Switzerland, NAGRA
   United Kingdom, NDA

3. The CoA supports the initiative of the EC to set up a directive to maintain and to promote the sustainable management of radioactive waste and spent fuel.

4. The scope of the directive should be the management of all kinds of radioactive waste, low, intermediate and high level, short and long-lived, regardless of its origin and spent fuel. Naturally occurring radioactive material may be included when specifically declared as radioactive waste. All management stages and all waste management facilities should be included.

5. The directive should be addressed to all Member State countries, with or without nuclear reactors, as all produce radioactive waste.

6. The management of radioactive waste and spent fuel should respect the fundamental principles recommended by the IAEA and defined by the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

7. The waste produced in each country is the responsibility of each individual country. Each country is responsible to define a management policy for the waste produced and is responsible to define legislation and regulatory guidelines relevant to their waste. For joint programs a clear share of responsibilities on all aspects is necessary.

8. With regard to the financing of the management of radioactive waste and spent fuel the 'polluter pays principle' should be leading.

9. With regard to harmonisation of radioactive waste management within Europe, voluntarily co-operation in all relevant fields of research, development and operation should be encouraged.

10. The directive should ask for a clear description of the national policy, or policies, with regard to the management of radioactive waste and spent fuel.

11. An important element of the policy is that a dedicated body or bodies are identified that are responsible for the execution of the waste management policy and that are independent of the national regulator.

12. Based on the national legislation a plan or plans for the management of radioactive waste and spent fuel should be put in place.

13. The waste management plan should be updated regularly, preferentially in the same years that reporting under the IAEA Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive waste is required or in line with national updating requirements.

14. The waste management plan(s) should contain:
    - an inventory of radioactive waste and spent fuel and a forecast of the development of the inventory;
    - a description of the maintenance of data related to the waste during the total life cycles of the various types of waste and spent fuel;
    - a description of the total life cycles of the various kinds of radioactive waste and spent fuel until its final disposal;
    - a description of the management policies for the various waste types and spent fuel;
    - a description of all the actors and of their roles and responsibilities in the field of radioactive waste management;
    - a description of the legal framework in the field of radioactive waste management;
    - a planning table for all the steps needed in the management until final disposal. Options for siting mechanisms should be pointed out;
    - a description of the estimated costs and the funding mechanism.

15. The directive should be incorporated in the national legislation before a fixed date. This date should be realistic and should not give rise for unnecessary delays.

16. This collective opinion is endorsed by 17 members of the CoA.

1.5. Working Party on Nuclear Safety (WPNS)

In 2005 and 2006 the Council Working Party on Nuclear Safety (WPNS) consulted the EU Member States on the safety of nuclear installations and of spent fuel and radioactive waste management, and considered the various approaches taken up by Western European Nuclear Regulators Association (WENRA), Organisation for Economic Co-operation and Development / Nuclear Energy Agency (OECD/NEA), Joint Convention[57], the International Atomic Energy Agency (IAEA) Safety Standards etc. The Council Conclusions of 8 May 2007[58] acknowledged the great commitment of the stakeholders in the WPNS and its final report and the three sub-groups reports, in particular their recommendations and

[57] Joint Convention of the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, http://www-ns.iaea.org/conventions/waste-jointconvention.htm

[58] Council Conclusions of 8 May 2007 on Nuclear Safety and Safe Management of Spent Nuclear Fuel and Radioactive Waste, 8784/07

conclusions[59]. The Council sets out that each EU Member State should be urged "to establish and keep updated a national programme for the safe management of radioactive waste and spent fuel that includes all radioactive waste under its jurisdiction and covers all stages of management". It also supported the establishment of a High Level Group at EU level aimed at furthering a common approach in the safety of nuclear installations and of spent fuel and radioactive waste management.

1.5. Confrontations Europe

Confrontations Europe is a non-for-profit civil society organisation which gathers companies' managers, unionists, territorial players, members of the civil society, politicians, intellectuals and students from numerous countries in Europe, all committed to one idea: active participation of civil society for building of Europe. In 2008 the organisation welcomed the revised proposal for a Council Directive setting up a Community framework for nuclear safety and expressed their hopes "for a similar framework to manage nuclear waste"[60].

2. Public consultation

2.1. Open public consultation "Approaches for a possible EU legislative proposal on the management of spent fuel and radioactive waste

The public consultation was carried out over a period of eight and half weeks, from the 31st of March to the 31st of May 2010. In total 510 responses were received. It was published on the website "*Your voice in Europe*" and announced to a range of key stakeholders and EU Institutions. The General Principles and Minimum Standards for Consultation of Interested Parties by the Commission[61] were respected in the elaboration and presentation of this questionnaire.

The questions presented covered the following areas:

– The characteristics of the respondents and the specific identification of the participating public authorities and radioactive waste management organisations,

– The respondents' perception of the issue of spent fuel and radioactive waste management in their country of residence together with the main challenges to be addressed in this area,

– Their preferred approach towards EU legislation in this area and in particular, whether binding or non-binding legislation would result in the greater improvement of the national situation,

– Two options for possible binding EU legislation:

  - Option 1: Strengthening the international principles and requirements laid down by the IAEA Safety Standards and the Joint Convention,

[59] 15475/2/06 REV2

[60] Nuclear revival, nuclear safety: challenges for the European Union, Proceedings of two symposiums, numero 26, Paris, Brussels, 2008

[61] COM(2002)704

- Option 2: Additional action over and beyond that of option 1, adding some specific requirements to be considered in the Member States' national programmes for the management of spent fuel and radioactive waste.

Regarding option 1, the respondents were asked to identify, in their view, the most important principles and requirements for spent fuel and radioactive waste management. For option 2, a list of possible contents for the national programmes was presented, with the respondents being invited to identify their preferences.

– The means by which binding legislation could be implemented and in particular how national reports and peer reviews might contribute to this process

– The possible impacts of binding legislation.

– Additional proposals and comments.

Almost all of these questions were presented in a multiple choice format, facilitating a quantitative analysis. Only the section on additional proposals and comments was presented as an open question (*intended for a qualitative analysis*).

Profile of the respondents

The majority of respondents to the questionnaire were individuals (428), with the remainder being organisations or public authorities (82). Represented among the collective were, NGOs (35), Public Authorities (15), Waste Management Organisations (8), Producers of Radioactive Waste (11), Technical Services (3) and Others (10).

For the **individuals**, the majority (63.3%) could be defined as interested citizens having no direct professional involvement in radioactive waste issues, and 75.4% of these considered themselves to be "very well" or "fairly well" informed regarding spent fuel and radioactive waste policy in their country.

It was notable that 31.1% of the total responses emanated from Italy.

Contents of the answers – quantitative data

A significant majority of the **individual** respondents (69.6%) considered that the measures taken in their country for ensuring the safe management of spent fuel and radioactive waste were insufficient. They felt that in this regard, the main challenges to be address in their countries were:

– the lack of transparency,

– the lack of a permanent and safe solution for the disposal of high level waste and spent fuel,

– and the insufficient involvement of the public in decision-making processes.

These were also the three main concerns highlighted by **NGOs**.

For the **public authorities**, in addition to the challenges identified above, an important concern was the current absence of a comprehensive national program. For **radioactive waste**

management organisations, **producers of radioactive waste** and **technical organisations**, another important challenge to be addressed was the lack of clear political direction and decisions[62].

As a means to tackling the challenges identified above, 74.8% of the **individual respondents** believed in the need for a common approach within the EU. Of this group 77.6% favoured binding legislation in the form of an EU Directive as the preferred implementation route.

71% of **individuals** also considered that legal certainty would be enhanced should the principles of the IAEA Safety Fundamentals and the Joint Convention be integrated into Community legislation.

Radioactive waste management organisations, radioactive waste producers and technical service organisations responded similarly, with 75% supporting binding legislation.

The **NGO** response also showed strong support for binding legislation (88.6%), while support from **public authorities** (66.7%) was also very strong.

The **first policy option** presented for Community action was a strengthening of the internationally accepted principles and requirements laid down by the IAEA. The questionnaire identified a series of main principles and requirements and requested the respondents to identify those actions which they felt were important to be complied with.

82% of **individuals** agreed on the fact that, as a fundamental principle, Member States should protect future generations from the dangers of ionising radiation effectively.

Likewise, 63.3% of the **individual** respondents agreed that transparency arrangements should be implemented. Other requirements that were identified as "very important" were; ensuring the effective independence of the regulatory authority, applying the polluter pays principle and actively involving the public in the decision making process.

These opinions were similar to those of the **NGOs** and **public authorities**, although public authorities also regarded ensuring financial resources as paramount.

Radioactive waste management organisations, **radioactive waste producers** and **organisations providing technical services**, considered the establishment and maintenance of a national framework to be the most important issue to be addressed.

The **second policy option** proposed additional elements and issues as supplements to the existing IAEA principles and requirements, which would be implemented through the national programmes for spent fuel and radioactive waste management. In this regard, the respondents were asked which issues they felt should be included in the national programmes.

The majority of the **individuals** answered that national programmes should include an assignment of roles and responsibilities, and inventories of radioactive waste and spent fuel. They also considered that the proposal of plans and technical solutions as well as a description

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[62] Please note that in the questionnaire "lack of political decisions" and "lack of political, solution oriented leadership" were identified as two different challenges. The challenge in the first case is that no decisions are taken at all. In the second case, decisions may be taken, but they are not carried out effectively due to a failure in leadership or management.

of the decision making processes were also among the elements that should be included in the plans. The same priorities were highlighted by **public authorities**.

The **NGOs** additionally highlighted the issue of remedial actions for legacy waste and the identification and achievement of significant milestones as key issues, while **radioactive waste management organisations**, **radioactive waste producers** and **technical service organisations** focused on the cost assessments and the identification and achievement of significant milestones achieved, as being important.

When **individual respondents** were asked for their opinions on how to ensure compliance with binding EU legislation in the Member States:

– 50.7% were in favour of organising periodic international peer-reviews on the regulatory system,

– 47.2% were in favour of examining the national programmes through peer-reviews,

– 44.2% supported reporting to the Commission and Member States on the results of the peer-reviews,

– 37.1% welcomed the idea of describing the implementation of the legislative instrument in the national reports to be submitted at the Joint Convention's review meetings,

– while a minority (31.3%) supported reporting to the Commission separately, in addition to the Joint Convention's reports.

The **NGOs** expressed a desire (54.3%) to report separately to the Commission while **public authorities** (20%), and **radioactive waste management organisations**, **radioactive waste producers** and **technical service organisations** (37.5%) showed less support for this idea.

Radioactive waste management organisations, **radioactive waste producers** and **technical service organisations** were more reluctant towards the proposal for peer reviews on the regulatory system, preferring instead that they should be organised at the national programme level.

Some possible impacts of binding Community legislation were considered.

Many **individual respondents** agreed that the main outcomes would be:

– An enhanced safety and better management of radioactive waste and spent fuel,

– Enhanced legal certainty,

– The avoidance of unjustified delays for disposal solutions,

– And increased public involvement in the decision making process.

NGOs were in general agreement with this view, adding that there would be an enhancement in the political will with regard to national decision-making,

Radioactive waste management organisations, **radioactive waste producers** and **technical service organisations** also highlight similar themes, while **public authorities** were

concerned about the substantial additional human and financial resources that would be required in order to establish such national programmes and to comply with the associated new obligations.

Comments and suggestions to the open question

Regarding the open question, 186 suggestions and opinions were received, 128 of them coming from individuals, 26 from NGOs and the remainder (32) from authorities, waste management organisations, waste producers, technical services and others.

Many of the comments received from **individual respondents** expressed an outright opposition to nuclear energy (57). Many suggestions indicated a desire for increased transparency and involvement of the public in the decision-making processes as a pre-requisite to achieve the necessary confidence in radioactive waste management (24).

Some questioned the acceptability of disposal of radioactive waste as an acceptable solution (14) and underlined the polluter-pays principle at EU level (14).

A number of respondents expressed serious concerns that safe radioactive waste management could not be assured at the national level and as such it was an issue to be handled at the EU level (14).

Other common suggestions received were:

– the need to increase the activities of research and development in the area (12),

– the need to increase safety and security (9),

– and the need to introduce a ban on the export of radioactive waste from the EU to third countries (5).

The **NGOs** shared some of the views expressed by individuals, mainly the fundamental opposition towards nuclear energy (13), and the need to apply the polluter pays principle (14) and improved transparency arrangements (9).

6 NGOs expressed their disagreement with the idea of disposal of nuclear waste in geological repositories as an end-point for radioactive waste management. Instead, they suggested an increase in research into long-term storage alternatives should be prioritised.

Other concerns included

– the need to increase nuclear safety by applying the best available technologies (8)

– the need to ensure the effective independence of regulatory bodies and/or the radioactive waste management organisations (4)

– and the need to take into consideration the documents on radioactive waste management, produced by the European Nuclear Energy Forum ENEF (4).

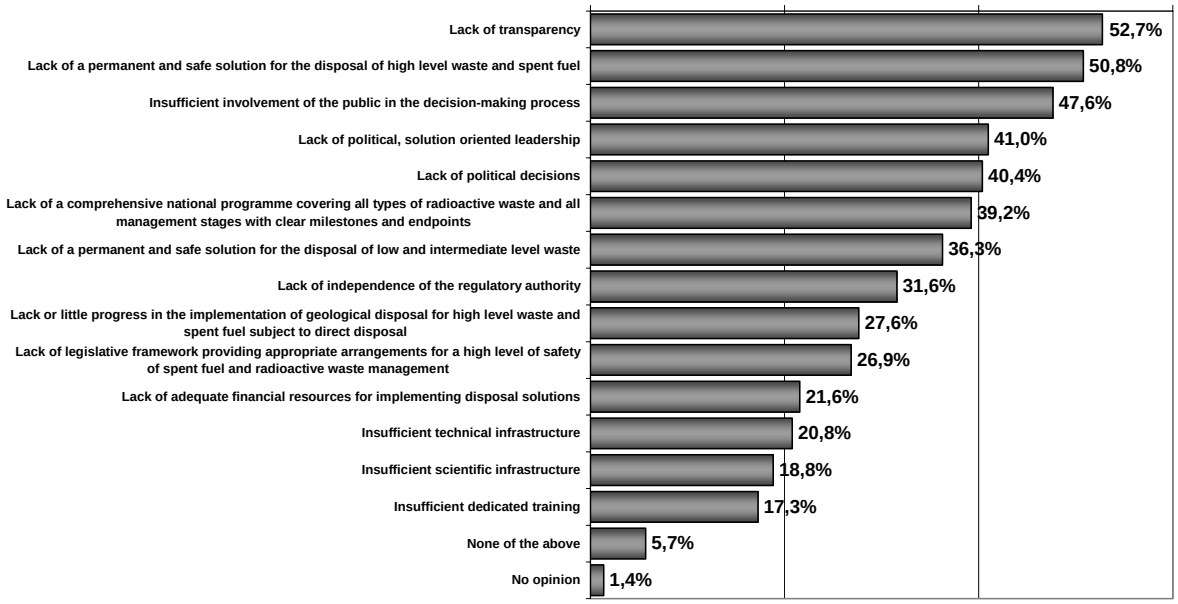
Other concerns voiced by Radioactive waste producers, radioactive waste management organisations, national authorities and others were

– the need to improve the provision of adequate information (7),

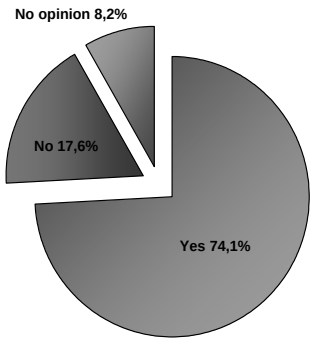
– and the problem of an overload of work and a duplication of tasks at IAEA and EU instances (5).

Some of the answers received are represented in the following charts –the values reflected in these charts refer to the total amount of answers received, without differentiating among individuals, NGOs, public authorities, etc.

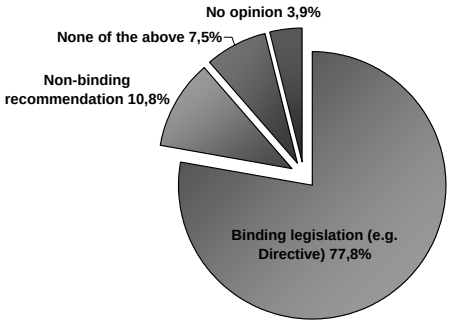
What are the main challenges related to the spent fuel and radioactive waste management with which your country is still confronted?



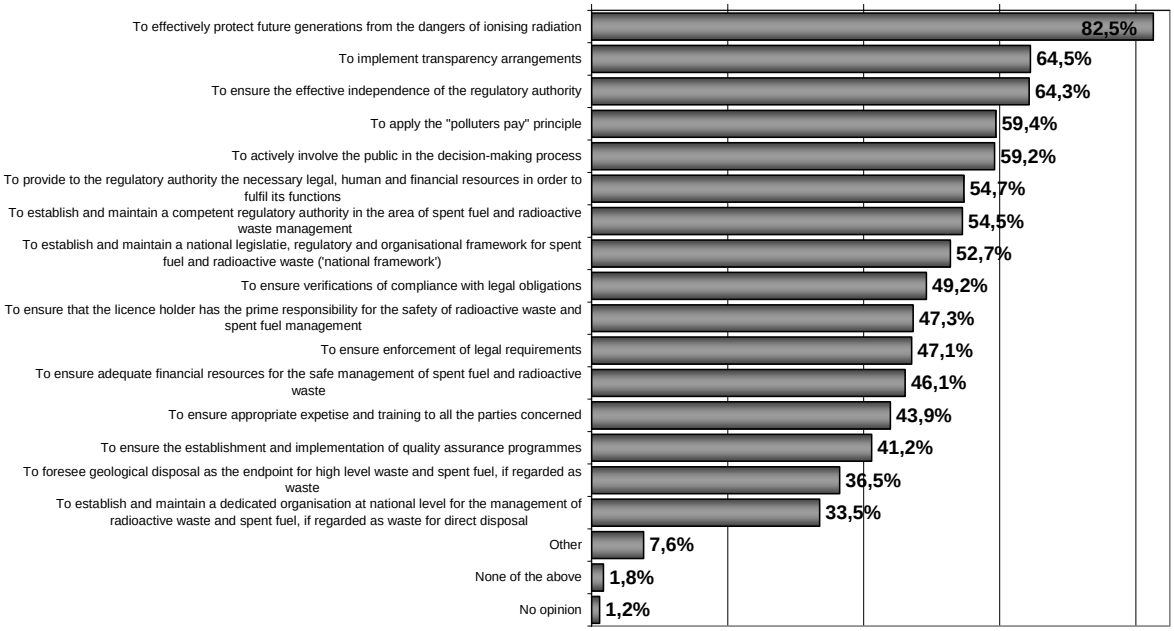
Do you consider that a common approach of all the 27 EU MSs is needed for tackling the challenges?



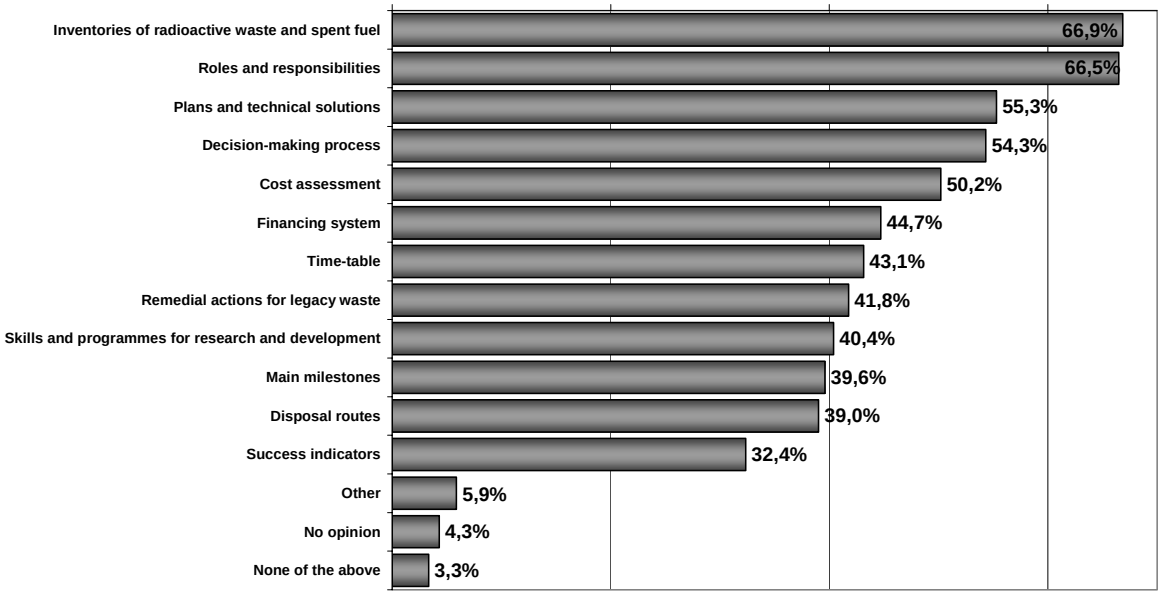
What would be your preferred instrument of Community intervention?



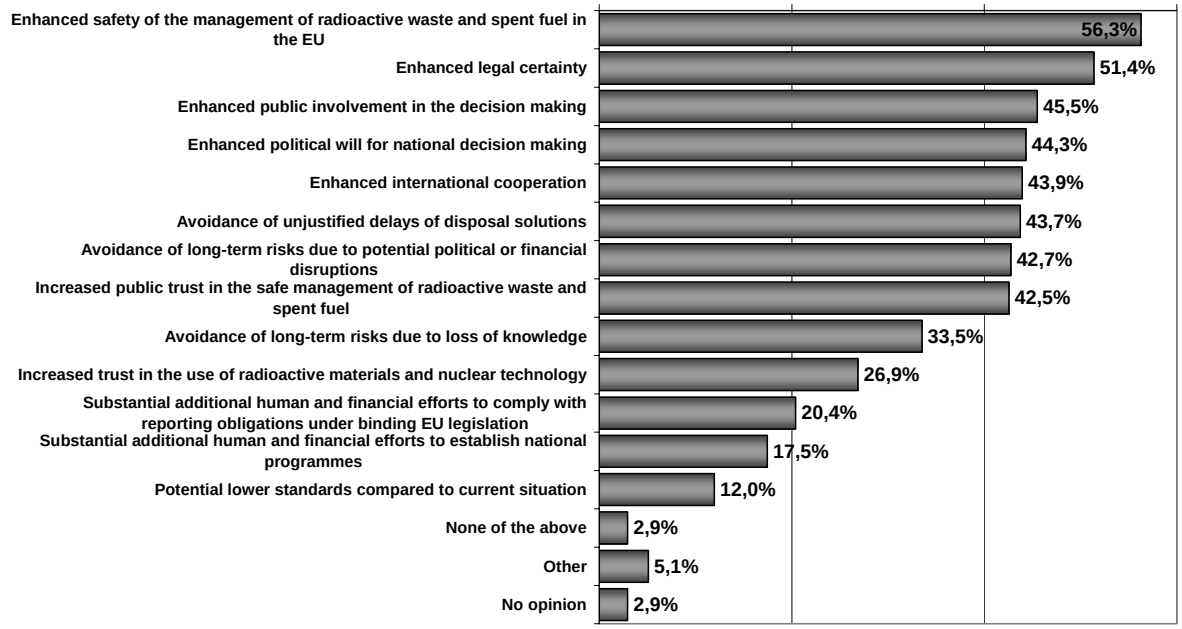
Option 1 - Which are the fundamental principles and requirements that MSs should comply with under this policy option?



Option 2 - Which elements should be included in the national programme for spent fuel and radioactive waste management?



As to potential impacts, which of the following would you expect?



Additional opinions received

A number of individual contributions have been received in response to the open public consultation.

Greenpeace sent opinions to the open consultation through their different Campaigns in UK, Germany, the Netherlands, France, Greenpeace Nordic and EU Unit. Their comments can be summarized as follows:

– Criticism towards the questionnaire for being too simplified and having deadlines for responses which were too short (Greenpeace UK-EU). Greenpeace UK also suggested some amendments that could be made to the questions.

– Outright opposition to nuclear power generation with the pre-condition for any discussion on a solution for radioactive waste management being the immediate termination of any nuclear power activity, thus stopping the generation of new radioactive waste. In this regard, Greenpeace UK highlighted that it is not acceptable to couple the development of "final solutions" for radioactive waste with the social acceptance for nuclear new build.

– Opposition to spent fuel reprocessing and all related activities, including transport of reprocessed material or of spent fuel for reprocessing (Greenpeace NL and EU Unit).

– Application of the environmental principles of the EU Treaty and secondary legislation[63] to the management of radioactive waste, which would result in an abandonment of the nuclear power generation (Greenpeace EU Unit).

63 The legislation referred to is: Directive 2006/12/EC on conventional waste, Directive 91/689/EEC on hazardous waste, Directive 2008/105/EC on environmental quality standards in the field of water policy, Directive 2008/1/EC on integrated pollution prevention and control, Directive 2002/95/EC on

– In particular, the environmental rights of public information, public participation and access to justice should be guaranteed in any legal instrument dealing with radioactive waste management (Greenpeace EU Unit).

– Emphasis should be given to the polluter pays principle and all aspects dealing with decommissioning funds. This was particularly highlighted by Greenpeace UK, who enclosed a series of questions addressing the issue of nuclear decommissioning funding (in the UK in particular).

– The request for the radioactive waste to be kept at its place of origin (in the sites and countries where it is generated), thus minimising the transport of spent fuel or radioactive waste. This would require two legislative changes: a ban of any radioactive material exports from the EU (Greenpeace EU Unit), and a prohibition on the development of regional repositories within the EU (Greenpeace NL).

– The various Greenpeace Campaigns strongly encouraged the Commission to disregard geological repositories as a possible disposal solution for radioactive waste. Instead, EU initiatives should focus on the research and development towards the improvement of intermediate storage solutions, applying the best available technique and ensuring the retrievability of radioactive waste at any time.

– The Greenpeace EU Unit and the Belgian Campaign also stressed the importance of having fully accountable and independent authorities involved in radioactive waste management. This would include not only national nuclear regulators, but also radioactive waste management organisations, which, in the view of Greenpeace should also be functionally independent and separate from radioactive waste producers.

– Adopt EU common definitions for radioactive waste in accordance with the EU definition for conventional waste, i.e. considering all the residues from enrichment and reprocessing activities as "radioactive waste" (Greenpeace France, Belgium and EU Unit). The Greenpeace EU Unit emphasised that radioactive waste should not be treated in a less stringent manner than other hazardous waste.

Friends of the Earth Europe agrees in general terms that the EU needs to play a role in radioactive waste policies, and an EU initiative in this regard offers the possibility to improve the current situation. They stress the need for transparency and to ensure the polluter pays principle and consider that the minimum requirements for the proposal should be, a clear methodology applied when preparing final radioactive waste solutions (be it geological disposal or not); a ban on exports of radioactive waste; a ban on reprocessing, partitioning and transmutation before disposal; and the phase-out of nuclear power as a precondition to the search for nuclear waste solutions.

Fairlie Community Council, which is an association of neighbours close to the nuclear power plants Hunterston A and B (UK), expressed their objection to the proposal to dispose of intermediate level waste, rather than store and monitor it. They opposed any radioactive materials going into landfill and the transport of external waste to Hunterston.

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the restriction of the use of certain hazardous substances in electrical and electronic equipment and the Community Strategy Concerning Mercury {SEC(2005) 101}

Nuclear Free Local Authorities from the UK and Ireland rejected the concept of geological disposal and called for a phase out of nuclear power generation, radioactive waste minimisation, reduction of the transports of radioactive material and ban of any discharges of nuclear origin in the environment. The **Shetland Islands Council** sent a separate letter echoing the views of Nuclear Free Local Authorities, in particular with their opposition to geological disposal.

Radiation Free Lakeland, a NGO based in Cumbria (UK), expressed its concern about the safety of the radioactive waste management at Sellafield and its opposition to the disposal of radioactive waste.

The **Scottish Councils' Committee on Radioactive Substances (SCCORS)** stated that "Any Directive provisions requiring the adoption of deep geological disposal policies would be in conflict with current Scottish Government policies" and stressed the importance of applying the polluter pays principle to radioactive waste management.

The **Swedish NGO Office for Nuclear Waste Review, MKG,** indicated that the Swedish radioactive waste management policy should not be regarded as a model for the EU due to the existence of a number of unresolved challenges. They stressed the importance of relying upon independent regulators, the need to comply with the polluter pays principle and to implement transparency arrangements, as well as their concerns regarding the consideration of geological disposal as an end-point for radioactive waste management.

The NGOs **Terra Mileniul III** from Romania and **Energia Klub** from Hungary issued a common opinion in favour of developing EU binding legislation on spent fuel and radioactive waste management, highlighting in general terms the same principles indicated above (polluter pays, transparency, etc.). They also expressed their opposition to the deep geological disposal of radioactive waste.

A letter by **a member of the Royal College of Physicians of London**[64] stressed the fact that neither storage nor disposal should be imposed at EU level as long as the issue of high level waste management remained unresolved.

The company **ENEL** strongly supported the development of EU legislation in the domain of spent fuel and radioactive waste management, stressing the point that neither the IAEA safety standards nor the Joint Convention were directly enforceable within the EU. Member States' national programmes should aim to strengthen these standards with disposal as their ultimate goal and should report to the Commission, including any progress made. Adequate public communication should be ensured through independent monitoring. The decommissioning funds should be managed through contributions by the operators, "*fixed in a transparent manner by an independent body and regularly reviewed during the lifetime of the nuclear plant following continuous consultations with nuclear operators*". Finally, for the sake of a clear assignment of responsibilities, *"it should be established* when *the "title to" and "liability for" an operator's waste should be transferred to the Government or other bodies".*

The waste management organisation **TVO Finland** also sent a letter in this frame, which provided an example of how the radioactive waste (in the particular case of waste from the

64 Dr Carl Iwan Clowes, FFPH Royal College of Physicians, London. This letter does not represent the opinion of the whole College of Physicians.

nuclear power plant Olkiluoto 3) could be managed in a way that would satisfy the needs and requirements of all parties involved.

The nuclear industry represented by **FORATOM** submitted a paper on the wider context of the Public Consultation "*Towards a new Energy Strategy for Europe 2011-2020*". FORATOM expressed its support to the current debate on future EU legislation on radioactive waste management taking into account the existing arrangements for ensuring safe radioactive waste management, both at national and international level, that in the opinion of FORATOM, have until now, delivered excellent results. The upcoming EC legislative proposal should aim to provide an EU legal framework for all Member States and should therefore encourage progress to be made in this area. Whilst several technical solutions for the management of spent fuel and high-level radioactive waste exist, there is a consensus on the need for deep geological repositories.

2.2. Special Eurobarometer surveys

The Eurobarometer is a major policy instrument that enables citizens' views to be taken into account in the framing of EU policies and initiatives. In order to examine European citizens' attitudes towards radioactive waste, DG TREN launched a special Eurobarometer survey in 2008. It was carried out in February and March 2008 and the report was published in June 2008[65]. Almost 27 000 EU citizens in all the 27 Member States were interviewed face-by-face. This survey is a follow-up to three previous surveys conducted in 1998, 2001 and 2005. It reveals that an overwhelming majority of European citizens sees an urgent need to finding solutions for management of high-level waste now, rather than leaving it unsolved for later generations. European citizens consider the Member States to be fully responsible for the management of their own radioactive waste according to a management plan specifying fixed deadlines and clearly want to be directly informed and given an opportunity to be involved in the decision-making process. At the same time they clearly want the EU to play an active role in managing radioactive waste through monitoring of national practices and programmes and development of harmonised and consistent methodologies.

A new Special Eurobarometer on nuclear safety was carried out in 2009 and the report was published in April 2010[66]. The results reveal that the issue of radioactive waste management remains a major concern associated with the use of nuclear energy, and that a large majority of Europeans believe it would be useful to have European legislation regulating waste management within the European Union and their national territory.

3. External expertise

A dedicated study on Regulations Covering Radioactive Waste Disposal in EU Countries[67] finalised in 2006 has been considered in the preparation of the current Impact Assessment. The consultant, DECOM (Slovakia), provided assistance in order to advise the Commission on how waste disposal regulations might be better harmonised between the Member States. The advice given is based upon a review and comparison of policies, legislation and regulation, as well as discussions with and feedback from regulatory representatives in Member States. The approaches of the International Atomic Energy Agency (IAEA), Western European Nuclear Regulators Association (WENRA), Organisation for Economic Co-

65 Special Eurobarometer 297 (2008)
66 Special Eurobarometer 324 (2010)
67 TREN/04/NUCL/S07.39027

operation and Development / Nuclear Energy Agency (OECD/NEA) and Working Party on Nuclear Safety **(**WPNS) were also considered. The specific goals were to identify key issues of interest to national stakeholders, to consider whether increased harmonisation in the relevant areas would be beneficial, to propose any special Commission initiatives that would help resolving any open issues and to provide specific suggestions for input to potential legislation.

The study recommended to the EU to consider harmonisation of national policies and strategies for radioactive waste management at general level, such as a requirement each Member State to have a clearly defined policy and means of implementing it within a defined programme with realistic timescales. In respect of "the need for an overarching Waste Directive", the conclusion and recommendation of that study is that the requirements should focus on ensuring adequate safe and secure storage facilities are available for all waste arising, that disposal programmes continue to move ahead and that protected funds are accumulated in order to finance the repositories when they are needed.

ANNEX 3: NATIONAL APPROACHES FOR MANAGEMENT OF RADIOACTIVE WASTE AND SPENT FUEL IN THE EU[68]

Table 1. National policies and practices (the information is valid to the end of 2008)

country	VLLW (if applicable) & LILW	HLW / SF
Austria	Interim storage of conditioned waste (LILW) at the Research Center Seibersdorf. Study in 2001 concluded that surface disposal was not an option in view of the presence of long-lived waste. However, in view of the small quantities a regional solution is the preferred option	-
Belgium	Interim storage of conditioned waste at the Belgoprocess site in Dessel pending the availability of a disposal site. Surface disposal repository planned for Dessel, with construction commencing around 2011.	Storage at the Belgoprocess site of returned vitrified waste from reprocessing at La Hague. SF is now being stored in AFR facilities on NPP sites – current policy is a moratorium on further reprocessing contracts. However both open and closed fuel cycle scenarios are considered. Underground research continuing at the HADES facility at Mol concerning the concept of deep geological disposal in clay. Construction of a deep geological repository would not start before 2025, with possible operation around 2040. The WMO is a member of ARIUS and participated in the SAPPIERR project.
Bulgaria	Processing of all waste. Construction of a national near-surface repository for LILW-SL (both institutional and from NPP) by 2015. The repository should assure storage of waste not suitable for near surface disposal.	Transfer of SF for storage and reprocessing in Russia with HLW return, under terms of 1995 agreement. SF can be declared waste if a disposal route is available. Storage of SF in reactor ponds and wet store at Kozloduy. Dry store to be commissioned around 2009, which can store both SF and HLW (after return from Russia). Decision on HLW disposal concept around 2012. Bulgaria participated in the SAPIERR project.
Czech Rep.	Treatment and conditioning of all waste, disposal in one of the operation disposal sites or safe storage of waste that can not be deposited in the existing repositories.	Long term interim storage of all SF pending the availability of a disposal route. The national management strategy does not foresee a deep geological disposal site in operation before 2065. Six possible locations have been identified. It is anticipated a deep repository will accommodate all the waste that can not be deposited in near-surface repositories, SF once it is declared as waste and HLW from decommissioning.

[68] Sixth Situation Report on Radioactive Waste and Spent Fuel Management in the European Union, COM(2008)542 final and SEC(2008)2416

country	VLLW (if applicable) & LILW	HLW / SF
Denmark	Interim storage of conditioned waste at Risø National Laboratory. Repository concept under development. "Basis for Decision" outlining development expected to be approved.	International solution being sought for small amount of SF remaining in line with earlier solutions regarding SF from research reactors.
Estonia	All waste from the decommissioning of Paldiski and from institutional sources is conditioned for long-term storage at Paldiski pending the availability of a disposal route.	None (all SF from the Paldiski training reactors was returned to Russia)
Finland	Routine disposal of operational NPP waste in underground (intermediate depth) repositories at the two NPP sites.	SF stored in AFR facilities on NPP sites. The Decision in Principle by the Finnish Parliament in 2001 endorsed the selection of Olkiluoto as the site for the development of a deep disposal facility, subject to approval by the regulatory authorities. The repository is planed for operation around 2020. Posiva is now constructing the underground research facility Onkalo, which is planned to be part of the planned repository.
France	Routine disposal of short-lived LILW at the Centre de l'Aube facility. Centre de Morvilliers opened in 2003 for disposal of VLLW. Long-term storage of conditioned LILW-LL pending development of disposal solution	Routine reprocessing of most, but not all, SF. Unreprocessed SF is stored at La Hague. Deep geological disposal of HLW, based on investigations in Bure underground laboratory. Decision on a site expected by 2015, with operation of a repository by 2025.
Germany	In line with its objective to dispose of this waste in deep geological formations, the Federal Government is not pursuing any plans for near-surface repositories. After the dismissal of court cases against the licence issued for the Konrad repository in 2002, covering non-heat developing waste, work has started to transform the former iron ore mine into a repository. Disposal operations are planned to start at the end of 2013.	Returned vitrified waste following reprocessing of SF at La Hague or Sellafield is stored at Gorleben. Final transport of SF for reprocessing took place in 2005. No further contracts are allowed All new generated SF is placed in dry stores adjacent to NPPs, until availability of deep geological repository. The Federal Government is aiming to establish a repository in deep geological formations for the disposal of all kinds of waste, including spent fuel assemblies, by the year 2030.
Greece	Wastes are stored at the NCSR Demokritos and in users' premises under GAEC inspection.	SF return to supplier state

country	VLLW (if applicable) & LILW	HLW / SF
Hungary	Institutional LILW-SL waste still to be disposed of at Püspökszilágy, though spare capacity is limited. An underground repository (200m) for NPP operational and decommissioning LILW waste is under construction at Bátaapáti, to be operational by 2008.	Long term interim storage of all SF in AFR facility pending the availability of a disposal route. The reference scenario is domestic direct disposal in deep geologic repository, although other scenarios are kept open. The current target is to finalize URL by 2012, with possible SF/HLW repository operation by the end of the 2040's (candidate site at Boda). PURAM is a member of ARIUS and participated in the SAPIERR project.
Ireland	The small quantities of waste are stored on site by users.	-
Italy	Wastes to be conditioned and stored at point of origin. A national disposal facility is foreseen for VLLW and LILW-SL. As yet no timetable for implementation, although the stated aim of decommissioning all facilities by 2020 will require the availability of a disposal option.	All remaining SF stored in NPP ponds and will be exported for reprocessing. A centralised store for the HLW returned is envisaged. In principle HLW and any remaining SF will be disposed of in a deep geological disposal. Italy participated in the SAPIERR project and participates in SAPIERR II.
Latvia	Wastes from decommissioning of Salaspils will be disposed of at Baldone, which is currently being expanded. LLLW-LL stored pending availability of deep repository (national or regional); Latvia participated in the SAPIERR project.	SF from the research reactor at Salaspils is planned to be moved out of Latvia in the framework of USA–IAEA–Russia co-operation project and proposed Latvia–Russia governmental Agreement on co-operation in the spent fuel management.
Lithuania	VLLW disposal facility currently under construction. Confirmed site for disposal of LILW-SL at Stabatiškė, in the vicinity of the Ignalina NPP. The design work is to start in 2008, the construction in 2012, and the near-surface repository is to be commissioned in 2015. Initial investigations for an intermediate-depth repository for waste not acceptable for near-surface disposal.	SF categorized as radioactive waste. Storage in dry store for at least 50 years prior to disposal in deep geological repository. Some initial investigations have taken place. Lithuania participated in the SAPIERR project and participates in SAPIERR II.
The Netherlands	Long-term interim storage of conditioned waste at the COVRA facility in Borssele. (Near) surface disposal option not considered.	All SF to be reprocessed and vitrified wastes returned and stored in the HABOG facility at Borssele. Current policy is long-term interim storage (100 years) prior to a definitive decision. Participated in the SAPIERR project and participates in SAPIERR II.
Portugal	Interim storage at the DPRSN facility at Sacavém.	Small quantities of HLW stored at Sacavém. All research reactor spent fuel returned to USA.

country	VLLW (if applicable) & LILW	HLW / SF
Poland	Disposal of Institutional LILW at the Różan facility, together with interim storage of long-lived waste. Some siting activities have taken place for a replacement repository, but have stalled due to lack of local support at the concerned sites.	SF is in temporary pond storage at Swierk from research reactors. Placement of this material into dry storage is underway, financed by state budget and under PHARE.
Romania	Disposal of institutional short-lived waste at Baita Bihor site. NPP operational wastes to be disposed of in near surface repository, planned to be built till 2014. Conditioning of LL-LILW and storage minimum 50 years prior to deep geological disposal together with SF.	Open fuel cycle, SF considered as radioactive waste. Six years wet storage at NPP, followed by minimum 50 years in Spent Fuel Dry Store. Deep geological disposal in a national repository that should be available around 2050. Regarding the SF from research reactors – return to the country of origin and/or deep geological disposal in the national repository.
Slovakia	All suitable wastes are sent to the Mochovce facility for disposal (both institutional and NPP operational waste). VLLW disposal facility under consideration. Wastes not suitable for Mochovce stored pending availability of deep geological repository.	Storage of SF for 50 years followed by deep geological disposal. Other alternatives are also considered. A proposal for back-end fuel-cycle policy is expected in 2007. As yet there is no timetable for repository development. Slovakia was represented in the SAPIERR study and is represented in SAPIERR II as well.
Slovenia	All waste currently being stored – mainly at Krško NPP – pending the availability of a national repository. The site should be determined around 2008, with operation around 2013.	All SF is currently stored in the AR pond at Krško NPP – there is sufficient space for the projected reactor lifetime. Current plans include operation of a dry store from 2023, with an operational deep geological repository around 2065, although export is also considered.
Spain	Routine disposal of VLLW and short-lived LILW at the El Cabril facility. VLLW repository at El Cabril available since July 2008. LILW-LL stored pending availability of a deep geological repository.	The GRWP in force considers as a basic element of the reference scenario an open cycle strategy. Since 1982 all SF is currently stored in AR fuel ponds; except at Trillo NPP, where a dry cask AFR storage has operated since 2002. Some vitrified waste is due to be returned from France around 2010 by the reprocessing of the SNF from Vandellos 1 (Gas Cooled Reactor). GRWM plan assumes the availability of a central SF store around the same time and a HLW / SF repository around 2050.

country	VLLW (if applicable) & LILW	HLW / SF
Sweden	Routine disposal either in surface facilities at nuclear sites (VLLW) or in SFR-1 underground facility close to Forsmark NPP (LILW-SL). Planned disposal of decommissioning waste in an extension to SFR-1 with operation in 2020. A repository for LILW-LL will be sited in about 2035.	All SF is stored centrally in the CLAB facility at Oskarshamn. The WMO is proceeding with detailed site investigations at two possible deep disposal sites, with the approval of the local municipalities and the government. Site selection is expected around 2008, with repository operation around 2018.
United Kingdom	Routine disposal of LLW at the Low Level Waste Repository near to the village of Drigg in Cumbria. Plans exist for surface repository at Dounreay for LLW wastes from that site. LILW-LL is stored at the sites of production and is being progressively conditioned into a form suitable for long-term management. LILW-LL will be disposed of in a deep geological repository.	All remaining Magnox fuel will not be reprocessed until 2016 or later. AGR reprocessing contracts will be fulfilled by 2011, leaving 3500 te AGR and 1200 te PWR fuel in storage. Since 2006, official policy for HLW is deep geological disposal, together with the appropriate long-term storage.

Table 2. National financing schemes for radioactive waste (the information is valid to the end of 2008)

country	basis for allocation of charges to waste producers	mechanisms for financing longer term liabilities[69]
Austria	A price list updated annually, and approved by the regulatory authority, includes the actual cost of waste management (transport, treatment, conditioning, interim storage) payable to Nuclear Engineering Seibersdorf GmbH	Since the beginning of 2003, all holders of radioactive waste and orphan sources for disposal are obliged to make contributions to a fund for final disposal. Users have to pay this fee to WMO. WMO regularly transfers the collected fees to the Federal Ministry of Agriculture, Forestry, Environment and Water Management, where this fund has been separately set up for the exclusive purpose of the later final disposal of the conditioned radioactive waste.
Belgium	'Polluter pays' principle: Costs are waste category specific and proportional to the volume within each category.	WMO is responsible for the management of all radioactive waste in Belgium and, all radioactive waste has to be transferred from the producer or owner to WMO. Upon transfer, the producer or owner pays to WMO the amount which covers the future management costs. These provisions are managed by WMO.
Bulgaria	SF management cost included in NPP operation. Waste management activities carried out by SERAW; budget is covered by national fund.	Segregated external funds were created in 1999 to cover decommissioning and waste liabilities. Under the 2003 Regulation funds are collected from radioactive waste producers and managed by the Ministry of Economy and Energy in a dedicated fund. Funds allocated to cover the annual activity programme. Some activities are financed by EU under PHARE and also through the Kozloduy International Decommissioning Support fund (KIDSF).
Czech Rep.	Payments are made into the Nuclear Account and cover all of activities connecting with SF and waste disposal and repository operation. Small producers pay on acceptance of their waste for disposal.	State-controlled segregated fund – the Nuclear Account – receives contributions from waste producers including the nuclear operator who pays levies according to the average production of electricity. Each producer pays according to his share of the total waste and the estimated costs of the WMO's activities, which are updated according to economic or waste management policy changes. The WMO is responsible for collecting these charges, monitors the adequacy of the reserve and approves any withdrawal. A segregate decommissioning reserve is created.
Denmark	Fees charged for items received from outside Danish Decommissioning	State support as the major costs will arise as a result of the decommissioning of the research facilities at Risø.

[69] WMO means Waste Management Organisation

country	basis for allocation of charges to waste producers	mechanisms for financing longer term liabilities[69]
Estonia	Payment is made by waste producers at the time of transfer of their waste into interim storage. At present, no distinction in charges is made between different types of waste.	State pays for "historical waste" liabilities such as the former soviet nuclear naval training facility at Paldiski and its implementation were entrusted to the Estonian Radioactive Waste Management Agency (A.L.A.R.A.).
Finland	The nuclear power companies and the operator of the research reactor present annual cost estimates for the future management of nuclear wastes and ensure that funds are deposited with the State Nuclear Waste Management Fund.	According to the Nuclear Energy Act the licence holder has an obligation to take responsibility for all nuclear waste management measures and their appropriate preparation (including decommissioning costs), and shall cover all the related expenses. This is done by gathering adequate funds for future investments in an independent Finnish State Nuclear Waste Management Fund. To guarantee against the insolvency of the nuclear utilities, they shall provide securities to MTI for the part of financial liability which is not covered by the Fund.
France	Unit volume (or commercial tariff for specified packages) on delivery for disposal.	For VLLW and LILW-SL disposal is financed through commercial contracts between the producer and ANDRA. For LILW-LL and HLW waste producers build up provisions on the basis of an evaluation by ANDRA. The regulatory situation and organisation of nuclear decommissioning and waste management in France underwent profound change in 2006 with the adoption new legislation on nuclear waste research and management. ANDRA has to set up an internal restricted fund in order to finance the storage of long lived high and medium level wastes. The fund will be fed by contributions from the nuclear operators under bilateral conventions. The nuclear operators will set up internal restricted funds covered by dedicated assets managed under separate accountability.
Germany	State bears the cost for the initial development of repositories. These costs are recovered through contributions (cost per unit volume) or advanced payments.	For privately owned nuclear facilities i.e. NPPS provisions are allocated to the foreseen costs. Provisions for management of radioactive waste from operation are made according to the waste generated. For publicly owned facilities costs are finance d through the annual public budget.

country	basis for allocation of charges to waste producers	mechanisms for financing longer term liabilities[69]
Hungary	Official tariff list set by ministerial decree for small producers.	The Central Nuclear Financial Fund, a separate Treasury account made up of the contributions of the nuclear power plant operator, will cover all future waste management and decommissioning costs. Annual payments into the fund by Paks Nuclear Power Plant are proposed by the Minister supervising the Hungarian Atomic Energy Authority (HAEA). Payments are based upon submittals prepared by the PURAM and approved by the HAEA and by the Hungarian Energy Office.
Italy	Official current estimate € 7 000 / m^3 forms basis of estimate for waste management liabilities.	ENEL transferred its long-term liabilities fund for decommissioning and waste management (about €750 million) to SOGIN on its creation. As these were judged insufficient an additional levy per kWh, adjusted every 3 years has been implemented. The levy is fixed by the National Authority for the Electricity and Gas on the basis of Sogin's annual program of activities.
Latvia	Fees collected by BAPA for management services as well directly from state budget.	Natural resource tax payable on radioactive substances imported, which generate waste requiring disposal in Latvia. Additional disposal vault and storage facility at Baldone funded under PHARE.
Lithuania	NPP operator contributes to the national fund for the decommissioning of Ignalina NPP. Other waste producers contribute through charges to the finances of RATA.	NPP operator and other waste producers contribute through charges to the finances of RATA, which is responsible for managing all waste according to the national strategy. There are also national and international funds for the decommissioning of Ignalina and management of the wastes. The NPP decommissioning fund is financed through a levy of 6% on the price of electricity sold. It co-finances waste management activities with the Ignalina International Decommissioning Support Funds.
The Netherlands	For LILW: treatment, volume and radiation level of conditioned waste. For HLW: reserved capacity (volume).	For waste management and final disposal funding the operators pay volumetric fees to Central Organisation for Radioactive Waste (COVRA). COVRA then takes over full title of the waste (i.e. ownership and liability).
Poland	Funds available through state budget or from services carried out by RWMP.	No arrangements currently for some long-term activities These will be provided from the state budget as required.
Portugal	Part of estimated cost per item of waste.	None. Portugal has no relevant activities or installations in the nuclear field.

country	basis for allocation of charges to waste producers	mechanisms for financing longer term liabilities[69]
Romania	Annual allocation of charges to waste producers (to cover operational costs of the new WMO called ANDRAD).	The Government Ordinance 31/2006 defines two segregated funds; one for spent fuel and radioactive waste management and the second one for decommissioning of nuclear facilities. The funding mechanism is scheduled by the end of 2007 (plan: pay a fee based on a certain amount per MWh of electricity delivered).
Slovakia	NPP operational wastes management funded from operating budget.	A national fund has steadily built up since the mid-nineties. The State Fund for Decommissioning of Nuclear Installations and Management of Spent Fuel and Radioactive Wastes restructured in 2004. The fund is managed by the Ministry of Economy. Annual contributions by NPP operators are as a levy on the electricity price to the end user. The contributions are reviewed at five year intervals. There is co-funding of activities with the Bohunice International Decommissioning Support Fund.
Slovenia	Small waste producers (medicine, industry and research) pay ARAO for services provided on the basis of a price list established by government decree.	The Fund for the Decommissioning of the Krško NPP is financed through a levy on the kWh electricity production. The purpose of the Fund is to collect money as a levy on the produced electricity for future decommissioning and for the disposal of radioactive waste and spent fuel. The Fund operates as an independent legal entity and its work is overseen by a Supervisory Committee.
Spain	The National up-front Fund for the activities contemplated in the General Plan for RWM and Decommissioning is being done through incomes collected during the facilities lifetime based on cost estimations. Costs estimations are subjected to annual revision by the Government.	According to the Royal Decree 5/2005 an updated financing system has been set up. The revenues transferred to the Fund arise from: The amounts collected via the supply and access tariffs for the entire electricity sales. Billing to NPPs licensees for the amount resulting from multiplying the gross KWh monthly generated by each plant by a specific unit value, applicable to waste and SF originated beyond 31st March 2005. Idem to 2 referring to the Juzbado Fuel Assemblies Manufacturing Plant by annual contributions. Billing to the licenses of radioactive installations outside the nuclear cycle via tariffs approved by the MITyC. This case invoicing is done when the waste is collected by ENRESA.

country	basis for allocation of charges to waste producers	mechanisms for financing longer term liabilities[69]
Sweden	Costs for operational LILW disposal are paid for directly by producers. Costs for management of spent fuel and long-lived LILW are levied on power generators (i.e. waste producers) by means of fees on generated electricity.	The Nuclear Waste Fund administrated by a special Board and invested with the Swedish National Debt Office, though SSM (regulator) advises Government, on the basis of an estimate made by SKB, regarding the size of the fees and must approve the main disbursements. The fees are reviewed annually. Additional guarantees are requires to cover early closure of NPPs (< 25 years operation) and unforeseen and unforeseen waste management costs. The funds are set up as external segregated funds with considerable oversight especially with respect to fund investment.
United Kingdom	Charges are levied by waste managers on waste producers for disposal of Low Level Radioactive Waste (LLW). For higher level wastes, no charges are levied at present, there being no disposal facilities available	Historic liabilities (previously owned by BNFL and the UKAEA) assumed by NDA will be funded through a combination of continued commercial operation of some facilities and the state budget. The NDA's strategy for dealing with radioactive waste is dependent on the outcome of reviews initiated by the UK Government. British Energy has its own segregated fund to cover its own liabilities.

ANNEX 4: WASTE AND SPENT FUEL IN STORAGE AT THE END OF 2004

Quantities of spent fuel and waste in storage at end of 2004

Country	VLLW (m^3)	LILW – SL (m^3)	LILW – LL (m^3)	HLW (m^3)	SF (te HM)	comments
Austria	-	1800	200	-	-	Any remaining SF will be shipped to USA under 'take back agreement'
Belgium	-	13 000	4 000	444	2 675	Does not include 200 m^3 radium-contaminated wastes
Bulgaria	-	7 636	-	-	943	Does not include liquid wastes (7 400 m^3)
Czech Rep.	-	4510	4	-	891	
Denmark	-	1 100	125	-	-	The small amount of SF is considered as LILW-LL
Estonia	-	400	1	-	-	Mainly from decommissioning of former submarine training centre at Tammiku
Finland	-	1 940	40	-	1 416	
France	128 000	98 700	92 600	1 851	8 279	In addition probably around 3 000 te at NPP
Germany	-	128 761		2 000 840	3 109	HLW includes 448 m^3 untreated heat-generating wastes. LILW includes 47 500 m^3 untreated wastes and intermediate products. Total vitrified waste to be returned
Greece	-	70	-	-	-	
Hungary	-	1 214	-	-	740	Liquid waste awaiting processing (4 700 m^3) not included
Italy	8 000	17 000	8 000	-	247	
Latvia	-	-	-	-	-	Small quantities of sealed sources only
Lithuania	26 000	57 900	760	-	1 820	Does not include liquid wastes
The Netherlands	-	8550		5	2	
Poland	-	30	4	-	0.6	Does not include liquid wastes (300 m^3)
Portugal	-	1000	-	-	-	
Romania	-	472	11	-	767	
Slovakia	4 000	15 000	50	-	770	
Slovenia	-	2362	-	-	313	LILW-SL includes some LILW-LL
Spain	5760	30230	1146	13	3 195	HLW currently stored in France; LILW-LL 666 m^3 stored in France and the rest stored on site at Vandellos 1 NPP from its decommissioning. VLLW also stored on site at Vandellos 1 from its decommissioning

Quantities of spent fuel and waste in storage at end of 2004						
Country	**VLLW (m^3)**	**LILW – SL (m^3)**	**LILW – LL (m^3)**	**HLW (m^3)**	**SF (te HM)**	**comments**
Sweden	3 940	7 881	4 900	-	4 930	
United Kingdom	-	2 000	105 000	1 200	8 000	ILW and HLW include waste arising from the reprocessing of fuel for foreign customers