

EUROPEAN ATOMIC ENERGY COMMUNITY

REPORT

**On the implementation of the obligations under the Joint Convention on the
Safety of
Spent Fuel Management and on the Safety of Radioactive Waste Management**

**Fourth Review Meeting of the Contracting Parties
Vienna, 14 to 23 May 2012**

Executive summary

i. The European Atomic Energy Community & nuclear energy in the European Union

The European Atomic Energy Community (henceforth referred to as "Euratom" or the "Community") is a "regional organisation" within the meaning of Article 39(4) of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (henceforth referred to as the "Joint Convention")¹, and a party to that Convention since January 2, 2006.

Euratom was established by the Treaty signed in Rome on 25 March 1957, under the general objective to tackle with the general shortage of "conventional" energy in the 1950s. The founding states looked to nuclear energy as a means of achieving energy independence and ensuring security of supply. At the same time, the Treaty establishing Euratom guarantees high safety standards for the public and prevents nuclear materials intended principally for civilian use from being diverted to military use. Euratom's powers are limited to peaceful civil uses of nuclear energy.

In its Nuclear Illustrative Programme of October 2007², the European Commission (henceforth referred to as the "Commission") noted that the contribution of nuclear power to the diversification and the security of energy supplies is recognised for a number of reasons, in particular the availability and distribution of nuclear fuel (natural uranium) and the limited impact of fuel price variations on plant operating costs. Moreover, on 13 November 2008 the Nuclear Illustrative Programme 2007 was updated³, as part of the Commission's Second Strategic Energy Review⁴ focusing on security of supply and the conditions for realising investments in more efficient, low-carbon energy networks. The updated Illustrative Programme highlights that by 2020 nearly two-thirds of the electricity production in the European Union (henceforth referred to as the "EU") could be low-carbon, if rapid investment decisions are taken with regard to renewable energy sources as well as nuclear energy⁵.

Indeed, nuclear power today is Europe's principal low-carbon source of electricity. 143 reactors account for almost one-third of the electricity production, amounting to two-thirds of

¹ INFCIRC/546 of 24 December 1997.

² Communication from the Commission, "Nuclear Illustrative Programme", COM (2007) 565.

³ COM (2008) 776 final.

⁴ Communication from the Commission, "European Union energy security and solidarity action plan" COM (2008) 781.

⁵ More recently, the Commission's Communication on "Energy 2020 - A strategy for competitive, sustainable and secure energy" underlined also the importance of nuclear safety and the provisions of the Treaty establishing Euratom in this respect, including safeguards of nuclear materials and detection of any illicit activities, especially in a scenario of increased recourse to nuclear power; COM (2010) 639.

the low-carbon energy produced in the EU. This represents almost 700 million tons CO₂ per year that otherwise might be emitted to the atmosphere⁶, which is equivalent to that produced by all cars in Europe. Nuclear power, therefore, plays a key role in limiting the EU's carbon emissions.

The aforementioned objectives still remain apropos and are shared by a large number of European states. It is noteworthy that more than half of the twenty seven EU Member States operate nuclear power plants.

ii. *Euratom law and the Treaty of Lisbon*

On 1 December 2009 the Treaty of Lisbon⁷ entered into force and amended the existing Treaty on EU, the Treaty establishing the European Community and the Treaty establishing Euratom. Euratom remains a separate legal entity. Yet, Euratom is still strongly interlinked with the EU, as its membership, finances and institutions are fully integrated with the Union⁸. The Euratom Treaty and its derived legislation is *lex specialis* and prevails in case of conflicting rules. Legislation adopted under this Treaty is legally binding upon Member States. It has primacy over national law and can be directly applicable within the legal systems of the Member States.

To ensure a better understanding and easier peer review of Euratom's legal system, the present Report contains a revised and updated reference to the Euratom Treaty, the legal measures which can be adopted by Euratom, their effect on national law and the respective obligations of Member States.

iii. *Euratom competences with regard to radioactive waste and spent fuel management*

Community competences regarding spent fuel and radioactive waste arising from civil nuclear activities fall under the framework of the Euratom Treaty. Article 2(b) of the Treaty provides for uniform safety standards to be set to protect the health of workers and of the general public. Article 30 provides more specifically for the adoption of basic standards in order to protect workers and the general public against the dangers arising from ionizing radiations, while Article 37 requires Member States to provide the Commission with general data on any plan for the disposal of radioactive waste.

As recognised by the Court of Justice of the EU in its case-law⁹, the provisions of Title II, Chapter 3, of the Euratom Treaty (Articles 30 to 39 on health and safety) form a coherent

⁶ Based on a representative mix of alternative sources.

⁷ Treaty of Lisbon amending the Treaty on European Union and the Treaty establishing the European Community, signed in Lisbon, 13 December 2007 (2007/C 306/01), OJ 306, 17.12.2007, p. 1.

⁸ See, in particular, Article 106a of the Euratom Treaty.

⁹ Case C-187/87, ECR 1988, p. 5013.

whole, conferring powers of a considerable scope in order to protect the population and the environment against risks of nuclear contamination. On the basis of the Court's rulings¹⁰, 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 radiation, can be "supplemented", within the meaning of the Treaty establishing Euratom, with safety requirements governing the management of radioactive waste and spent fuel. The issue of spent fuel and radioactive waste management is clearly an area where national legislation has to be supplemented by legislation at Community level, owing to the cross-border aspect of safety.

iv. Radioactive waste and spent fuel in the EU

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

More than half of the Member States have spent fuel from operation of nuclear reactors. Fourteen (14) of the twenty seven (27) Member States, participating in Euratom, have nuclear power plants in operation. There are nuclear reactors under construction and being decommissioned, as well as plans for new builds in some Member States.

Euratom does not possess or operate any nuclear power plants. Other types of nuclear facilities (mainly research facilities) are located at sites of the Commission's Joint Research Centre, in Ispra (Italy), Geel (Belgium), Karlsruhe (Germany) and Petten (Netherlands). In 1999 the Commission decided to launch a Decommissioning and Waste Management Programme, with respect to its obsolete nuclear facilities. It should be noted that these nuclear installations are located in EU Member States and that for that reason all safety or environmental obligations are those of the countries concerned.

More than 100 000 m³ of radioactive waste are produced annually in the EU, mainly very low level waste and short-lived low and intermediate level waste.

The amount of the annual production of spent fuel in the EU is about 2 500 tonnes (Heavy Metal), which might either be sent to reprocessing or be stored for subsequent direct disposal as waste in a deep geological repository, depending on national policies.

v. Euratom regulatory framework, relevant to the management of radioactive waste and spent fuel

The management of radioactive waste and spent fuel has been addressed at Community level mainly through a variety of legislative instruments adopted under Title II, Chapter 3, of the

¹⁰ Case C-29/99, ECR 2002, p. I-11221.

Euratom Treaty. Existing binding Euratom legislation, relevant to the management of radioactive waste and spent fuel, includes Council Directive 96/29¹¹, encompassing the current basic safety standards for the protection of the health of workers and of the general public, Council Directive 89/618¹² on measures to be applied and steps to be taken in the event of a radiological emergency, Council Decision 87/600¹³ on arrangements for the early exchange of information between competent authorities in the event of a radiological emergency, Council Directive 2003/122¹⁴ on the control of high-activity sealed radioactive sources and orphan sources, Council Directive 2006/117¹⁵ on the supervision and control of shipments of radioactive waste and spent fuel, and Council Directive 2009/71¹⁶ establishing a Community framework for the nuclear safety of nuclear installations.

Non-binding instruments, also related to the management of spent fuel and radioactive waste, include three Commission Recommendations, concerning the management of the financial resources for the decommissioning of nuclear installations, spent fuel and radioactive waste¹⁷, the criteria for the export of radioactive waste and spent fuel to third countries¹⁸ and the application of Article 37 of the Euratom Treaty¹⁹, respectively.

At the international level, there are safety standards developed by the International Atomic Energy Agency (henceforth referred to as "IAEA"), in collaboration with other organisations. All EU Member States are members of the IAEA and participate in the adoption of these standards. In 2006, the IAEA updated its entire corpus of standards and published the Fundamental Safety Principles²⁰, which were jointly sponsored by Euratom, the Organisation for Economic Cooperation and Development/Nuclear Energy Agency and other international organisations.

The Joint Convention, concluded under the auspices of IAEA, is the most significant international agreement in its specific field.

vi. *Follow-up work, developments and other initiatives since the previous Euratom Report*

The present Report indicates in its respective sections several developments and initiatives taken by the EU/Euratom since the last Euratom report. Legislative initiatives include *new*

¹¹ OJ L 159 of 29.06.1996, p. 1.

¹² OJ L 357 of 07.12.1989, p. 31.

¹³ OJ L 371 of 30.12.1987, p. 76.

¹⁴ OJ L 346 of 31.12.2003, p. 57.

¹⁵ OJ L 337 of 05.12.2006, p. 21.

¹⁶ OJ L 172 of 02.07.2009, p. 18.

¹⁷ OJ L 330 of 28.11.2006, p. 31.

¹⁸ OJ L 338 of 17.12.2008, p. 69.

¹⁹ OJ L 279 of 23.10.2010, p. 36.

²⁰ Fundamental Safety Principles, Safety Fundamentals No. SF-1, Vienna, 2006.

legislation, such as Council Directive 2009/71 on the nuclear safety of nuclear installations and Council Directive 2011/70/Euratom on responsible and safe management of spent fuel and radioactive waste. They also include *draft legislation and work undertaken for the review of the legislation in force*, such as the revision of Euratom secondary legislation on radiation protection. Other *main relevant initiatives* include the cooperation through the European Nuclear Safety Regulators Group (ENSREG – previously named "High Level Group on Nuclear Safety and Waste Management") and the European Nuclear Energy Forum (ENEF). Reference is also made to *recent scientific cooperation at European level*, through the establishment of *technology platforms*. The Sustainable Nuclear Energy Technology Platform (SNE-TP) was launched in 2007. In May 2009 it produced the first edition of its Strategic Research Agenda (SRA). The SRA states *inter alia* that several EU countries have implemented commercially available solutions associated with the handling of low and intermediate level waste, while the present solution for high level waste is to properly condition them inside isolating packages that are then disposed of in deep underground geological repositories. With regard to geological disposal, the Implementing Geological Disposal Technology Platform (IGDTP) was launched at the end of 2009, bringing together key research and development stakeholders in Europe, such as national waste management agencies and research organisations and institutes. This forum will collectively agree a common strategic research agenda and associated development strategy, in order to address outstanding research and development issues and realise the joint vision of implementing geological disposal, safely in Europe, by 2025.

In addition, the present Report mentions Euratom's orientations with respect to *nuclear-related research*, supported through *Framework Programmes*. The Commission has recently submitted its proposals for a 2-year extension of the current 7th Framework Programme on research and training (2007-2011), for the years 2012 and 2013.

vii. *Council Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste*

Through Council Directive of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste²¹, important elements of this management, endorsed by the international community and manifested in the Joint Convention and the IAEA Safety Standards, become legally binding requirements in the EU,

²¹ OJ L 199, 02.08.2011, p. 48.

as Member States shall bring into force the laws, regulations and administrative provisions necessary to comply with this Directive by August 2013.

The Directive aims at ensuring responsible and safe management of spent fuel and radioactive waste to avoid undue burdens on future generations. It reaffirms the ultimate responsibility of Member States for the management of spent fuel and radioactive waste, including to establish and maintain national policies and frameworks, and to assure the needed resources and transparency. This Directive reaffirms also the principle of prime responsibility of the licence holder for the safety of spent fuel and radioactive waste management under the supervision of its national competent regulatory authority.

Strong provisions are foreseen for assuring safety of spent fuel and radioactive waste management, including in the long term. The Directive reinforces the role and strengthens the independence of the national regulatory authorities.

Member States are required to establish, implement, review and update national programmes for management of spent fuel and radioactive waste from generation to disposal. They will invite international peer reviews to exchange experience and ensure the application of the highest standards.

Explanation of the preparation, structure and main features of the present Report

The present Report is submitted in compliance with Articles 30 and 32 of the Joint Convention, in view of the forthcoming Fourth Review Meeting of the Contracting Parties, to be held in Vienna, in May 2012.

The Report follows the structure suggested in the "*Guidelines regarding the Form and Structure of National Reports*", which were established by the Contracting Parties (INFCIRC/604/Rev.1). It is based on the last report for the Third Review Meeting of the Contracting Parties to the Joint Convention (held in Vienna, from 11 to 20 May 2009) and it has been revised and updated, in accordance with the aforementioned Guidelines.

New information has been highlighted, as recommended, in ***bold italics*** font.

The Report covers both Euratom's general regulatory obligations under the Joint Convention and its specific obligations arising from its own nuclear installations. As stated in Euratom's last report under the Convention on Nuclear Safety²²: "*Since more than 25 years all research reactors of the JRC [Joint Research Centre] in Ispra, Italy, have been shutdown and will undergo decommissioning in the coming years. All nuclear fuel has been removed from their cores. For this reason they are excluded from the scope of application (see Art 2 of the Convention [on Nuclear Safety]) and will be dealt with in the Euratom Report for the next review meeting under the Joint Convention on the Safety of Spent Fuel and the Safety of Radioactive Waste Management*". Apart from Ispra (Italy), other Joint Research Centre facilities, in Geel (Belgium), Karlsruhe (Germany) and Petten (Netherlands), are accounted for in the present Report. The Report also makes reference to low-radioactivity sealed sources and fissile material calibration standards held by the Commission.

Since the Member States of Euratom are responsible for implementing and applying Euratom legislation, this Report only informs about the legal framework of Euratom and relevant EU initiatives and programmes, but not on the actual implementation in the twenty seven (27) Member States. This information is to be found in the respective national reports.

The structure of the Report is as follows: the Report starts, in Section A, with an introduction on Euratom competences in the framework of the Joint Convention and a chapter on the implications of the Lisbon Treaty for the EU and Euratom; Section C is linked with the obligations under Article 3 of the Joint Convention (scope of application); Sections B and D set out the general Euratom policies and activities in this field and then make detailed reference to the policies and practices in the framework of the Joint Research Centre;

²² Euratom report submitted for peer review at the Fifth Review Meeting of the Contracting Parties to the Convention on Nuclear Safety, which was held in Vienna in April 2011.

Euratom's legislative system and regulatory framework is analysed in Section E; Sections F to J follow an article-by-article review of the implementation of the Joint Convention by Euratom, with regard to general safety provisions and requirements (such as those relating to the siting, design, construction, operation and the safety assessment of nuclear facilities), the transboundary movement of radioactive waste and spent fuel, and the handling of disused sources; finally, Section K of the Report mentions other, additional Euratom actions and programmes, aimed at enhancing the safety of radioactive waste management and the safety of spent fuel management. The Report closes with Annex I, which includes additional information on Euratom research initiatives, implemented through multi-annual Framework Programmes.

An overview matrix, in accordance with paragraph 12 of the Guidelines regarding the Form and Structure of National Reports, is also included in the Report (at section B.2.2).

Conclusions drawn from the discussion of the Euratom Report at the previous Review Meeting are cited below, in accordance with paragraph 6 of the above Guidelines.

Conclusions from the discussion of the Euratom Report at the previous Review Meeting

As outcome of the Third Review Meeting, as good practices were highlighted in the Report of the Rapporteur in Country Group 3 regarding Euratom the following achievements: Euratom activities help to ensure common standards of radiation protection in Member States, where has to be mentioned the development of common exemption levels in the planned revision of the Basic Safety Standards Directive. Further, that the waste management plans for JRC facilities being decommissioned are well developed and also that Euratom encourages, through its framework programmes, research in a wide range of subjects which include the safe management of spent fuel and radioactive waste. These efforts were, as the current Report shows, successfully continued since then.

Regarding the challenges for Euratom, it has to be emphasized that an important step forward towards a common EU policy on spent fuel and radioactive waste was achieved by the adoption of the Council Directive concerning the responsible and safe management of spent fuel and radioactive waste. Also, work to further strengthening the transparency in the field of nuclear energy in the framework of the European Energy Forum (ENEF) is on-going. Finally, the efforts of the JRC to ensure the safe decommissioning at its sites are continued.

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Section A

INTRODUCTION

1. EURATOM COMPETENCES IN THE FRAMEWORK OF THE JOINT CONVENTION

1.1 Legal background for the accession of Euratom to the Joint Convention

The Treaty which was signed in Rome on 25 March 1957 and which established Euratom (also referred to in this Report as the "Euratom Treaty" or the "Treaty") is the legal basis for the competences and activities of Euratom.

The signatories²³ stated in the preamble to the Treaty that they were, in particular:

- Resolved to create the conditions which are necessary for the development of a powerful nuclear industry;
- Anxious to create the conditions of safety which are necessary to eliminate hazards to the life and health of the public;
- Desiring to associate other countries with their work and to cooperate with international organisations concerned with the peaceful development of atomic energy.

Therefore the Treaty stipulates that Euratom may, within the limits of its powers and jurisdiction, enter into obligations by concluding agreements or contracts with international organisations or third states²⁴.

Euratom meets the requirements laid down in Article 39(4) of the Joint Convention for becoming a Party to it. It acceded to the Joint Convention by a Commission Decision of 14 June 2005²⁵, following a Council Decision of 24 January 2005²⁶. The instruments of accession were deposited with the Director General of IAEA on 4 October 2005. Euratom's accession came into effect on 2 January 2006, in accordance with Article 40(2) of the Joint Convention.

The instruments of accession included the declaration required by Article 39(4)(iii) of the Joint Convention. In particular, Article 39(4)(iii) of the Joint Convention stipulates that: *"When becoming party to this Convention, such an organization shall communicate to the Depositary referred to in Article 43, a declaration indicating which States are members thereof, which Articles of this Convention apply to it, and the extent of its competence in the field covered by those articles"*.

²³ The six (6) founding countries were: Belgium, France, Germany, Italy, Luxembourg and the Netherlands.

²⁴ Article 101.

²⁵ C (2005) 1729.

²⁶ 2005/84/Euratom, OJ L 30, 03.02.2005, p. 10.

1.2 Declaration by Euratom according to the provisions of Article 39(4)(iii) of the Joint Convention regarding Euratom competences in the framework of the Joint Convention

In December 2002, the Court of Justice ruled on the competences of Euratom with regard to the Convention on Nuclear Safety²⁷. In its judgment²⁸, the Court found that Euratom possesses competences relating not only to the "traditionally" recognised *radiation protection aspects*, but also to *different aspects of nuclear safety*²⁹. Based on this landmark ruling, the existing basic safety standards, aiming mainly at the protection of the health of workers and of the general public against the dangers arising from ionising radiations, can be "supplemented", within the meaning of the Euratom Treaty, with safety requirements governing the safe management of radioactive waste and spent fuel. Moreover, the Court had already adjudicated in 1988 that the provisions of Title II, Chapter 3, of the Treaty, on health and safety, form a coherent whole conferring upon the Commission powers of a considerable scope, in order to protect the population and the environment against risks of nuclear contamination³⁰.

The declaration of competences on the part of Euratom, under the aforesaid Article 39(4)(iii) of the Joint Convention, followed the principles established by the Court of Justice:

"The Community declares that Articles 1 to 16, 18, 19, 21 and 24 to 44 of the Joint Convention apply to it."

"The Community possesses competences, shared with its Member States, in the fields covered by Articles 4, 6 to 11, 13 to 16, 19 and 24 to 28 of the Joint Convention as provided by the Treaty establishing the European Atomic Energy Community in Article 2(b) and the relevant Articles of Title II, Chapter 3, entitled 'Health and Safety'."

1.3 Member States of Euratom

The following twenty seven (27) states are presently members of Euratom: the Kingdom of Belgium, the Czech Republic, the Kingdom of Denmark, the Federal Republic of Germany, the Republic of Estonia, the Hellenic Republic, the Kingdom of Spain, the French Republic, Ireland, the Italian Republic, Republic of Bulgaria, the Republic of Cyprus, the Republic of Latvia, the Republic of Lithuania, the Grand Duchy of Luxembourg, the Republic of Hungary, the Republic of Malta, the Kingdom of the Netherlands, the Republic of Austria, the Republic of Poland, the Portuguese Republic, the Republic of Romania, the Republic of

²⁷ The Convention on Nuclear Safety was adopted in Vienna on 17 June 1994. Euratom acceded to this Convention by a Commission Decision of 16 November 1999 (Commission Decision 1999/819/Euratom concerning the accession to the 1994 Convention on Nuclear Safety by the European Atomic Energy Community, OJ L 318, 11.12.1999, p. 2), following a Council Decision of 7 December 1998. The instruments of accession were deposited with the Director General of IAEA on 31 January 2000. Thus, for Euratom the Convention on Nuclear Safety entered into force on 30 April 2000 in accordance with Article 31(2) of the Convention.

²⁸ Judgment of the Court of 10 December 2002, case C-29/99 *Commission v. Council* ECR 2002, p. I-11221.

²⁹ In paragraphs 82 and 83 of the Court's reasoning, it is stated that: "*it is not appropriate, in order to define the Community's competences, to draw an artificial distinction between the protection of the health of the general public and the safety of sources of ionising radiation. Those considerations should inform the determination as to whether the Community possesses competences in the fields covered by articles of the Convention...*".

³⁰ Case C-187/87, ECR 1988, p. 5013.

Slovenia, the Slovak Republic, the Republic of Finland, the Kingdom of Sweden, the United Kingdom of Great Britain and Northern Ireland.

2. THE EU AFTER THE LISBON TREATY AND ITS RELATION WITH EURATOM

The Treaty of Lisbon was signed in Lisbon on 13 December 2007³¹ for an indefinite duration and it entered into force on 1 December 2009. It mainly amends the Treaty on EU and the Treaty establishing the European Community³², but also the Euratom Treaty³³.

Until the Treaty of Lisbon came into force, the European Community³⁴ and Euratom formed together the so-called "European Communities" and as such the "first pillar" of the EU³⁵. Both the Treaty establishing the European Community and the Euratom Treaty were signed for an indefinite duration³⁶.

Following the entry into force of the Treaty of Lisbon (1 December 2009), the previous structure of the EU based on distinct "pillars" is no longer used. The EU is now founded on the present Treaty on EU (TEU) and the Treaty on the Functioning of the EU (TFEU). The Treaty establishing the European Community is renamed to the latter (TFEU) and the EU succeeds the European Community (Article 1 of the TEU).

As regards Euratom, this Community is not dissolved into the EU (like the European Community) and it thus maintains its separate legal personality. In particular, the Treaty of Lisbon amends the Euratom Treaty by its Protocol No. 2, recalling that the provisions of the latter Treaty should continue to have full legal effect. The amendments concern for the most part institutional and financial aspects, with respect to which Euratom remains interlinked with the EU. The new Article 106a(1) of the Euratom Treaty lists up all provisions of the EU Treaties which apply to Euratom, especially those on the institutions, legislative procedures and financial matters.

*Also, Article 106a(3) of the Euratom Treaty states: "The provisions of the Treaty on European Union and the Treaty on the Functioning of the European Union shall not derogate from the provisions of this Treaty [Euratom]". Therefore, the Euratom Treaty and its derived legislation is *lex specialis* and prevails in case of conflicting rules.*

³¹ Treaty of Lisbon amending the Treaty on EU and the Treaty establishing the European Community, signed in Lisbon, 13 December 2007 (2007/C 306/01), OJ 306, 17.12.2007, p. 1.

³² Consolidated versions of these two Treaties: OJ C 115, 09.05.2008.

³³ Consolidated version of the Euratom Treaty: OJ C 84, 30.03.2010, p.1.

³⁴ The Treaty establishing the European Community was signed on 25 March 1957 (ie the same date when the Euratom Treaty was signed). The European Community was originally founded under the name "European Economic Community". The term "Economic" was subsequently removed from its name by the Treaty on EU, which was signed in Maastricht on 7 February 1992 and which entered into force on 1 November 1993.

³⁵ The other two pillars being the Common Foreign and Security Policy (known as the "second Pillar" of the EU) and Police and Judicial Co-operation in Criminal Matters, originally named Justice and Home Affairs (known as the "third Pillar" of the EU).

³⁶ As regards the third "European Community", ie the European Coal and Steel Community, this ceased to exist when the Treaty of Paris establishing it (signed on 18 April 1951) expired on 23 July 2002. It was accordingly decided that the coal and steel trade would thenceforth be governed by the rules of the European Community Treaty.

Section B

EURATOM POLICIES AND PRACTICES WITH REGARD TO RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT (Article 32(1) of the Joint Convention)

1. GENERAL EURATOM POLICIES AND PRACTICES

1.1 Foreword: relevant data

Through its Member States, Euratom is a large producer of radioactive waste. As a result, management of radioactive waste and spent fuel is one of the key issues in Europe's nuclear energy policies. This is also reflected in the amount of legal instruments that the Community has produced, upon the basis of the Treaty, dealing amongst others with radioactive waste management and decommissioning. An overview of Euratom legislation in this field can be found in section E.1 of this Report.

Fourteen (14) of the twenty seven (27) Member States, participating in Euratom, have nuclear power plants in operation; two (2) other Member States have nuclear power plants only under decommissioning³⁷. Each Member State may define its fuel cycle policy, considering spent fuel as a valuable resource that may be reprocessed or considering it as waste for direct disposal. General data about the spent fuel quantities are presented below.

As regards **radioactive waste**, according to the Seventh Situation Report on the Management of Radioactive Waste³⁸ and based on the information provided by Member States as for the end of year 2007, the annual generation reported in the EU is about 110 700 m³, mainly low and intermediate level waste (reported 40 900 m³ short-lived and 38 900 m³ long-lived), as well as very low level waste (reported 30 700 m³). About 190 m³ are high level waste (ie vitrified residues from the reprocessing of spent fuel).

As regards **spent fuel**, the amount of annual production in the EU is about 2 500 tonnes (Heavy Metal), of which at about one third can currently be considered as being placed in storage for possible direct disposal as waste. Some Member States have only very small quantities of spent fuel originating from research reactors.

Most of the short-lived, low and intermediate level waste is routinely disposed of. By 2020 it is likely that many Member States having nuclear power will have operational repositories for this type of waste. By contrast, all accumulations of the more hazardous high-level and long-lived wastes (including spent fuel for direct disposal) are currently being stored in surface or near-surface facilities pending the availability of more permanent solutions.

³⁷ The Member States having nuclear power plants in operation are: Belgium, Bulgaria, the Czech Republic, Finland, France, Germany, Hungary, the Netherlands, Romania, Slovakia, Slovenia, Spain, Sweden and the United Kingdom; Italy and Lithuania have only nuclear power plants under decommissioning.

³⁸ Report from the Commission - Seventh Situation Report on Radioactive Waste and Spent Fuel Management in the EU, SEC (2011) 1007 final.

1.2 General Euratom policies – recent reports by ENSREG and ENEF

Radioactive waste and spent fuel management policy remains largely a national competence and varies between Member States. Some Member States are reassessing their waste management options, as well as the associated decision-making processes. Some regard spent fuel as waste, others as a resource from which valuable quantities of fissile and fertile material can be extracted, while others have not yet defined their policy.

A few countries have established precise programmes for the development of geological disposal with fixed milestones and deadlines: Finland, France and Sweden expect to have operational disposal facilities for high level waste by 2025-2030, and Germany and Belgium will possibly follow before 2050. The remaining Member States have set target dates, but are less advanced in the implementation of repository development or the determination of a definitive spent fuel management policy.

Safe management of radioactive waste has been one of the major objectives of Euratom since its inception. Over the last thirty years Euratom has developed activities and policies related to radioactive waste and spent fuel management, mainly through research and development (R&D) Framework Programmes³⁹ and Community Plans of Action in the field of radioactive waste.

The first Action Plans were based on the Council Resolutions of 18 February 1980⁴⁰ and 15 June 1992⁴¹, and remained in force up to 1999. They provided a framework for coordinating activities and enhancing cooperation between Member States. The Plans recognised that radioactive waste raises a combination of issues, some involving the development of existing technologies via R&D, whilst others being of a legal, administrative, financial and social nature. They also assumed that collaboration with third countries and organisations on management and storage of radioactive waste could benefit from any expansion of Euratom activities.

In 2001, the Green Paper on security of energy supply⁴² concluded that nuclear energy would remain an option for the future in Europe, provided the general public felt that management of nuclear waste was properly handled.

Later on, **in 2003, the Commission proposed one Council Directive (Euratom) dealing with the management of spent nuclear fuel and radioactive waste,** which was re-submitted to the Council as an amended proposal in 2004⁴³.

After long negotiations, **the Council Conclusions in June 2004⁴⁴** called for an "extensive consultation" with stakeholders before any instrument in this field would be developed in the framework of the Treaty. The Council reaffirmed the Member States' commitment to the safe management of spent fuel and radioactive waste and recognised the importance of a Community framework, while giving also greater weight to national and international efforts.

³⁹ On Euratom research Framework Programmes, see section K.3 below.

⁴⁰ Council Resolution of 18 February 1980 on the implementation of a Community plan of action in the field of radioactive waste, OJ C 51, 29.02.1980, p. 1.

⁴¹ Council Resolution of 15 June 1992 on the renewal of the Community Plan of Action in the field of radioactive waste, OJ C 158, 25.06.1992, pp. 3-5.

⁴² Green Paper "Towards a European strategy for the security of energy supply", COM (2000) 769 final.

⁴³ COM (2004) 526 final.

⁴⁴ Council of the EU 10823/04.

Following these Conclusions, **the Council proposed an Action Plan**⁴⁵ and a wide ranging consultation process was initiated aimed at identifying new instrument(s) that could contribute more effectively to further improving the safety of the management of spent fuel and radioactive waste.

As a consequence, **the European Nuclear Safety Regulators Group (ENSREG), initially called "High Level Group on Nuclear Safety and Waste Management"**⁴⁶, was established on 17 July 2007, by a Commission Decision⁴⁷. This Group is 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 representative. Its mandate is to advise and assist the Commission in progressively developing a common understanding and eventually European rules in the field of safety of nuclear installations and safety of waste management. Its establishment was endorsed by the European Council⁴⁸ and was supported by the Council⁴⁹ and the European Parliament⁵⁰.

ENSREG's work programme covers actions in three fields: Nuclear Safety; Spent Fuel, Radioactive Waste Management and Decommissioning; and Transparency.

*This Group has expressed several positions on radioactive waste management. In 2009, the first ENSREG's report was submitted to the European institutions*⁵¹. *In it, 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"; it underlines "the importance for the EU to promote improvement of regulatory effectiveness and to provide leadership on peer reviews"; and it recommends that "the Commission should promote wider use of best practices". With respect to the management of spent fuel and radioactive waste, the report is based on seven (7) documents dealing in details with different aspects of this issue and providing conclusions and recommendations:*

- *Identification of difficulties and challenges for progress in spent fuel and high-level waste management;*
- *Better use of the Joint Convention process in the EU;*
- *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;*
- *Better exchange of information on waste safety experience;*

⁴⁵ Council of the EU 15293/04.

⁴⁶ See also at: http://ec.europa.eu/energy/nuclear/ensreg/ensreg_en.htm.

⁴⁷ Commission Decision 2007/530/Euratom, OJ L 195/44 of 27.07.2007.

⁴⁸ European Council of 8-9 March 2007.

⁴⁹ Council Conclusions of 8 May 2007 on Nuclear Safety and Safe Management of Spent Nuclear Fuel and Radioactive Waste, 8784/07.

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

⁵¹ Report of the European Nuclear Safety Regulators Group, July 2009.

– *Waste safety reviews of new nuclear power plants*⁵².

The European Nuclear Energy Forum (ENEF)⁵³ is another initiative of the Commission, endorsed by the EU heads of state and government in March 2007. It is a 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. ENEF gathers all relevant stakeholders in the nuclear field, such as the 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.

Several Plenary meetings of ENEF have been held in the cities of Bratislava and Prague. During the 5th Plenary Meeting (Bratislava, May 2010), ENEF underlined the need for a legally binding Community instrument for radioactive waste, stressing that each Member State should develop and implement an adequate national plan for nuclear waste management, in line with the subsidiarity principle. Guidance for the successful national implementation of geological waste repositories and contributions to the upcoming EU legislation have been prepared at this forum.

In particular, ENEF's Roadmap to Successful Implementation of Geological Disposal in the EU (October 2009)⁵⁴ 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 the 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.

Furthermore, a position paper entitled "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. This document justifies the need of a legally binding instrument at EU level, as well as its scope and essential elements, including national programmes, technology and financing. 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 Member States, the implementation of geological disposal is still posing a challenge in many Member States, 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

⁵² See also at: http://circa.europa.eu/Public/irc/tren/nuclear_safety_and_waste/library?l=/general_archive/public&vm=detailed&sb=Title.

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

⁵⁴ EUR 24301 EN, http://ec.europa.eu/energy/nuclear/forum/risks/waste_disposal_en.htm. The Roadmap was produced by the ENEF Sub-Working Group "Waste Management", which is a sub-group of the Working Group "Risks".

waste and spent fuel, if regarded as waste, as part of the national programme if applicable".

The above developments were taken into account in the preparation of the new Directive establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste, adopted by the Council on July 2011 (see section B.1.8 below).

1.3 The updated Nuclear Illustrative Programme

The same year in which ENSREG and ENEF were founded, the Commission issued its **Nuclear Illustrative Programme 2007**⁵⁵. This programme describes the status of the nuclear sector in the EU in 2006 and the possible developments in this sector, taking into account economic and environmental issues. *On the subject of radioactive waste*, the Commission noted that the vast majority is low level short-lived waste, for which strategies are implemented on an industrial scale in almost all the states with nuclear power plants. The disposal of high level long-lived waste is notably influenced by social factors, in particular the choice of final disposal sites and public acceptance of this choice. Research also focuses on techniques for reducing the volume or life of radioactive waste or long-lived components. The Commission concluded that one of the key elements to progress is greater public acceptance: waste is fundamentally an environmental and health issue; as such, management and disposal of radioactive waste have to be subject to the same scrutiny applied to all projects which could have an impact on humans and their environment.

*On 13 November 2008, the Commission updated its Nuclear Illustrative Programme 2007*⁵⁶, in the context of the Commission's Second Strategic Energy Review⁵⁷. *The updated Illustrative Programme focuses on the security of supply and the requirements and conditions for realising investments, making a number of recommendations: proposing that future new build is of the latest technology; ensuring the highest standards of nuclear safety, as well as simplifying and harmonising the currently differing licensing requirements and procedures in the Member States. It highlights that by 2020 nearly two-thirds of EU electricity production could be low-carbon, if rapid investment decisions are taken with regard to renewable energy sources, as well as nuclear energy. The revised Nuclear Illustrative Programme also emphasises that over the next 10-20 years the majority of nuclear power plants in the EU will start to reach the end of their originally designed lifetimes. Decisions about lifetime extension, new investments or replacement become more acute, notably in the light of the EU CO₂ reduction objectives. All these considered, it must be clear that the EU maintains the highest safety, security, non-proliferation and environmental protection standards for nuclear generation and that it develops a common legislative framework with respect to the safety of nuclear installations and the management of nuclear waste.*

⁵⁵ Communication from the Commission, "Nuclear Illustrative Programme", COM (2007) 565.

⁵⁶ Communication from the Commission, "Update of the Nuclear Illustrative Programme", COM (2008) 776 final; see also at: http://ec.europa.eu/energy/strategies/2008/doc/2008_11_ser2/nuclear_illustrative_programme_pinc_updt_communication.pdf.

⁵⁷ Communication from the Commission, "EU energy security and solidarity action plan", COM (2008) 781.

1.4 The Sustainable Nuclear Energy Technology Platform

The **Sustainable Nuclear Energy Technology Platform (SNE – TP)** was launched in September 2007. It aims at promoting the research, development and demonstration of European nuclear fission technologies and gathers more than seventy (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, as well as the feedback obtained from an open public consultation⁵⁸. The objective of the SRA is to provide decision-makers, as well as the scientific community, with clearly identified technological roadmaps 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";*
- *"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".*

1.5 The Implementing Geological Disposal Technology Platform – geological disposal

The Implementing Geological Disposal Technology Platform (IGD – TP) was launched in November 2009, as a tool to support the confidence-building in the safety and implementation of deep geological disposal solutions⁵⁹. 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 the Member States.*

⁵⁸ SNE-TP, Strategic Research Agenda, May 2009. See also at: www.SNETP.eu.

⁵⁹ IGD-TP, Vision document, October 2009. See also at: www.igdtp.eu.

It is broadly accepted at the technical level that deep geological disposal represents the safest and most sustainable option to manage high level waste/spent fuel (if declared as waste) in the long term, even though there may be a need to ensure reversibility and implementation-oriented R&D needs to continue in those subject areas identified by the principal research stakeholder organisations and coordinated through the applicable Euratom Framework Programmes.

1.6 Complementary solutions to disposal

Complementary solutions to disposal are also under investigation in some countries, in particular **partitioning and transmutation (P&T)**. In the case of P&T, research is still ongoing. While having the potential to reduce significantly the quantities of long-lived and/or radiotoxic radionuclides (in particular minor actinides) in the most hazardous waste forms, P&T would not completely eliminate all such waste constituents and therefore is not a replacement for geological disposal. Nonetheless, it could be a valuable complement, enabling optimum use to be made of the space in geological repositories, in particular by reducing the heat generation of the waste.

Surface and sub-surface storage could also be considered as a temporary option, provided a permanent solution is defined with associated milestones and deadlines. While envisaged by most experts in the short to medium-term, especially to allow time for implementing geological disposal and also to allow for the temperature decrease of heat emitting wastes, storage is not considered sustainable in the longer term.

1.7 Public opinion

European citizens are also concerned about the management of spent fuel and radioactive waste in Europe. The *Eurobarometers published in July 2008⁶⁰ and April 2010⁶¹* show that European citizens think that Member States should take up their responsibilities and implement now demonstrated solutions for high-level radioactive waste, instead of leaving it for the future, and that nuclear waste management should be regulated at European level. *An open consultation carried out in the website of the Commission during the months of March to May 2010 showed similar conclusions, where an overwhelming majority of the respondents declared their support for the development of binding Community legislation in this area⁶².*

1.8 Council Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste

Taking into account the opinions expressed by the stakeholders and civil society, including the important contributions received from international forums (especially ENSREG, ENEF and the Club of Waste Management Agencies), the Commission adopted on 3 November 2010 a revised proposal for a Council Directive on the management of spent fuel

⁶⁰ Special Eurobarometer survey 297 – Attitude towards radioactive waste, Commission, 2008: http://ec.europa.eu/public_opinion/index_en.htm.

⁶¹ Special Eurobarometer survey 324 – Europeans and nuclear safety, Commission, 2010: http://ec.europa.eu/energy/nuclear/safety/safety_en.htm.

⁶² Public Consultation, 31 March 2010 to 31 May 2010 – Approaches for a possible EU legislative proposal on the management of spent fuel and radioactive waste: http://ec.europa.eu/energy/nuclear/consultations/2010_05_31_fuel_waste-en.htm.

and radioactive waste⁶³. The proposal was accompanied by an in-depth Impact Assessment Report.

Following intensive negotiations on the above proposal, the Council adopted Directive 2011/70/Euratom of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste⁶⁴.

The general objective of the Directive is the establishment of a Euratom framework for the responsible and safe management of spent fuel and radioactive waste to avoid imposing undue burdens on future generations, ensuring that Member States provide for appropriate national arrangements for a high level of safety, and providing necessary public information and participation.

As it is clarified in the preamble of the Directive, each Member State remains free to define its fuel cycle policy. The spent fuel can be regarded either as a valuable resource that may be reprocessed or as radioactive waste that is destined for direct disposal. Whatever option is chosen, the disposal of high-level waste, separated at reprocessing, or of spent fuel regarded as waste should be considered. Radioactive waste, including spent fuel considered as waste, requires containment and isolation from humans and the living environment over the long term. Its specific nature, namely that it contains radionuclides, requires arrangements to protect human health and the environment against dangers arising from ionising radiation, including disposal in appropriate facilities as the end location point. The storage of radioactive waste, including long-term storage, is an interim solution, but not an alternative to disposal.

As a general principle, radioactive waste has to be disposed of in the Member State in which it was generated. Some Member States consider that the sharing of facilities for spent fuel and radioactive waste management, including disposal facilities, is a potentially beneficial, safe and cost-effective option when based on an agreement between the Member States concerned. Shipments of radioactive waste for disposal in third countries are possible under very strict conditions (see section I.2).

As the Directive provides, Member States have the ultimate responsibility for the management of spent fuel and radioactive waste generated in them and shall establish and maintain national policies on spent fuel and radioactive waste management. To implement their national policies, the Member States shall establish and implement national programmes covering all types of spent fuel and radioactive waste and all stages of their management from generation to disposal. Mandatory elements of a national programme include:

- the overall objectives of the Member State's national policy in respect of spent fuel and radioactive waste management;*
- the significant milestones and clear timeframes for the achievement of those milestones in light of the over-arching objectives of the national programme;*
- an inventory of all spent fuel and radioactive waste and estimates for future quantities, including those from decommissioning, clearly indicating the location*

⁶³ Proposal for a Council Directive on the management of spent fuel and radioactive waste, COM (2010) 618; http://ec.europa.eu/energy/nuclear/waste_management/waste_management_en.htm.

⁶⁴ OJ L 199, 02.08.2011, p.48.

and amount of the radioactive waste and spent fuel in accordance with appropriate classification of the radioactive waste;

- *the concepts or plans and technical solutions for spent fuel and radioactive waste management from generation to disposal;*
- *the concepts or plans for the post-closure period of a disposal facility's lifetime, including the period during which appropriate controls are retained and the means to be employed to preserve knowledge of that facility in the longer term;*
- *the research, development and demonstration activities that are needed in order to implement solutions for the management of spent fuel and radioactive waste;*
- *the responsibility for the implementation of the national programme and the key performance indicators to monitor progress towards implementation;*
- *an assessment of the national programme costs and the underlying basis and hypotheses for that assessment, which must include a profile over time;*
- *the financing scheme(s) in force;*
- *a transparency policy or process;*
- *if any, the agreement(s) concluded with a Member State or a third country on management of spent fuel or radioactive waste, including on the use of disposal facilities.*

References to specific aspects of Directive 2011/70/Euratom are made in subsequent sections of this Report.

2. EURATOM POLICIES IN THE FRAMEWORK OF THE JOINT RESEARCH CENTRE (JRC)

2.1 General introduction to the JRC

The Joint Research Centre (JRC) was set up at the beginning of the 1960s, under Article 8 of the Euratom Treaty, with sites in Ispra (Italy), Geel (Belgium), Karlsruhe (Germany), Petten (Netherlands), Brussels (Belgium) and, later, Seville (Spain). Article 8(1) of the Treaty provides in particular: "*After consulting the Scientific and Technical Committee, the Commission shall establish a Joint Nuclear Research Centre. The Centre shall ensure that the research programmes and other tasks assigned to it by the Commission are carried out...*".

Originally, the JRC was dedicated entirely to nuclear research, but since then it has diversified its activities. The mission of the JRC is to provide customer-driven scientific and technical support for the conception, development, implementation and monitoring of EU policies. As a service of the Commission, the JRC functions as a reference centre of science and technology for the EU. Close to the policy-making process, it serves the common interest of the Member States, while being independent of special interests, whether private or national.

In 1999 the Commission decided to launch the Decommissioning and Waste Management Programme⁶⁵ ("D&WM Programme"), for decommissioning its obsolete nuclear installations.

⁶⁵ Decommissioning and Waste Management Programme, presented by the Commission to the Council and the European Parliament in its Communication COM (1999) 114. The Council and the European Parliament agreed to the proposed approach.

In this, the Commission followed the new approach adopted by most of the EU Member States, preferring to start decommissioning immediately rather than implement a "deferred" decommissioning which would take advantage of the diminishing radioactivity of the installations. *The latest communication on the progress on the D&WM Programme and the necessary changes to it was presented to the Council and the Parliament in 2009⁶⁶*. This document includes the cost of the programme, paid through the EU budget. Costs associated with the running waste production are covered by the research budget, or by third parties if the research is performed on their account.

2.2 Brief overview of JRC installations and work

Most of the nuclear installations on the Ispra site are either obsolete or no longer required and have been shut down definitively, and therefore require decommissioning.

The other JRC nuclear installations, located in Petten, Geel and Karlsruhe, are still in operation. Decommissioning of these operating facilities will not start before 2015 at the very earliest for Petten (this only concerns the High Flux Reactor - "HFR"), and possibly not until 2025, or even later, for Geel and Karlsruhe. Nevertheless, in accordance with IAEA's recommendations, the Commission has drawn up decommissioning plans using these dates as a reference scenario for the installations still in operation.

The JRC has been carrying out decommissioning and associated waste management activities on the four sites, in particular in Ispra, since 1999, in line with the aforementioned programme⁶⁷.

An overview matrix providing the types of liabilities and the policies and practices for the JRC wastes is given hereunder.

Type of Liability	Long-Term Management Policy	Funding of Liabilities	Current Practice/ Facilities	Planned Facilities
Spent Fuel	Reprocessing or long-term storage in national repository	Funds provided from the EU budget	Interim storage	Interim storage
Research Wastes	National repositories	Funds provided from the EU budget or third parties	On-site temporary storage Characterization Waste minimization	Characterization facilities Waste compaction Free release facility
Decommissioning Liabilities	Decommissioning	Funds provided from the EU budget	Pre-decommissioning plans	
Disused Sealed sources	Sources collection and storage at third parties facilities	Funds provided from the EU budget	On-site storage or shipment to third party facilities	

2.3 JRC policies and practices

2.3.1 Spent fuel management policy

The spent fuel management policy followed by the Commission on each site is dictated by:

⁶⁶ COM (2008) 903.

⁶⁷ The programme, as presented, focused mainly on the "historical liabilities", ie the installations shut down and the management of the waste accumulated during their operation.

- the existing regulations in the host country, ie produce ultimate waste/packaging that is compatible with the national final disposal requirements;
- the interests of the EU, especially the retention of valuable materials within the EU;
- the ultimate cost to the European taxpayer, ie make use of existing routes (reprocessing or return to third party) whenever feasible, rather than waiting for theoretical national solutions, for which the actual cost is uncertain.

2.3.2 *Spent fuel management practices*

In Petten spent fuel from the HFR is either shipped to an intermediate storage facility managed by COVRA⁶⁸, the central organisation for nuclear waste management, or back to the United States of America (USA) in the case of fuel originating from that country, under the take-back programme. At Ispra the matter was investigated in detail and the current option is dry storage in dual-purpose casks, pending shipment to the national long term storage facility.

2.3.3 *Radioactive waste management policy*

Euratom's policy is to reduce the amount of radioactive waste to the lowest level reasonably achievable and to dispose of the resulting waste packages in a national repository in the host country. In particular, due consideration is given to the decontamination of waste, in order to release the waste from regulatory control, and to the optimisation of processes, both to reduce the volume of primary waste and to minimise the quantity of secondary waste.

2.3.4 *Radioactive waste management practices*

Radioactive waste generated at the HFR at Petten is managed by the NRG⁶⁹, the operator and licence holder of the HFR, and eventually transferred to COVRA. From Geel, waste is transferred to ONDRAF/NIRAS⁷⁰ and shipped to the Belgoprocess facilities.

The Karlsruhe Institute for Transuranium Elements (ITU) is located adjacent to the Central Decontamination Operations Department (HDB) that is part of the WAK (Wiederaufbereitungsanlage Karlsruhe Rückbau- und Entsorgungs-GmbH), that directs all decommissioning activities on the site of the national research centre Karlsruhe Institute for Technology (KIT). The HDB manages radioactive wastes originating from the Karlsruhe site, including ITU and various other sites in Germany. Moreover, it should be noted that irradiated material no longer used for research activities is subject to intermediate storage as waste.

In Ispra the waste is stored in facilities on site, waiting for the availability of a national repository. In the meantime, the Ispra site is constructing or refurbishing several waste management facilities in order to treat, characterise, process, condition and package properly the existing waste and that arising from dismantling operations. ***The construction of a new interim storage facility on the site will start in 2011, with the plan to be commissioned in 2013.***

⁶⁸ Centrale Organisatie Voor Radioactief Afval.

⁶⁹ Nuclear Research and Consultancy Group.

⁷⁰ Organisme national des déchets radioactifs et des matières fissiles enrichies/Nationale instelling voor radioactief afval en verrijkte splijtstoffen.

2.3.5 Waste categorisation criteria

At each site JRC follows the relevant national waste categorisation criteria, defined by law or by national norms. Reference is made to the national reports from Belgium, Germany, Italy and the Netherlands, for the corresponding legislation and categorisation criteria.

Section C

SCOPE OF APPLICATION (Article 3 of the Joint Convention)

The scope of application of the requirements of the Joint Convention is defined in the aforementioned declaration submitted by Euratom at the time of accession (see section A.1.2).

In addition, the following observations are made:

- To date, Euratom has not made a declaration under Article 3(1) of the Joint Convention.
- Euratom has not made a declaration under Article 3(2) of the Joint Convention.
- Euratom has not made a declaration under Article 3(3) of the Joint Convention⁷¹.

Section D

INVENTORIES AND PRACTICES IN EURATOM FACILITIES (Article 32(2) of the Joint Convention)

1. JRC GEEL (BELGIUM)

In 2002, Geel completed the first phase of its programme for the removal of "historical liabilities". The radiochemical building has been decommissioned and is now being used for non-nuclear activities. One of the two Van de Graaff accelerators has been decommissioned and other clean-up measures have been performed.

In addition, various clean-up activities have taken place, such as the GELINA linear accelerator area, reduction of the number of glove boxes in the mass spectrometry building and solidification of historical liquid waste.

Most of the non-irradiated nuclear materials have been transferred earlier to SCK•CEN⁷² in Mol (Belgium). This has cleared the way for downgrading the site to Category II⁷³, which imposes fewer monitoring constraints than Category I.

A detailed radiological investigation was conducted of all the nuclear installations still active, with a view to establishing an accurate forecast of future decommissioning and waste management costs. This was undertaken under the supervision of ONDRAF/NIRAS, the body designated by the Belgian Government to monitor the decommissioning and waste

⁷¹ The Court of Justice has ruled that activities falling within the military sphere are outside the scope of all the provisions of the Euratom Treaty, as well as of Euratom secondary legislation (Case C-61/03 *Commission v. UK* [2005] ECR I-2477 and Case 65/04 *Commission v. UK* [2006] ECR I-2239).

⁷² Studiecentrum voor Kernenergie - Centre d'étude de l'Énergie Nucléaire.

⁷³ According to IAEA INFCIRC 225 rev.4; "The physical protection of nuclear material and nuclear facilities".

management activities. This financial evaluation of future liabilities mainly concerns the GELINA linear accelerator and also includes provisional decommissioning plans. It was formally approved by ONDRAF/NIRAS in 2001. The plan has to be updated every five (5) years. A first update was performed in 2006, a second update is scheduled for 2011.

On the site of JRC Geel, at the end of 2010, there was no spent fuel stored and about 2 m³ of low level activity waste.

2. JRC KARLSRUHE (GERMANY)

Under the Euratom Treaty, the mission of the ITU is to be the European reference centre for basic actinide research, contributing to an effective safety and safeguards system for the nuclear fuel cycle and studying technological and medical applications of trans-uranium elements. Its continuously evolving scientific and technological activities have led to a variety of nuclear equipment, which are no longer required by current activities and are progressively being removed to allow optimum utilisation of its nuclear infrastructure. Consequently, the focus of the Karlsruhe site's D&WM Programme is presently on management of historical waste and the dismantling of obsolete nuclear equipment, such as glove-boxes.

Safe storage

Storage of the non-irradiated material was reorganised by order of the competent authorities to prevent discharge/dispersion of radioactivity into the environment in the event of an accident. Initially the material was stored in "bird cages" that guaranteed the required distance between materials to prevent criticality, before it was reloaded into special vaults in 2001 and 2002.

Remnants of nuclear material generated by earlier research work, both irradiated and non-irradiated, have accumulated as "historical liabilities" and must be stored until a point in time when a final geological repository exists and the materials can be conditioned according to site-specific acceptance criteria of that repository. In Germany nuclear material from nuclear facilities is usually stored on site by its owner, with the exception of vitrified fission products from reprocessing. The final disposal strategy for high level waste and spent fuel (heat generating waste) is still under evaluation; regarding the low and medium radioactive waste (waste with negligible heat generation) the final repository KONRAD is currently under construction and is expected to open before 2020.

Based on its forecast share of waste volume to be disposed of, ITU pays annually its part of all final repository related costs that the German state has encountered in managing the repository sites. This includes planning, construction and operation and closure.

The quantity of "historical" nuclear materials requires that ITU stores/facilities be ranked as Class 1⁷⁴ facilities for physical protection/security. This entails security guards, radiation protection staff, safeguards, staff for the operation of safety-related systems (ventilation, monitoring systems, fire detection, alarm systems, etc.) and recurrent safety checks; these are continuous activities at ITU.

⁷⁴ According to IAEA INFCIRC 225 rev.4; "The physical protection of nuclear material and nuclear facilities".

General contractor support

Various tasks have been contracted out, following the principle of using experienced external contractors, with JRC supervising the activities. The Central Decontamination Operations Department (HDB) of the WAK is the main contractor for radioactive waste treatment. This includes:

- licensed interim storage of radioactive waste packages; provision of required licences and enough space in storage facilities; optimum performance of waste packages during storage;
- production of solidified waste packages from liquid radioactive waste; treatment of radioactive waste to reduce waste volume corresponding to the principles and requirements for future final disposal;
- measurement and estimation of waste packages containing irradiated spent fuel; bookkeeping related to waste packages, kind of waste, quantities, isotopes and activities; transport of radioactive waste packages comply with safety principles and requirements.

Additional contracts have been established for radiation protection tasks and the corresponding physical protection.

Glove boxes

Many of ITU's scientific and technological activities necessitate handling radioactive isotopes in glove boxes to avoid airborne activity and the spread of contamination in the workplace. At the start of the D&WM Programme, ITU had about 400 glove boxes, of which about 240 have been dismantled. Obsolete glove boxes and equipment must be dismantled and removed. After removal of the equipment and material, the interior of the glove box is decontaminated to facilitate dismantling of the containment to suitable dimensions. The resulting radioactive waste, including glove box sections, is then sorted, characterised and appropriately sealed in plastic bags and loaded into 200-litre drums, prior to being dispatched to HDB at the WAK for further treatment. To protect against spread of contamination during measurements, a caisson structure, including ventilation and fume hood, was constructed and put into operation.

Decontamination of hot cells

From 1966 to 1998 material and devices were progressively accumulated in twenty hot cells. They have to be removed, and the interior of the hot cells has to be decontaminated. In particular, as the nuclear material inventory approaches the licensed hot cell limits for the total activity and quantity of nuclear material, it is paramount to remove the material from the hot cells as soon as practicable. Some hot cells have already been decontaminated and preparatory work has started on another hot cell. Unwanted nuclear material and degraded components and devices have been dismantled, cut up and removed from the hot cell as radioactive waste, using appropriately shielded container and drum discharging systems. After removing all fuel and equipment, the inner surface of the hot cell and, if necessary, concrete shielding, are decontaminated, potentially using remote handling techniques to avoid undue risk to personnel. The resulting waste is sorted and characterised (isotopes and their activities, chemical composition, combustible or non-combustible, etc.) before being packaged and transferred to the WAK for further treatment.

To comply with the national regulations relating to the transport of radioactive material and the treatment of radioactive waste when the isotopic composition and quantities in the hot cell radioactive waste are not sufficiently known, new procedures and measurement methods were developed to assist in obtaining the missing data.

Water cell

One former project at ITU, in the 1970's, concerned the production of Californium sources. *A 30m² water cell, designed for the welding of sources into a second container and for assurance of a contamination-free end product, was dismantled and disposed of in 2010.* Most of the masses could be released for unrestricted use according to §29 of the German radiation protection ordinance.

Solid waste characterisation equipment

Before further treatment and final disposal of contaminated material and radioactive waste, its isotopic content has to be precisely known. For this characterisation of radioactive waste packages, gamma counters and passive neutron coincidence counters were procured and assembled. *In 2010, equipment and additional personnel were procured to increase the capacity of the system.*

Caisson equipment

One former objective of ITU was to improve nuclear fuel characteristics based on the use of mixed oxides, nitrides and carbides of plutonium and uranium. To support this activity, glove box equipment for the production of mixed oxide nuclear fuel rods was located in two metallic caissons. Removal of the equipment from the caisson is necessary in order to process the items as radioactive waste and to release the area for conducting new research activities which was completed in 2006.

At the end of 2010, the quantity of research irradiated fuel on the site was about 30 kg, whereas the quantity of low and intermediate wastes was about 86 m³.

3. JRC PETTEN (NETHERLANDS)

So far, the two activities in Petten in connection with its "historical liabilities" were the shipment to the USA of spent fuel originating from the period when the reactor was the subject of a Community research programme and the treatment of historical experimental waste. *After the shipment of the last eighteen (18) high enriched uranium (HEU) spent fuel elements, which were still in the reactor, to the Dutch spent fuel storage facility (HABOG) in the first quarter of 2011, all HEU spent fuel elements used in the HFR have been either sent back to the USA (in an earlier period of time, not covered by this report) or stored in the HABOG. Presently, there is no spent fuel on the site being property of the JRC.*

As owner of the HFR, the Commission is responsible for its later decommissioning. The financing of this decommissioning is made from the EU decommissioning budget and partly through provisions from the budget of the HFR supplementary research programme. The final amount of these provisions will depend on the date of final shutdown of the HFR.

The HFR is a multi-purpose research reactor of the tank-in-pool type, cooled and moderated by light water, and operated at 45 MW. In operation since 1961, the reactor provides a variety of neutron field conditions and irradiation facilities. Within the reactor vessel (the "tank")

neutrons are available for irradiation in reactor core positions (17 positions with fast and thermal neutron fluxes). In the poolside facilities (outside the reactor vessel) thermal neutron fluxes are used mainly for nuclear fuel testing and radioisotope production. In addition neutron beams are available for analytical applications (e.g. neutron activation analysis, neutron radiography) and further research (solid state physics, materials science).

The decommissioning of the HFR in Petten is not envisaged before 2015. The plant itself is in excellent condition, as demonstrated by the regular achievement of its planned operating schedule, as well as by the regular maintenance activities and upgrading works (ie the replacement of the reactor vessel in 1984-1985, and the repair of a defect in the reactor coolant system in 2010), which will allow the reactor to operate well beyond 2015. An earlier shutdown cannot be ruled out in the event of a halt to the research programmes and/or withdrawal of the countries participating in financing the operation of the HFR.

In 2005, an agreement was signed to transfer the operating license as well as the liabilities linked to the exploitation of the HFR (in particular, the management of the spent fuel and the waste originating in the research and radioisotope production activities) to the Dutch company NRG. ***In 2007, a contract was signed with NRG concerning the removal and disposal of historic high active waste originated from experiments and from the HEU fuel cycle. It is expected that the shipment of this waste to COVRA will be completed by 2014.*** Therefore, the liabilities associated with the decommissioning of the HFR have to be seen as "future liabilities". In 2005 a reassessment of the future liabilities of the HFR confirmed the initial cost estimates for the dismantling of the HFR. ***A new reassessment has been contracted in 2010 to a specialized company, which will provide an updated estimation of the cost of the decommissioning and dismantling of the HFR by the end of 2011.***

4. JRC ISPRA (ITALY)

Safety and radiation protection of the Ispra JRC facilities, including the safe management of spent fuel and radioactive waste, are regulated by the Italian legislation according to agreement between the Commission and the Government of the Republic of Italy, dated July 22, 1959, transposed into the Italian legislation with Law No. 906 of August 1, 1960.

The action programme at the Ispra site is the most pressing since almost all the nuclear installations, therein, have been definitively shut down. The strategy consists of processing and storing accumulated waste ("historical liabilities") on site, in order to take into account both new waste management practices and current Italian legislation, until Italy opens a national site for the disposal of low level waste and long term storage of ILW and HLW. Present work includes construction or refurbishment of the waste characterisation, treatment, conditioning and storage installations essential for managing historical waste, as well as decommissioning waste as it is produced. In parallel, some nuclear materials are being transferred to industrialised non-EU countries, whenever possible.

Since 1999 the Ispra site has been working on reducing the volume of waste and on transferring abroad the fuel present on the site. Most of the spent fuel has been returned to the USA and the contaminated heavy water was transferred to Canada.

Construction and refurbishment of waste management installations are almost completed. They include, in particular, a waste characterisation installation, a decontamination

installation, a liquid effluent treatment station, the concrete encapsulation plant, a temporary storage facility and a free-release facility.

In addition, "pre-decommissioning" activities⁷⁵ have been completed. They include dismantling the shut-down VLLW⁷⁶ incinerator and dismantling the cooling tower of the Ispra-1 reactor⁷⁷, demolishing the overhead pipeline to convey liquid effluents to the old treatment station, demolishing several buildings, removing equipment and clearing more than 1 200 tonnes of materials from controlled zones not forming an integral part of a nuclear installation. ***At the end of 2010, the unconditional release of the site's former Radiochemistry Laboratory was finally achieved.***

The overall decommissioning strategy is based on the concept of the JRC as awarding authority, managing and maintaining control of the decommissioning and waste management activities and maximising the use of experienced contractors, when feasible from a technical, managerial and legal viewpoint. A staffing policy has been drawn up, indicating the evolution of profiles and competences as the programme develops. Moreover, new major long-term contracts for assistance with managing the various projects have been placed for.

Operation and maintenance of waste management facilities

Supply/management of general services includes the operation of electricity supplies, power distribution and lighting, instrumentation, control and automation, mechanical services (ventilation, fluids, cranes, equipment/machines, structures, workshop, warehouse, logistics and handling equipment) and civil services (buildings, plants, sites, environment, etc.).

Nuclear Safety and Radiation protection

From the licensing point of view, continuous activities have been conducted, such as management of the operating licences of the installations and downgrading thereof, in line with Italian legislation, and relations with the Italian authorities, including preparation for and follow-up of inspections by the authorities. The obligations arising from activities include amongst others: regularly updating operational procedures, improving safety and security performance, supplying licensed staff, including off-duty service, executing emergency exercises, managing the technical archive, all internal/external technical committees prescribed by legislation in force, preparing the status report for each facility, preparing the projects under the decommissioning plans and obtaining the necessary authorisations.

Pre-decommissioning activities and activities related to the management of radioactive waste are conducted according to specific authorization envisaged by the Italian legislation. In this regard, the licence of "Area 40" (site area dedicated to waste characterization, treatment and storage activities) has been recently renewed in 2008, while projects for the temporary storage of embedded spent fuel and for liquid wastes are under approval.

⁷⁵ "Pre-decommissioning" means activities aiming to reduce the burden of the decommissioning process and which can be carried out on a shut-down installation on the basis of an operating licence and/or a specific authorisation granted by the authorities. Examples of pre-decommissioning: removal of spent/unirradiated fuel, partial removal of components, buildings for safety reasons, changes to make decommissioning easier, on-site waste treatment, etc.

⁷⁶ Very Low Level Waste.

⁷⁷ The first small research reactor in Italy.

The total number of outside contractors working on a day-to-day basis at Ispra is about seventy (70) staff; additional personnel are employed on the contractors' premises.

During the period between the shutdown and decommissioning of a nuclear installation, a programme of routine activities is undertaken to keep the installation in a safe state, in compliance with regulatory and site requirements. These activities also include keeping operating and maintenance knowledge and records of shutdown nuclear installations and existing radioactive wastes for radiological characterisation of the installations, with a view to decommissioning.

Modernisation and/or provision of waste management installations

As part of the waste management strategy, the "Area-40" complex is being set up to host all waste management plants. Some of the existing conventional infrastructure has been refurbished in order to obtain the fire prevention certificate. The area has also been equipped with ventilation, radiation-monitoring equipment and comprehensive radiation monitoring systems for radiation protection and operational purposes, with a central control room for the entire area, the liquid drainage network serving the "suspect" and active effluents, where needed, and water supplies, and the roof and heating and ventilation system of building 40 have been replaced. In order to reinforce the security measures, new perimeter fencing (with sensors, alarms, etc.) has been erected. The development plan for Area 40 has been issued and forwarded to the competent authority.

As mentioned above, Area 40 recently received a new licence according to the Italian legislation. Conditions attached to the licence also include the programme for the management of the historical wastes stored underground and for the construction of a new interim storage facility. ***The construction of this facility has been decided and, at the time of writing, it is expected to start in September 2011. It will allow to store the wastes after their characterization and adequate conditioning in drums and containers.***

Treatment station for liquid effluents

Construction of this installation has been completed and the station has been commissioned. The facility is capable of treating 150 m³ of "suspect" waste per year and a similar quantity of low-level liquid effluents with a maximum activity of 400 Bq/g. It includes a treatment section and a storage section with a capacity of 60 m³ of processed effluents and 120 m³ of untreated effluents.

Free release facility

Infrastructure is needed to execute material clearance control procedures in accordance with the applicable legislation, guidelines and technical prescriptions, as any material arising from pre-decommissioning and decommissioning activities undertaken in controlled areas is potentially radioactive.

All civil works at the free release facility have been completed and the facility is now in operation. The system is able to check about 3 000 m³ of suspect material annually.

To facilitate management of the cleared material after monitoring, a transit store has been constructed, including storage for the cleared materials prior to dispatch off-site, portal monitors and a weighing station for trucks.

Characterisation plant

Taking into account that about 15 000 m³ of radioactive solid waste need to be measured, Ispra has acquired a comprehensive waste characterisation system comprising a tomographic gamma scanning and active neutron interrogation system, linked by conveyors capable of automatically handling batches of twenty 440-litre drums per day (continuous measuring chain). The facility is now in operation.

Decontamination plant

The decontamination plant underwent an initial refurbishment, which included major clean-up and clearance operations, provision of a complete heat, ventilation and air conditioning system, and an upgrade of the fire emergency systems.

The new decontamination system based on the abrasive blasting is going to be commissioned within 2011.

Compaction and cementation

The need for construction of an in-situ compaction and cementation plant has been evaluated. Options of on-site mobile and off-site treatments are currently under discussion.

Pre-decommissioning and decommissioning activities

More than 1 000 tonnes of material (metal, electrical cabling, plastic, insulating material, glass, rubble and wood) have been removed from the hot cell installation (LCSR), from the ESSOR nuclear plant (including asbestos components), from the Ispra 1 reactor and from other facilities in Area 40. They were released from the controlled areas after monitoring (and decontamination when required) and disposed of as clearable material. Several hundred radioactive sources (no longer used) have been collected and finally disposed and/or transferred to third parties. The status report on the ESSOR complex has been updated and forwarded to the regulatory authority. A thorough physical radiological characterisation of the site shut-down installations has been completed. Still in the ESSOR complex, the PETRA experimental installation has been partially removed to allow temporary storage of spent fuel before proceeding with handling operations to transfer it into transportation casks.

In Ethel facility, Tritium has been removed from the U-getters and these have been shipped off site in the frame of a contract for the transfer of ownership of fresh NM. Ethel has been dismantled and declassified and can now eventually be utilized for other purposes. Twelve (12) glove boxes have been transferred to third parties in the framework of the research supporting the fusion programme.

Preliminary activities, as agreed in the past between JRC and the Safety Authority, have started to increase the safety of Ispra-1 reactor. Other pre-decommissioning activities are in execution. A complex operation to recover and dry store most of the radioactive materials previously stored in the pond has been successfully completed. The new status report of Ispra-1 reactor has been issued, with the aim to better describe the current status of the facility and to support the application for the decommissioning.

Following the signature at the end of 2009 of the Settlement Agreement to compensate the Italian Liabilities present on the Ispra site, the execution of the decommissioning of the Ispra 1 reactor has been transferred to the Italian Government.

The hot cells complex (LCSR) is a two-storey facility with a floor space of 1 000 m², housing series of hot cells for metallographic and gamma scanning of fuel element sections, chemical separation of actinides, vitrification of radioactive waste and metallographic investigations of irradiated structural materials. It was in use until 1992. Now it is in safe shutdown conditions. A request for a license conversion has been addressed to the Italian Ministry and it will be finalised as soon as the authorized modifications to the plant are completed. In this frame, the new status report of the plant has been issued and addressed to the Italian authorities according to licence prescriptions.

The old treatment station for liquid effluents includes an open storage area, housing twelve tanks (total of 1 440 m³) and a treatment area. To increase the safety of the installations, as part of the pre-decommissioning activities, part of the treatment circuit has been replaced with the agreement of the authority ***and a temporary store for post-treatment sludge (secondary waste) has been realised and is going to be commissioned within 2011.***

FARO⁷⁸ is a large test facility for investigating phenomena related to severe accidents in light water reactors. Some of the experimental installations have been removed and sent to Cadarache (France) for reuse. Other equipment was shipped between July and September 2003. The depleted uranium inventory has been removed from the building and transferred to the ESSOR area. ***A contract for facility dismantling has been established in 2010.***

The radiochemistry laboratory has been in operation since 1962. ***The laboratory and its annexes are now declassified and unconditionally released from any radiological constraint.***

Physical and radiological characterisation of all Ispra's nuclear facilities undergoing decommissioning has been completed in 2010.

At the end of 2010, the total quantity of waste on the Ispra site consists in about 700 kg of spent fuel and of about 2500 m³ of low and medium activity wastes (excluding the waste arising from future decommissioning).

5. COMMISSION PREMISES IN LUXEMBOURG

Under a licence issued by the Health Ministry of Luxembourg, the Commission's Directorate-General for Energy (DG ENER) holds a total number of 78 low-radioactivity sealed sources. 37 of these radioactive sources are stored in specific locations inside the Commission's DG ENER premises in Luxembourg. These 27 gamma sources and 10 neutron sources are used for calibrating and testing safeguards non-destructive measurement equipment and for testing radioactivity detection instruments.

Another 36 neutron sources are stored in JRC Ispra locations. 14 of these sources with very low activity are out of use; the others are used for nuclear safeguards inspectors training courses.

Moreover, DG ENER holds 43 fissile materials calibration standards containing in total about 1430 grams of uranium of different enrichment. These calibration standards are stored in two different locations inside the EUFO building in Luxembourg.

⁷⁸ Fuel Assemblies (melting) Release Oven.

A limited number of radioactive sources are frequently transported, because they are incorporated in measurement equipments which are used for safeguards applications inside nuclear installations. The total amount of radioactivity of all sources involved is well below the maximum amount permitted by the Luxembourg authorities. In accordance with this authorisation, specific safety requirements are applied for storage and use of the sources inside the EUFO building. Additionally, DG ENER holds an authorisation for radioactive sources transports from and to nuclear facilities. The authorisation for the operation of the EUFO locations includes specific requirements for air condition systems and the liquid effluences collection system. These systems are separated from other air condition and water collection systems installed inside the EUFO office building. Permanent radioactivity control and regular radio-chemical analysis are performed in order to monitor radioactivity in the air evacuation systems and the liquid effluences collection system. The monitoring results are regularly reported to the Luxembourg radiation protection authority.

Furthermore, the authorisation requires annual leakage tests and radioactivity measurements of all radioactive sources held by DG ENER. Since DG ENER is in possession of fissile materials, European and IAEA nuclear safeguards legislation and regulations are also applied and annual physical inventory verifications are performed.

The radioactive sources measurements results are reported annually to the Luxembourg radiation protection competent authority and the fissile materials are under Euratom Safeguards.

Section E

EURATOM'S LEGISLATIVE AND REGULATORY SYSTEM

1. LEGISLATIVE AND REGULATORY FRAMEWORK (ARTICLE 19 OF THE JOINT CONVENTION)

1.1 Treaty provisions

Article 2(b) of Title I of the Euratom Treaty states that in order to perform its task, Euratom shall, as provided for in the Treaty, "*establish uniform safety standards to protect the health of workers and of the general public and ensure that they are applied*".

Title II, Chapter 3, of the Treaty ("Health and Safety" – Articles 30 to 39) sets out a number of detailed provisions intended to establish, bring into force and apply the basic standards mentioned in Article 2(b). Thus, Article 30 of the Treaty stipulates: "*Basic standards shall be laid down within the Community for the protection of the health of workers and the general public against the dangers arising from ionising radiations...*". Articles 31 and 32, then, provide for the details regarding the adoption and the revision of the basic standards, while Article 33 ensures that Member States' implementing legislation complies with the basic standards adopted by the Community. Also, Articles 34 et seq. ensure, in various ways, monitoring by the Commission of health and safety measures, including any plans for the disposal of radioactive waste⁷⁹.

⁷⁹ For more details on these Treaty provisions, see section E.2 below.

Under the combined provisions of Article 106a(1),(2) of the Euratom Treaty and Article 288 TFEU, the relationship between the legislation adopted by Euratom and the national regulatory systems of the Member States is as follows:

"...the institutions shall adopt regulations, directives, decisions, recommendations and opinions.

A regulation shall have general application. It shall be binding in its entirety and directly applicable in all Member States.

A directive shall be binding, as to the result to be achieved, upon each Member State to which it is addressed, but shall leave to the national authorities the choice of form and methods.

A decision shall be binding in its entirety. A decision which specifies those to whom it is addressed, shall be binding only on them.

Recommendations and opinions shall have no binding force".

1.2 Secondary legislation⁸⁰

A substantial corpus of Euratom binding secondary legislation has been adopted and updated over the years.

The central element of this legislation, based on Title II, Chapter 3, of the Treaty, is Council Directive 96/29/Euratom of 13 May 1996⁸¹ laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation (the "Basic Safety Standards Directive" or otherwise known as the "BSS Directive").

The BSS Directive applies to all practices involving ionising radiation or radioactive substances, including natural radiation sources and naturally occurring radionuclides, and requires prior authorisation by the competent national authorities for specific practices.

These practices include, in particular, the management of radioactive waste and spent fuel, as Article 5 of the BSS Directive requires that "*the disposal, recycling or reuse of radioactive substances or materials containing radioactive substances...is subject to prior authorisation*". Article 4 of the BSS Directive lays down a general authorisation requirement for relevant practices giving rise to these substances, among which is the practice of the "*operation and decommissioning of any facility of the nuclear fuel cycle*" (Article 4(1)(a) of the BSS Directive). Hence, not only management of spent fuel and radioactive waste as part of the nuclear fuel cycle, but also the decommissioning of nuclear installations, including the release of materials for recycling or reuse, is subject to prior authorisation.

The management of spent fuel and radioactive waste has been addressed at EU level mainly through a variety of legislative instruments adopted under Title II, Chapter 3, of the Treaty (Articles 30 to 39 on health and safety). At present, Treaty-based legislation covers *inter alia* the following aspects:

⁸⁰ "Secondary law" herein means measures that are adopted by the institutions under the express empowerment of a Treaty provision (e.g. a Regulation, a Directive, etc.), as opposed to "primary law" which signifies the law laid down by the Treaty provisions themselves.

⁸¹ OJ L 159, 29.06.1996, p. 1.

- The aforementioned 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 (the BSS Directive), whose provisions have been supplemented by more specific legislation⁸². As mentioned above, 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 2003/122/Euratom of 22 December 2003 on the control of high-activity sealed radioactive sources and orphan sources (including disused sources)⁸³, aiming at preventing exposure to ionising radiation arising from inadequate control of high-activity sealed radioactive sources and at harmonising controls in the Member States;
- Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel (repealing previous Council Directive 92/3/Euratom)⁸⁴ lays down a Community system of supervision and control of transboundary shipments of radioactive waste and spent fuel. In particular, it provides for a compulsory and common scheme of notification and a standard control document, for shipments of radioactive waste or spent fuel which have a point of departure, transit or destination in an EU Member State, provided that the quantities or concentration in question are over certain limits fixed by the BSS Directive (Article 1(1),(2)(b) of Directive 2006/117, in conjunction with Article 3(2)(a-b) of the BSS Directive);
- *Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations (the "Nuclear Safety Directive")⁸⁵, imposes obligations on the Member States to establish and maintain a national framework for nuclear safety. With regard to spent fuel and radioactive waste, this Directive applies to spent fuel storage facilities and to storage facilities for radioactive waste that are on the site and are directly related to nuclear installations. Thus, it does not cover all types of facilities or aspects of spent fuel and radioactive waste management. Directive 2009/71, in fact, supplements the basic standards referred to in Article 30 of the Treaty, as regards the safety of nuclear installations, and is without prejudice to the BSS Directive. Its goal is to maintain and promote the continuous improvement of nuclear safety and to ensure that a high level of nuclear safety is provided by EU Member States to protect workers and the general public against dangers arising from nuclear installations. Towards this end, it reflects the fundamental*

⁸² Council Decision 87/600/Euratom of 14 December 1987 on Community arrangements for the early exchange of information in the event of a radiological emergency (OJ L 371, 30.12.1987, p. 76) established a framework for notification and provision of information to be used by the Member States in order to protect the general public in case of a radiological emergency; Council Directive 89/618/Euratom of 27 November 1989 on informing the general public about health protection measures to be applied and steps to be taken in the event of a radiological emergency (OJ L 357, 07.12.1989, p. 31) imposed obligations on the Member States to inform the general public in the event of a radiological emergency.

⁸³ OJ L 346, 31.12.2003, p. 57.

⁸⁴ OJ L 337, 05.12.2006, p. 21.

⁸⁵ OJ L 172, 02.07.2009, p. 18.

safety principles and requirements of the Convention on Nuclear Safety⁸⁶ and is built upon the Safety Fundamentals⁸⁷ established by the IAEA⁸⁸.

- *Council Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste⁸⁹, applies to all stages of management of spent fuel and radioactive waste from civilian activities, but not to authorised releases and waste from extractive industries which may be radioactive that are covered by other European legislation (in particular by the BSS Directive and Directive 2006/21/EC). It supplements the basic standards referred to in Article 30 of the Euratom Treaty, as regards the safety of spent fuel and radioactive waste, and is without prejudice to the BSS Directive. It reflects the main principles and requirements of the IAEA Safety Standards and of the Joint Convention. The Directive imposes obligations on the Member states to establish and maintain national legislative, regulatory and organisational framework for the management of spent fuel and radioactive waste that allocates responsibility and provides for coordination between relevant competent bodies. The national framework shall provide for the following:*
 - *a national programme for the implementation of spent fuel and radioactive waste management policy;*
 - *national arrangements for the safety of spent fuel and radioactive waste management;*
 - *a system of licensing of spent fuel and radioactive waste management activities, facilities or both, including the prohibition of spent fuel or radioactive waste management activities, of the operation of a spent fuel or radioactive waste management facility without a licence or both and, if appropriate, prescribing conditions for further management of the activity, facility or both;*
 - *a system of appropriate control, a management system, regulatory inspections, documentation and reporting obligations for radioactive waste and spent fuel management activities, facilities or both, including appropriate measures for the post-closure periods of disposal facilities;*
 - *enforcement actions, including the suspension of activities and the modification, expiration or revocation of a licence together with requirements, if appropriate, for alternative solutions that lead to improved safety;*
 - *the allocation of responsibility to the bodies involved in the different steps of spent fuel and radioactive waste management; in particular, the national framework shall give primary responsibility for the spent fuel and radioactive waste to their generators or, under specific circumstances, to a licence holder to whom this responsibility has been entrusted by competent bodies;*
 - *national requirements for public information and participation;*
 - *the financing scheme(s) for spent fuel and radioactive waste management.*

⁸⁶ See section A.1.2, footnote 27, above.

⁸⁷ Fundamental Safety Principles: Safety Fundamentals, IAEA Safety Standard Series No. SF-1 (2006).

⁸⁸ Detailed reference to the Nuclear Safety Directive has been made in the last Euratom report on the implementation of the obligations under the Convention on Nuclear Safety, which was submitted to the secretariat of IAEA in 2010, in view of the Fifth Review Meeting of the Contracting Parties (Vienna, April 2011).

⁸⁹ OJ L 199, 02.08.2011, p.48

Member States shall ensure that the national framework is improved where appropriate, taking into account operating experience, insights gained from the decision-making process, and the development of relevant technology and research.

In addition, there are EU Directives dealing with:

– environmental assessment at EU level:

- Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment⁹⁰, as amended by Directives 97/11/EC, 2003/35/EC and 2009/31/EC;
- 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 programs on the environment⁹¹.

– implementing the Aarhus Convention:

- 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/EEC⁹²;
- 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/EC⁹³.

– the management of waste from extracting industries:

- 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 industries⁹⁴. 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.

⁹⁰ OJ L 175, 05.07.1985, p. 40.

⁹¹ OJ L 197, 21.07.2001, p. 30.

⁹² OJ L 41, 14.02.2003, p. 26.

⁹³ OJ L 156, 25.06.2003, p. 17.

⁹⁴ O J L 102, 11.04.2006, p. 15.

1.3 "Soft law" measures⁹⁵

Also, the following (non-binding) Recommendations relate with the management of spent fuel and radioactive waste:

- Commission Recommendation of 24 October 2006 on the management of the financial resources for the decommissioning of nuclear installations, spent fuel and radioactive waste⁹⁶. The focus lies on the adequacy of funding, its financial security and the transparency in its use, ensuring the funds are only used for the intended purposes;
- *Commission Recommendation 2008/956/Euratom of 4 December 2008 on the criteria for the export of radioactive waste and spent fuel to third countries*⁹⁷. *The Recommendation clarifies the main requirements relating to the export of radioactive waste or spent fuel to third countries, referred to in Article 16(1)(c) of Directive 2006/117, as well as the criteria which Member States should take into consideration in order to evaluate whether the above requirements are met;*
- *The revised Commission Recommendation on the application of Article 37 of the Treaty, which was adopted on October 2010*⁹⁸. Article 37 of the Treaty requires Member States to provide the Commission with general data relating to any plan for the disposal of radioactive waste; then, the Commission delivers an opinion with regard to the plan concerned. *The revised Recommendation improves relevant terminology to ensure consistency and clarity, and simplifies the general data to be provided by Member States. It strengthens the assessment of accidental situations by introducing a new requirement for safety-related information on unplanned releases from nuclear reactors and reprocessing plants. Concerning dismantling operations, in addition to nuclear reactors and reprocessing plants, a submission of general data for the dismantling of mixed-oxide fuel fabrication plants is required.*

2. IMPLEMENTING MEASURES (ARTICLE 18 OF THE JOINT CONVENTION)

The obligations under the Joint Convention are reflected in the requirement to implement the basic safety standards provided for in Articles 30, 31 and 32 of Title II, Chapter 3, of the Euratom Treaty and related secondary legislation. More specifically:

- Elaboration of basic safety standards relevant to radiation protection is a legislative task conferred to Euratom by the aforementioned Articles 2(b), 30 and 31 of the Treaty. It is restated that **Article 2(b)** empowers the Community to establish uniform safety standards for the protection of the health of workers and the general public and

⁹⁵ Non-binding acts are often called "soft law". Such acts include Recommendations and Opinions formulated by the Commission, which, as it is expressly provided in Article 288 TFEU, "have no binding force". However, while this precludes "soft law" measures from having legally binding effect on the national legal order, it does not immunize them from the judicial process. It is, for example, open to a national court to make a reference to the Court of Justice concerning the interpretation or validity of a measure of that kind; Case C-322/88 *Grimaldi v. Fonds des Maladies Professionnelles* [1989] ECR 4407. Moreover, "soft law" instruments are useful both for developing Community policy and communicating to the Member States the Commission's views and/or guidelines as to the provisions of a legally binding measure or how the Commission will exercise its discretion in a particular area.

⁹⁶ OJ L 330, 28.11.2006, p.31.

⁹⁷ OJ L 338, 17.12.2008, p. 69.

⁹⁸ 2010/635/Euratom, OJ L 279, 23.10.2010, pp. 36–67.

to ensure that they are applied, while **Article 30** elucidates this general empowerment stipulating that "*Basic standards shall be laid down within the Community for the protection of the health of workers and the general public against the dangers arising from ionizing radiations. The expression 'basic standards' means: (a) maximum permissible doses compatible with adequate safety; (b) maximum permissible levels of exposure and contamination; (c) the fundamental principles governing the health surveillance of workers*". It is also recalled that the BSS Directive constitutes a central legislative tool in this area, implementing the above Community tasks⁹⁹.

- **Article 31** is specifically concerned with the procedure which is required for the adoption of such uniform basic standards. It provides: "*The basic standards shall be worked out by the Commission after it has obtained the opinion of a group of persons appointed by the Scientific and Technical Committee from among scientific experts, and in particular public health experts, in the Member States. The Commission shall obtain the opinion of the Economic and Social Committee on these basic standards. After consulting the European Parliament the Council shall, on a proposal from the Commission, which shall forward to it the opinions obtained from these Committees, establish the basic standards; the Council shall act by a qualified majority*".
- **Article 32** makes express provision for the possibility to revise or supplement the basic standards which have already been adopted, specifying that "*At the request of the Commission or of a Member State, the basic standards may be revised or supplemented, in accordance with the procedure laid down in Article 31*".

To ensure that the basic safety standards are properly incorporated into the legal systems of the Member States, Article 33 of the Treaty provides: "*Each Member State shall lay down the appropriate provisions, whether by legislation, regulation or administrative action, to ensure compliance with the basic standards which have been established and shall take the necessary measures with regard to teaching, education and vocational training. The Commission shall make appropriate recommendations for harmonising the provisions applicable in this field in the Member States. To this end, the Member States shall communicate to the Commission the provisions applicable at the date of entry into force of this Treaty and any subsequent draft provisions of the same kind. Any recommendations the Commission may wish to issue with regard to such draft provisions shall be made within three months of the date on which such draft provisions are communicated*". Thus, Member States are under an obligation to lay down the appropriate provisions to ensure compliance with the basic standards adopted by the Community, taking into account the BSS Directive, and to communicate those provisions to the Commission.

Moreover, with regard to Euratom health and safety measures there are additional provisions in Title II, Chapter 3, of the Euratom Treaty ensuring their monitoring by the Commission. Reference is made to the following provisions of the Treaty:

- "*Any Member State in whose territories particularly dangerous experiments are to take place shall take additional health and safety measures, on which it shall first obtain the opinion of the Commission. The assent of the Commission shall be required where the effects of such experiments are liable to affect the territories of other Member States*" (**Article 34**).

⁹⁹ See section E.1.2 above.

- *"Each Member State shall establish the facilities necessary to carry out continuous monitoring of the level of radioactivity in the air, water and soil and to ensure compliance with the basic standards. The Commission shall have the right of access to such facilities; it may verify their operation and efficiency" (Article 35).*
- *"The appropriate authorities shall periodically communicate information on the checks referred to in Article 35 to the Commission so that it is kept informed of the level of radioactivity to which the public is exposed" (Article 36).*
- **With regard to plans for the disposal of radioactive waste, in particular, the Treaty requires Member States to provide the Commission with general data and empowers the Commission to deliver opinions thereupon. It states: "Each Member State shall provide the Commission with such general data relating to any plan for the disposal of radioactive waste in whatever forms will make it possible to determine whether the implementation of such plan is liable to result in the radioactive contamination of the water, soil or airspace of another Member State. The Commission shall deliver its opinion within six months, after consulting the group of experts referred to in Article 31 " (Article 37).**
- *"The Commission shall make recommendations to the Member States with regard to the level of radioactivity in the air, water and soil. In cases of urgency, the Commission shall issue a directive requiring the Member State concerned to take, within a period laid down by the Commission, all necessary measures to prevent infringement of the basic standards and to ensure compliance with regulations. Should the State in question fail to comply with the Commission directive within the period laid down, the Commission or any Member State concerned may forthwith, by way of derogation from Articles 258 and 259 of the Treaty on the Functioning of the European Union, bring the matter before the Court of Justice" (Article 38).*

Furthermore, the Treaties guarantee that Euratom possesses the necessary enforcement mechanisms to ensure that all Community binding legislation is complied with by the Member States. To this end, the Court of Justice of the EU is entrusted with an important role¹⁰⁰. The Court of Justice of the EU, including the Court of Justice, the General Court and specialised courts¹⁰¹, ensures that the law is observed in the interpretation and application of the TEU, the TFEU, the Euratom Treaty and of the legislation adopted by the EU institutions. The Court of Justice has competence, *inter alia*, over actions brought against Member States for failure to fulfil their obligations, references for a preliminary ruling and appeals against decisions of the General Court. It most commonly adjudicates on matters of interpretation of the Treaties or of secondary law, raised by:

- claims by the Commission that a Member State has not implemented an EU or Euratom directive or other binding legal requirement, in the framework of an infringement procedure¹⁰².
- references from national courts of the Member States, asking the Court of Justice questions about the meaning or validity of a particular piece of EU or Euratom law¹⁰³.

¹⁰⁰ Article 19 TEU and Articles 251 to 281 TFEU.

¹⁰¹ According to Article 19 (1) TEU: "*The Court of Justice of the European Union shall include the Court of Justice, the General Court and specialised courts...*".

¹⁰² Articles 19 TEU and 258 TFEU, in conjunction with Article 106a of the Euratom Treaty.

¹⁰³ Articles 19 TEU and 267 TFEU, in conjunction with Article 106a of the Euratom Treaty.

The Court of Justice gives its ruling on the interpretation of the law, which is binding on the national court.

Council Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste also comes within the ambit of the above legal mechanism, which ensures compliance by all Member States with binding Community rules.

Section F

OTHER GENERAL SAFETY PROVISIONS

1. RESPONSIBILITY OF THE LICENCE HOLDER (ARTICLE 21 OF THE JOINT CONVENTION)

Euratom is involved in the licensing process for radioactive waste management under the aforementioned Article 37 of the Treaty, which states: "*Each Member State shall provide the Commission with such general data relating to any plan for the disposal of radioactive waste in whatever form as will make it possible to determine whether the implementation of such plan is liable to result in the radioactive contamination of the water, soil or airspace of another Member State. The Commission shall deliver its opinion within six months...*". The licence cannot be granted at national level, before the Commission's opinion is delivered.

As it has also been stated above, a revised Commission Recommendation on the application of Article 37 of the Treaty was adopted on October 2010¹⁰⁴, aiming at clarifying, simplifying and improving the relevant aspects of the procedure under Article 37, on the basis of the experience gained, and replacing previous Commission Recommendation 99/829/Euratom¹⁰⁵.

The Court of Justice confirmed that "*Under Articles 30 to 32 of the Euratom Treaty the Community possesses legislative competence to establish, for the purpose of health protection, an authorisation system which must be applied by the Member States*"¹⁰⁶. In the framework of this authorisation system, which is expressly laid down in Articles 4 and 5 of the BSS Directive, the principle of the responsibility of the licence holder is endorsed in Article 47, which is entitled "*Responsibility of Undertakings*" and which provides: "*1. Each Member State shall require the undertaking responsible for practices as referred to in Article 2 to conduct them in accordance with the principles of health protection of the population in the area of radiation protection and in particular to carry out the following tasks within its installations: (a) achieving and maintaining an optimal level of protection of the environment and the population; (b) checking the effectiveness of technical devices for protecting the environment and the population; (c) acceptance into service, from the point of view of surveillance of radiation protection, of equipment and procedures for measuring and assessing, as appropriate, exposure and radioactive contamination of the environment and the population; (d) regular calibration of measuring instruments and regular checking that they are serviceable and correctly used. 2. Qualified experts and, as appropriate, the*

¹⁰⁴ 2010/635/Euratom, OJ L 279, 23.10.2010, pp. 36-67.

¹⁰⁵ OJ L 324, 16.12.1999, p. 23.

¹⁰⁶ Judgment of the Court of 10 December 2002, Case C-29/99 *Commission v. Council* ECR 2002, p. I-11221.

specialized radiation protection unit referred to in Article 38 (4) shall be concerned in the discharge of these duties".

The principle of responsibility of the licence holder is fully endorsed by Council Directives 2009/71/Euratom (Article 6) and 2011/70/Euratom (Article 7). The latter Directive, in particular, requires Member States to ensure that the prime responsibility for the safety of spent fuel and radioactive waste management facilities and/or activities rests with the licence holder and can not be delegated.

It also provides that each Member State has ultimate responsibility for the management of spent fuel and radioactive waste generated in it. Where radioactive waste or spent fuel is shipped for processing or reprocessing to a Member State or a third country, the ultimate responsibility for the safe and responsible disposal of those materials, including any waste as a by-product, remains with the Member State or third country from which the radioactive material was shipped.

2. OPERATIONAL RADIATION PROTECTION (ARTICLE 24 OF THE JOINT CONVENTION)

As noted above, Title I, Article 2(b), of the Treaty requires Euratom to establish uniform safety standards to protect the health of workers and of the general public and ensure that they are applied. Hence, Title II, Chapter 3, of the Treaty, empowers the Community to lay down basic standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation.

The current safety standards with regard to radiation protection are set out in the BSS Directive. The general principles for radiation protection under the BSS Directive are *dose limitation, optimisation* and *justification*. The system of *dose limitation* is laid down in the Directive (100 mSv in a consecutive five-year period for exposed workers and 1 mSv in a single year for members of the public or, in special circumstances, as an average over five consecutive years). The key principle in terms of operational protection is *optimisation*: all exposures must be kept as low as reasonably achievable, taking economic and social factors into account. Dose constraints should be used, where appropriate, in the context of optimisation. *Justification*, nevertheless, is a matter of judgment by Member States and the Directive does not prescribe how to make this judgment.

3. EMERGENCY PREPAREDNESS (ARTICLE 25 OF THE JOINT CONVENTION)

The primary responsibility of protecting the general public in the event of a nuclear or radiological emergency lies with the Member States' authorities. However, Euratom has competences to establish legislation regarding emergency preparedness and emergency response. Articles 30 to 32 of the Treaty confer on Euratom competence to lay down basic standards for emergency measures, which includes the power to require Member States to draw up plans laying down measures for emergency preparedness in respect of nuclear installations. At the international level, this competence of Euratom in the area of emergency preparedness is reflected in the accession of Euratom to the Convention on Early Notification of a Nuclear Accident¹⁰⁷ and the Convention on Assistance in the Case of a Nuclear

¹⁰⁷ OJ L 314, 30.11.2005, p. 22.

Accident¹⁰⁸. The Commission contributes to these actions by initiating and participating in international systems for radiological emergency preparedness.

In light of the above, Article 50 of the BSS Directive requires that "*Each Member State shall ensure that account is taken of the fact that radiological emergencies may occur in connection with practices on or outside its territory and affect it*" and that it shall also ensure that appropriate intervention plans are drawn up at national or local level. The same Article requires Member States to ensure, where appropriate, that provision is made for the creation and appropriate training of special teams for technical, medical and health intervention, as well as to seek to cooperate with other Member States or non-Member States, in relation to possible radiological emergencies at installations on their own territory, which may affect other Member States or non-Member States, in order to facilitate the organization of radiological protection in these states.

In addition, Council Decision 87/600/Euratom¹⁰⁹ makes arrangements for the early exchange of information in the event of a radiological emergency (ECURIE¹¹⁰). These arrangements cover EU Member States, Switzerland, the Former Yugoslav Republic of Macedonia and Croatia, and "*apply to the notification and provisions of information whenever a Member State decides to take measures of a wide-spread nature in order to protect the general public in case of a radiological emergency*" (Article 1 of the Decision). A radiological emergency may be declared either due to an accident at a facility where a significant release of radioactive material occurs or is likely to occur, or due to detection of abnormal levels of radioactivity which are likely to be detrimental to public health. Article 2(i) of the Decision sets out the actions to be taken by the Member State that initially decides to take measures, as referred to in Article 1 of the Decision, as follows: (a) forthwith notify the Commission and those Member States which are -or are likely to be- affected of such measures and the reasons for taking them; (b) promptly provide the Commission and those Member States which are -or are likely to be- affected with available information relevant to minimising the foreseen radiological consequences, if any, in those states. The Decision also specifies the nature of the information which shall be provided and requires that the initial information is supplemented at appropriate intervals. The Commission forwards the information it receives from a Member State to all the Member States.

ECURIE is a 24h emergency notification and information exchange system. The system notifies the competent authorities of the participating states and the Commission in case of a major nuclear accident or radiological emergency. During an emergency, the system provides an information exchange platform for the participating states, in order to inform about the current and foreseeable status of the accident, meteorological conditions, national countermeasures taken, etc. The legal basis for the participation of EU Member States in ECURIE is the aforementioned Council Decision 87/600/Euratom and the Agreement between Euratom and non-Member States on the participation of the latter in the Community arrangements for the early exchange of information in the event of a radiological emergency¹¹¹. The Commission is responsible for ECURIE management and development¹¹².

¹⁰⁸ OJ L 314, 30.11.2005, p. 28.

¹⁰⁹ Decision 87/600/Euratom of 14 December 1987 on Community arrangements for the early exchange of information in the event of a radiological emergency, OJ L 371, 30.12.1987, p. 76.

¹¹⁰ European Community Urgent Radiological Information Exchange.

¹¹¹ OJ C 102 of 29.04.2003, p. 2.

¹¹² For more details on the ECURIE system, see at: <http://rem.jrc.ec.europa.eu/40.html>.

Also, a set of Euratom regulations¹¹³ lay down maximum permitted levels of radioactive contamination of foodstuffs and feeding stuffs following a nuclear accident or any other case of radiological emergency. These pre-established maximum permitted levels can be made immediately applicable through the adoption of a regulation by the Commission if the latter receives official information about an accident through the ECURIE system, indicating that these levels are likely to be reached or have been reached.

Other forms of international cooperation in this area include EURDEP¹¹⁴. This is both a standard data format and a network for the exchange of environmental radiation monitoring data between European countries in real-time. Participation of the EU Member States is based on Commission Recommendation 2000/473/Euratom¹¹⁵. Participation of the various non-EU countries is on a voluntary basis. Those countries that send their national radiological monitoring data have access to the data of all the other participating countries. The system is continuously operating with a daily data exchange routine and there is a general consensus that participating in the system automatically means that the data transmissions will continue during an emergency in an elevated frequency¹¹⁶. ***In 2010, the Commission concluded a Memorandum of Understanding with IAEA concerning the EURDEP-system. This Memorandum makes EURDEP technology available for the IAEA for creating a global on-line environmental radiation data exchange application.***

In case of a major radiological or nuclear accident affecting Europe, national long-range radioactivity dispersion forecasts will inevitably differ because of differences in national models, differences in weather prediction methods and differences in national emergency management strategies. Differences in national long-range dispersion forecasts may cause problems at the European level, as national emergency management strategies based solely on national forecasts may not cohere with those in neighbouring countries. ENSEMBLE is software that integrates the different weather forecasts (with the possibility to select preferred ones and also to look at specific national forecasts) and thus, with the input of radioactive release data, provides a relatively reliable prediction of the dispersion of radioactive substances with time. In this context, the system addresses the issue of harmonisation and coherence of emergency management and decision-making in relation to long-range atmospheric dispersion modelling, by providing a website tool to view and compare national dispersion forecasts¹¹⁷.

Finally, the Commission participates in IACRNE (Inter-Agency Committee on Response to Nuclear Emergencies) and has concluded bilateral agreements with international organisations on arrangements in the area of radiological emergency preparedness. Other radiological emergency preparedness activities of the Commission include training of national authorities, assistance to research activity coordination and regular preparedness exercises.

¹¹³ Council Regulation No 3954/87 of 22 December 1987, OJ L 371 of 30.12.1987, p. 11, as amended by Council Regulation No 2218/89 of 18 July 1989, OJ L 211 of 27.07.1989, p. 1; Commission Regulation No 770/90 of 29 March 1990, OJ L 83 of 29.03.1990, p. 78; Commission Regulation No 944/89 of 12 April 1989, OJ L 101 of 13.04.1989, p. 17; Council Regulation No 2219/89 of 18 July 1989, OJ L 211 of 22.07.1989, p. 4.

¹¹⁴ European Radiological Data Exchange Platform.

¹¹⁵ OJ L 191 of 27.07.2000, p. 37.

¹¹⁶ For more details on the EURDEP system, see at: <http://rem.jrc.ec.europa.eu/175.html>.

¹¹⁷ For more details on the ENSEMBLE system, see at: <http://rem.jrc.ec.europa.eu/177.html>.

4. DECOMMISSIONING (ARTICLE 26 OF THE JOINT CONVENTION)

4.1 Implementing legislation

Article 4(1)(a) of the BSS Directive makes decommissioning of nuclear installations (and the closure of uranium mines) subject to prior authorisation. This authorisation relates specifically not only to the disposal of radioactive waste for decommissioning, but also to conventional disposal of residues from dismantling with zero or very low levels of contamination, or recycling or reuse thereof (e.g. in steel smelters). Such materials may, however, be released from the requirements of the BSS Directive provided they comply with clearance levels established by the national competent authorities. These clearance levels must follow the basic exemption criteria laid down in the BSS Directive and take into account any technical guidance provided by the Community. Such guidance has been provided by the Group of Experts established under Article 31 of the Treaty. Specific clearance levels for the recycling of metals, buildings and building rubble, as well as default values (general clearance levels) for any other type of material, are available to Member States. Some Member States have incorporated these values into their legislation; others apply them on an ad hoc basis or apply values calculated specifically for the disposal or recycling pathways relevant to national practice.

General data on the dismantling of nuclear installations have to be notified by the Member States to the Commission under Article 37 of the Treaty, which has the objective to forestall any possibility of radioactive contamination of other Member State(s). Following this notification to the Commission, the latter delivers its opinion, thereupon, within six months, after consulting the Group of Experts referred to in Article 31 of the Treaty¹¹⁸. Certain details concerning this procedure are now dealt with by the abovementioned Commission Recommendation 2010/635/Euratom¹¹⁹, which replaced previous Commission Recommendation 1999/829/Euratom¹²⁰.

Over the past three years the Commission has given opinions on the disposal of radioactive waste from the dismantling/decommissioning of the following nuclear installations:

- the dismantling of the FRJ-2 research reactor (Germany), the BR-3 reactor (Belgium), the Chooz-A NPS (France), the José Cabrera NPS (Spain) and the Brennilis NPS (France), and

- the decommissioning of the Oldbury NPS (United Kingdom), the Bohunice A-1 NPS (Slovakia), the Wylfa NPS (United Kingdom), the FRM research reactor (Germany) and the Bohunice V-1 NPS (Slovakia).

4.2 Qualified staff and adequate financial resources

Article 26 of the Joint Convention requires that "Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that: (i) qualified staff and adequate financial resources are available".

¹¹⁸ As noted above, certain details concerning this procedure are dealt with by Commission Recommendation 2010/635/Euratom (OJ L 279, 23.10.2010, p. 36), which replaced previous Commission Recommendation 1998/829/Euratom (OJ L 324, 16.12.1999, p. 23).

¹¹⁹ OJ L 279, 23.10.2010, p. 36.

¹²⁰ OJ L 324, 16.12.1999, p. 23.

With respect to qualified staff, both Council Directives 2009/71/Euratom and 2011/70/Euratom provide that the national frameworks in place require all parties to make arrangements for education and training for their staff in order to further develop necessary expertise and skills.

Nuclear decommissioning is the final step in the lifecycle of a nuclear installation which requires a long term financial planning. The number of nuclear power plants in the EU (as well as research reactors and other nuclear fuel cycle installations) that are definitively closed and undergoing decommissioning is steadily increasing. It is a fair assumption that more than one quarter of the reactors currently operating in the enlarged EU-27 will need to be shut down by 2025, which underlines the increasing importance of decommissioning in the years ahead.

To assure safe decommissioning of nuclear installations and the related management of waste it is vital to have adequate financial resources available in time for its intended use.

According to Council Directive 2011/70/Euratom, the costs for the management of spent fuel and radioactive waste, including from decommissioning, shall be borne by those who generated those materials. Member States shall ensure that the national framework require that adequate financial resources be available when needed for implementation of their national programmes for the management of spent fuel and radioactive waste, taking due account of the responsibility of spent fuel and radioactive waste generators. The financing scheme(s) for spent fuel and radioactive waste management are mandatory elements of the national frameworks and programmes.

While the decommissioning of nuclear installations is an exclusively national competence, the national decommissioning funding schemes were discussed in the context of the Directive on the common rules for the internal market in electricity¹²¹. The European Parliament expressed its concern at the possible adverse effects of the misuse of financial resources earmarked for the decommissioning of nuclear plants and the management of waste. As a result, an inter-institutional statement made in July 2003¹²² set the ground for Community action, highlighting the need for adequate financial resources for decommissioning and waste management activities to be available for the purpose for which they have been established and to be managed with full transparency. At the same time, the Commission stated its intention to publish an annual report on the use of decommissioning and waste management funds.

The first report¹²³ on the use of financial resources earmarked for the decommissioning of nuclear power plants, published in 2004 and covering the EU Member States possessing nuclear power plants (both operational and shut-down), noted the diverse national approaches to financing decommissioning. The creation of the internal market has brought an increased need for transparency and harmonisation in the management of these financial resources.

¹²¹ Directive 2003/54/EC of the European Parliament and of the Council of 26 June 2003 concerning common rules for the internal market in electricity and repealing Directive 96/92/EC, OJ L 176, 15.06.2003.

¹²² OJ L 176, 15. 07.2003.

¹²³ Communication from the Commission to the European Parliament and the Council, "Report on the use of financial resources earmarked for the decommissioning of nuclear power plants"; COM (2004) 719 final, Brussels, 26 October 2004.

Pending adoption of legally binding instruments, the Commission has adopted in 2006 Recommendation 2006/851/Euratom¹²⁴ on the management of financial resources for the decommissioning of nuclear installations, spent fuel and radioactive waste.

Then, in 2007, the second report¹²⁵ was adopted comparing EU nuclear operators and Member States funding practice with that detailed in the Commission's Recommendation. Whereas the first report of 2004 was limited to power reactors, the second report covers all nuclear installations with an emphasis being placed on those which are at greatest risk, should decommissioning funding be inadequately addressed. The report highlights examples of good practice in countries where the polluter-pays-principle is enshrined in national legislation and where funds show a demonstrable performance from the viewpoint of providing adequate resources when needed. Nevertheless, despite specific national legislation, there are grounds for progress in several aspects of fund adequacy, management and use, in particular through detailed monitoring and reporting at both national and EU level.

The Commission expressed its intention to focus on the adequacy of funding, its financial security and the ring fencing that is required in order to ensure that the funds are only used for the purposes intended.

For future nuclear constructions a common approach to methodology should be progressed, but for currently operating systems the Commission's activities need to be based upon independent evaluation and reporting.

At the time of writing, a third report is being prepared by the Commission, based on Member States' responses to a dedicated survey. The survey was aided by specific guidelines, elaborated by a dedicated working group, as to the interpretation and implementation of the 2006 Recommendation.

Sections G and H

REQUIREMENTS WITH REGARD TO SAFETY OF SPENT FUEL MANAGEMENT AND SAFETY OF RADIOACTIVE WASTE MANAGEMENT

1. GENERAL SAFETY REQUIREMENTS (ARTICLES 4 AND 11 OF THE JOINT CONVENTION)

Article 2(1) of the BSS Directive states that the Directive applies to "*all practices which involve a risk from ionising radiation...namely the...processing, handling, storage...and disposal of radioactive substances*". The regulatory framework set up by the BSS Directive can generally be outlined as follows:

- each Member State must require the above practices to be *reported*;
- each Member State must require *prior authorisation* to be obtained for practices that may involve a risk for ionising radiation, which, as mentioned above, include the storage and disposal of radioactive substances;

¹²⁴ OJ L 330, 28.11.2006, p.31.

¹²⁵ COM (2007) 794 final and SEC (2007) 1654.

- the Directive lays down *a system of dose limitation and optimisation of protection*. Limitations of doses are set out in the Directive, taking into account the particular situation of the different groups of persons exposed, such as "workers" and "exposed workers", apprentices, students, pregnant and nursing women. Where appropriate, efforts to ensure optimum radiological protection should include dose constraints;
- each Member State must take reasonable steps to ensure that the contribution made by each practice to the exposure of the population as a whole *is kept as low as reasonably achievable*, taking into account economic and social factors. The total of all such contributions must be assessed regularly;
- the Directive establishes *exposure prevention measures*:
 - the competent authorities must draw up appropriate guidelines for classifying controlled and supervised areas in a given situation and undertakings must monitor working conditions closely within these areas;
 - Member States must require undertakings to provide information to workers;
 - the undertaking is responsible for assessing and implementing arrangements for the radiological protection of exposed workers;
- exposure assessment involves *monitoring the workplace* (measuring external dose rates and indicating the nature and quality of the radiation in question, as well as measuring the air concentration and surface density of contaminating radioactive substances and indicating their nature and their physical and chemical states), *monitoring the individual* (systematic for the most exposed workers) and *monitoring in the event of accidental or emergency exposure*;
- each Member State must:
 - *establish one or more systems for carrying out inspections*, in order to enforce the provisions introduced under the Directive, as well as to initiate monitoring and intervene whenever necessary;
 - *require workers to be given access*, at their request, to the results of any individual monitoring relating to them;
 - *require the necessary means for proper radiation protection to be made available to the units responsible*;
- each Member State must *create the conditions necessary to ensure optimum protection of the population* and to *apply the fundamental principles governing operational protection of the population*;
- Member States must ensure that consideration is given to the fact that radiological emergencies may occur in connection with practices carried out within or outside their territory and that these may affect them. Each Member State must ensure that *appropriate action plans are drawn up at national or local level* and that these are tested at regular intervals.

Avoiding undue burdens on future generations is an objective of Council Directive 2011/70/Euratom. Through the implementation of this Directive Member States will have demonstrated that they have taken reasonable steps to ensure that that objective is met. The Directive requires that the national policies on spent fuel and radioactive waste management are based on the following principles:

- the generation of radioactive waste shall be kept to the minimum which is reasonably practicable, both in terms of activity and volume, by means of appropriate design measures and of operating and decommissioning practices, including the recycling and reuse of materials;*
- the interdependencies between all steps in spent fuel and radioactive waste generation and management shall be taken into account;*
- spent fuel and radioactive waste shall be safely managed, including in the long term with passive safety features;*
- implementation of measures shall follow a graded approach;*
- the costs for the management of spent fuel and radioactive waste shall be borne by those who generated those materials;*
- an evidence-based and documented decision-making process shall be applied with regard to all stages of the management of spent fuel and radioactive waste.*

The Directive specifies requirements for demonstration of the safety of any activity or facility for spent fuel and radioactive waste management (see section G and H.4).

The Directive also imposes obligations associated with the application of the abovementioned principles with respect to:

- a national framework for spent fuel and radioactive waste management in the long term;*
- a competent regulatory authority in the field of safety of spent fuel and radioactive waste management;*
- transparency in decision-making on spent fuel and radioactive waste management;*
- education and training to obtain the expertise and the skills required;*
- license holders;*
- national programmes.*

Member States must report to the Commission on the implementation of the Directive, for the first time by 23 August 2015 and every three years thereafter, taking advantage of the review and reporting under the Joint Convention. On the basis of the Member States' reports, the Commission will submit to the Council and the European Parliament a report on progress made with the implementation of the Directive and on the inventory of spent fuel and radioactive waste. They will notify their national programmes to the Commission.

Member States must, at least every ten years, invite international peer review of their national frameworks, competent regulatory authority and/or national programmes with the aim of ensuring that high standards are achieved in the safe management of spent fuel and

radioactive waste. The outcome of any peer review will be reported to the Member States and the Commission.

Considering the installations of the JRC, it should be recalled that they are located in EU Member States, and that all safety requirements of the specific Member States have to be met.

2. SITING OF PROPOSED FACILITIES (ARTICLES 6 AND 13 OF THE JOINT CONVENTION)

Euratom possesses competences with regard to the process of siting a nuclear facility. The reason is that the siting of a nuclear installation necessarily includes taking into account factors relating to radiation protection, such as the demographic characteristics of the site.

This competence is also reflected in the fact that, under Article 37 of the Treaty, Euratom possesses competence as regards "*any plan for the disposal of radioactive waste in whatever form*", if implementation of that plan "*is liable to result in the radioactive contamination of the water, soil or airspace of another Member State*".

Furthermore, Article 44(a) of the BSS Directive requires approval of the proposed siting of installations by the national competent authorities. In addition, in terms of emergency preparedness (Article 50 of the BSS Directive), Member States must seek to cooperate with other Member States, or non-Member States, in relation to possible radiological emergencies that might affect other Member States. The assessment of such consequences is an important feature of the procedure under Article 37 of the Treaty. The general data on the proposed site, features of the surroundings, planned discharges and envisaged magnitude of reference accidents which could lead to unplanned discharges enable the Commission to give an opinion on the impact on other Member States, both during normal operation and in the event of an accident. While the site location and distance to borders are important in this judgment, the Commission does not give an opinion on the proposed siting as such.

Over the past three years the Commission has given opinions on:

- *modifications of existing installations on which an opinion had already been given: the Flamanville-1+2 NPS (France), the Obrigheim NPS (Germany), the Chooz-B NPS (France), the Civaux NPS (France), the COMURHEX-II facility at Malvési (France), the George Besse II facility (France) and the Ex-Amersham facility (United Kingdom);*
- *modifications of existing installations on which no opinion had already been given: the PEGASE, CABRI and STED facilities at the CEA Cadarache site (France) and the FHP facility at the Sellafield site (United Kingdom), and*
- *new projects: the HOROWITZ research reactor and the AGATE and MAGENTA facilities at the CEA Cadarache site (France), the Flamanville-3 NPS (France), the URENCO facility (United Kingdom), the Batapaati repository (Hungary), the Buffer Store facility at the Ignalina site (Lithuania), the Olkiluoto-3 NPS (Finland), the COMURHEX-II facility at Pierrelatte (France), the Quotient facility (United Kingdom), the ICEDA facility (France), the East Northants facility (United Kingdom), the Lillyhall facility (United Kingdom), the Clifton Marsh facility (United Kingdom) and the Stoneyhill facility (United Kingdom).*

Also, according to Articles 41, 42 and 43 of the Treaty, "*Persons and undertakings engaged in the industrial activities listed in Annex II to this Treaty shall communicate to the Commission investment projects relating to new installations and also to replacements or*

conversions which fulfil the criteria as to type and size laid down by the Council on a proposal from the Commission...", "The projects referred to in Article 41 shall be communicated to the Commission and, for information purposes, to the Member State concerned not later than three months before the first contracts are concluded with the suppliers or, if the work is to be carried out by the undertaking with its own resources, three months before the work begins..." and "The Commission shall discuss with the persons or undertakings all aspects of investment projects which relate to the objectives of this Treaty. It shall communicate its views to the Member State concerned", respectively. A number of legal instruments regulate in more detail the obligation established by Article 41 of the Treaty: Regulation No 2587/1999¹²⁶ specifies what types of investment projects should be communicated to the Commission on the basis of that article; Regulation No 1209/2000¹²⁷ determines procedures for effecting such communications; and Regulation No 1352/2003¹²⁸ amends the latter, enabling the Member States to provide this information in electronic form.

Considering the fact that for any new investment projects within the EU nuclear safety and waste management should be addressed, the present Report mentions the following cases/projects with respect to which the Commission expressed its views under Articles 41-43 of the Treaty, since the date of submission of Euratom's previous report under the Joint Convention: Temelin (Czech Republic), Almelo (the Netherlands), Bugey (France), Cernavoda (Romania), Pierrelatte (France), Vattenfall (Sweden), Capenhurst (United Kingdom), Olkiluoto (Finland), Malvesi (France) and Fessenheim (France).

As required by Council Directive 2011/70/Euratom, siting of facilities is subject to national licensing processes. The Directive requires for a "safety demonstration" as a part of the licensing a facility or activity (see more detailed information given in section G and H.4).

3. DESIGN AND CONSTRUCTION OF FACILITIES (ARTICLES 7 AND 14 OF THE JOINT CONVENTION)

Euratom competence in the area of design and construction of nuclear facilities is reflected in the fact that the measures required by the Joint Convention concerning the design, construction and operation of nuclear installations can come under the provisions which the Member States lay down to ensure compliance with the basic safety standards, in accordance with the first paragraph of Article 33 of the Treaty. Furthermore, the Commission has powers to make recommendations for harmonising those provisions, as is clear from the second paragraph of Article 33. Finally, the Member States are required to assist in drawing up those recommendations through the communications referred to in the third paragraph of the same Article.

From a radiation protection point of view, one of the basic conditions for the design of such facilities is that they can be operated only in compliance with the basic radiation protection safety standards, as required by Articles 43 and 44 of the BSS Directive.

¹²⁶ Council Regulation (Euratom) No 2587/1999 of 2 December 1999 defining the investment projects to be communicated to the Commission in accordance with Article 41 of the Treaty establishing the European Atomic Energy Community - OJ L 315, 09.12.1999, pp. 1-3.

¹²⁷ Commission Regulation (EC) No 1209/2000 of 8 June 2000 determining procedures for effecting the communications prescribed under Article 41 of the Treaty establishing the European Atomic Energy Community - OJ L 138, 09.06.2000, pp. 12-14.

¹²⁸ Commission Regulation (Euratom) No 1352/2003 of 23 July 2003 amending Regulation No 1209/2000 determining procedures for effecting the communications prescribed under Article 41 of the Treaty establishing the European Atomic Energy Community - OJ L 192, 31.07.2003, pp. 15-17.

As required by Council Directive 2011/70/Euratom, design of facilities is subject to national licensing processes. The Directive requires for a "safety demonstration" as a part of the licensing a facility or activity (see more detailed information given in section G and H.4).

4. ASSESSMENT OF SAFETY OF FACILITIES (ARTICLES 8 AND 15 OF THE JOINT CONVENTION)

Euratom competences in the field of safety assessment of nuclear facilities can be seen from the fact that the second paragraph of Article 33 of the Treaty provides for the Commission to make appropriate recommendations for harmonising the provisions applicable in this field in the Member States, while the third paragraph of the same Article requires Member States to communicate those provisions to the Commission.

As stipulated in Articles 43 and 44 of the BSS Directive, all Member States must apply the fundamental principles governing operational protection of the population. In particular, Article 44 provides: "*Operational protection of the population...means all arrangements and surveys for detecting and eliminating the factors which, in the course of any operation involving exposure to ionising radiation, are liable to create a risk of exposure for the population...Such protection shall include...examination and approval of plans for installations involving an exposure risk...*". These principles and arrangements must also include "*acceptance into service of such new installations subject to adequate protection being provided against any exposure or radioactive contamination liable to extend beyond the perimeter, taking into account, if relevant, demographic, meteorological, geological, hydrological and ecological conditions*".

Council Directive 2011/70/Euratom introduces the concept of "safety demonstration" (or "safety case" according to the IAEA Safety Standards). Member States shall ensure that the national framework in place require licence holders, under the regulatory control of the competent regulatory authority, to regularly assess, verify and continuously improve, as far as is reasonably achievable, the safety of the radioactive waste and spent fuel management facility or activity in a systematic and verifiable manner. This shall be achieved through an appropriate safety assessment, other arguments and evidence.

As part of the licensing of a facility or activity the safety demonstration shall cover the development and operation of an activity and the development, operation and decommissioning of a facility or closure of a disposal facility as well as the post- closure phase of a disposal facility. The extent of the safety demonstration shall be commensurate with the complexity of the operation and the magnitude of the hazards associated with the radioactive waste and spent fuel, and the facility or activity. The licensing process shall contribute to safety in the facility or activity during normal operating conditions, anticipated operational occurrences and design basis accidents. It shall provide the required assurance of safety in the facility or activity. Measures shall be in place to prevent accidents and mitigate the consequences of accidents, including verification of physical barriers and the licence holder's administrative protection procedures that would have to fail before workers and the general public would be significantly affected by ionising radiation. That approach shall identify and reduce uncertainties.

Member States shall ensure that the national framework require licence holders to establish and implement integrated management systems, including quality assurance,

which give due priority for overall management of spent fuel and radioactive waste to safety and are regularly verified by the competent regulatory authority.

Member States shall ensure that the national framework require licence holders to provide for and maintain adequate financial and human resources to fulfil their obligations with respect to the safety of spent fuel and radioactive waste management.

5. OPERATION OF FACILITIES (ARTICLES 9 AND 16 OF THE JOINT CONVENTION)

Article 35 of the Treaty requires Member States to establish the "*facilities necessary to carry out continuous monitoring of the level of radioactivity in the air, water and soil and to ensure compliance with the basic standards*" and gives the Commission the right of access to such facilities for verification purposes. Article 36 of the Treaty requires periodic communication to the Commission of the monitoring data referred to in Article 35.

This competence is also reflected in the BSS Directive, as Article 4(1)(a) states that "*each Member State shall require prior authorisation for the...operation...of any facility of the nuclear fuel cycle*".

The "*conditions for authorisation*" are defined in Article 44 of the BSS Directive, which stipulates that "*operational protection of the population...means all arrangements and surveys for detecting and eliminating the factors which, in the course of any operation involving exposure to ionising radiation, are liable to create a risk of exposure for the population...*".

As required by Council Directive 2011/70/Euratom, operation of facilities is subject to national licensing processes. As already noted, the Directive requires for a "safety demonstration" as a part of the licensing a facility or activity (see more detailed information given in section G and H.4). Concepts or plans for the post-closure period of a disposal facility's lifetime, including the period during which appropriate controls are retained and the means to be employed to preserve knowledge of that facility in the longer term are mandatory elements of the national programmes (see section B.1.8).

6. DISPOSAL OF SPENT FUEL (ARTICLE 10 OF THE JOINT CONVENTION)

Relevant information with regard to facilities at JRC sites, in particular, and the relevant Euratom policies and practices, is given in sections B.2 and D, above.

Council Directive 2011/70/Euratom provides for the same requirements in respect to disposal of radioactive waste and spent fuel destined for disposal if regarded as radioactive waste.

Section I

TRANSBOUNDARY MOVEMENT

(Article 27 of the Joint Convention)

1. COUNCIL DIRECTIVE ON THE SUPERVISION AND CONTROL OF SHIPMENTS OF RADIOACTIVE WASTE BETWEEN MEMBER STATES AND INTO AND OUT OF THE COMMUNITY

Council Directive 2006/117/Euratom of 20 November 2006 on the supervision and control of shipments of radioactive waste and nuclear spent fuel¹²⁹ replaced previous legislation¹³⁰ containing the rules applicable for authorising the movement of radioactive waste from one country to another and extended these rules to spent nuclear fuel, whether it is intended for disposal or for reprocessing, while making the rules easier to apply and more consistent with other EU and international provisions.

It lays down a standardised system of controls and authorisations for the transboundary shipments of radioactive waste and spent fuel, from the point of origin to the destination, and prevents illegal trafficking in them.

It applies both to shipments between Member States and to imports into and exports out of the Community. It ensures that the Member States of destination and of transit are informed about movements of radioactive waste or spent fuel to or through their country and that they have an opportunity to object to, or impose conditions, in relation to a shipment of radioactive waste or spent fuel which requires their consent.

As well, the mandatory acknowledgement of receipt of the application by the authorities of the countries of destination and transit, together with the extension of the period for granting consent, allow tacit approval to be assumed with a high degree of certainty.

As regards exports, the authorities of the third country of destination should not only be informed of the shipment, but should also give their consent to it. Export of radioactive waste to certain places is totally forbidden, e.g. to the Antarctic, to the parties to the Cotonou ACP-EC Agreement or to states which do not have the administrative and technical capacity and regulatory structure to manage the radioactive waste or spent fuel safely.

Finally, Directive 2006/117 is fully consistent with the existing legislation for the health protection of workers and the population against the dangers arising from ionising radiation. It also ensures consistency with international Conventions, in particular with the Joint Convention.

Commission Decision 2008/312/Euratom of 5 March 2008¹³¹ established the standard document for the supervision and control of shipments of radioactive waste and spent fuel, referred to in Article 17 of Directive 2006/117. This standard document is made available in electronic form and is used for any shipments of radioactive waste or spent fuel between Member States, or into, out of and through the Community, which come within the ambit of Directive 2006/117.

¹²⁹ OJ L 337, 05.12.2006, p. 21.

¹³⁰ In particular, Council Directive 92/3/Euratom of 3 February 1992, OJ L 35, 12.02.1992, p. 24.

¹³¹ OJ L 107, 17.4.2008, p. 32.

Moreover, on 4 December 2008, the Commission issued Recommendation 2008/956/Euratom on the criteria for the export of radioactive waste and spent fuel to third countries¹³². The Recommendation clarifies the main requirements relating to the export of radioactive waste or spent fuel to third countries, referred to in Article 16(1)(c) of Directive 2006/117, as well as the criteria which Member States should take into consideration in order to evaluate whether the above requirements are met. In doing so, the Recommendation draws a distinction between "leading" criteria and "additional" criteria. The former include amongst others "IAEA membership and resultant adherence to the relevant safety standards of the International Atomic Energy Agency" and the "signature and ratification of, and compliance with the Joint Convention on the Safety of Radioactive Waste Management and the Safety of Spent Fuel Management, the Convention on Nuclear Safety, the Vienna Convention on Civil Liability for Nuclear Damage, the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage, the Convention for Supplementary Compensation for Nuclear Damage or the Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960, as amended by the Additional Protocol of 28 January 1964 and by the Protocol of 16 November 1982". The latter encompass the "signature and ratification of, and compliance with the Convention on Assistance in the Case of a Nuclear Accident and Radiological Emergency and the Convention on Early Notification in a Nuclear Accident, to demonstrate that appropriate information will be given to the affected population in the event of a radiological emergency and that adequate protective and corrective measures, including the preparation and testing of emergency plans, will apply in the event of a radiological emergency in order to control the release and mitigate its effects". Finally, the Recommendation invites the competent authorities of the Member States to cooperate, with a view to exchanging information on its application.

In addition, the Commission Recommendation 2009/527¹³³ has been developed for the improvement of the system of transmission of documents and information under Directive 2006/117. This Recommendation prompts the competent authorities of the Member States: to cooperate in order to ensure the smooth operation of the automatic consent procedure laid down in Article 9(2) of Directive 2006/117; to take the necessary measures in order to ensure that all information regarding shipments covered by that Directive is handled with due care and is protected against any misuse; and to apply general security measures to all information which is processed by them, when applying Directive 2006/117.

2. COUNCIL DIRECTIVE ESTABLISHING A COMMUNITY FRAMEWORK FOR THE RESPONSIBLE AND SAFE MANAGEMENT OF SPENT FUEL AND RADIOACTIVE WASTE

Council Directive 2011/70/Euratom requires that radioactive waste shall be disposed of in the Member State in which it was generated, unless at the time of shipment an agreement, taking into account the criteria established by the Commission in accordance with Article 16(2) of Directive 2006/117/Euratom, has entered into force between the Member State concerned and another Member State or a third country to use a disposal facility in one of them. Prior to a shipment to a third country, the exporting Member State shall inform the

¹³² OJ L 338, 17.12.2008, p. 69.

¹³³ Commission Recommendation of 7 July 2009 for a secure and effective system of transmission of documents and information relating to the provisions of Council Directive 2006/117/Euratom, OJ L 177, 08.07.2009.

Commission of the content of any such agreement and take reasonable measures to be assured that:

- the country of destination has concluded an agreement with the Community covering spent fuel and radioactive waste management or is a party to the Joint Convention;*
- the country of destination has radioactive waste management and disposal programmes with objectives representing a high level of safety equivalent to those established by this Directive; and*
- the disposal facility in the country of destination is authorised for the radioactive waste to be shipped, is operating prior to the shipment, and is managed in accordance with the requirements set down in the radioactive waste management and disposal programme of that country of destination.*

The above provisions do not apply to shipment of spent fuel of research reactors to a country where research reactor fuels are supplied or manufactured, taking into account applicable international agreements.

This Directive does not affect the right of a Member State or an undertaking in that Member State to return radioactive waste after processing to its country of origin where:

- the radioactive waste is to be shipped to that Member State or undertaking for processing; or*
- other material is to be shipped to that Member State or undertaking with the purpose of recovering the radioactive waste.*

This Directive does not affect the right of a Member State or an undertaking in that Member State to which spent fuel is to be shipped for treatment or reprocessing to return to its country of origin radioactive waste recovered from the treatment or reprocessing operation, or an agreed equivalent.

3. EURATOM REGULATION ON SHIPMENTS OF RADIOACTIVE SUBSTANCES BETWEEN MEMBER STATES

Regulation (Euratom) No 1493/93 on shipments of radioactive substances between Member States¹³⁴ ensures that as from 1 January 1993 competent authorities in Member States receive the same level of information on shipments of radioactive substances as they did prior to the removal of intra-Community frontier controls. It provides for a double declaration system (by the holder and the consignee) for intra-Community shipments.

The aim of the Regulation is to establish a system for controlling shipments of radioactive substances within the EU. Specified procedures must be followed whenever radioactive substances exceeding the quantities and concentrations laid down in the BSS Directive are shipped between EU Member States. These procedures include prior notification and the provision of specific information.

Before proceeding with shipment, the holder must obtain a written declaration by the consignee of the radioactive substances confirming compliance with the relevant provisions. This declaration must be stamped by the authorities of the Member State of destination.

¹³⁴ Council Regulation (Euratom) No 1493/93, OJ L 148, 19.06.1993, p. 1.

On a quarterly basis, the holder must report the details of the shipments carried out to the authorities of the Member State of destination.

Commission Communication 2009/C41/02¹³⁵, concerning the above Regulation No 1493/93 on shipments of radioactive substances between Member States, indicates the competent authorities of the Member States, as defined in Article 2 of the Regulation¹³⁶, as well as all necessary information for communicating with them rapidly.

Section J

DISUSED SEALED SOURCES

(Article 28 of the Joint Convention)

The BSS Directive sets up a system of notification or authorisation of practices with radioactive sources, depending on the degree of concern.

As a matter of principle, the production, processing, handling, use, holding, storage, transport, import to and export from the Community and disposal of radioactive substances is subject to notification.

Furthermore, authorisation is required, in particular, for the use of X-ray sets or radioactive sources for:

- industrial radiography, or
- processing of products, or
- research, or
- the exposure of persons for medical treatment, and
- the use of accelerators except electron microscopes.

These practices are exempted from or no longer submitted for authorisation/notification where the concentration values/quantities are below the exemption values set in the Annex to the Directive.

The above provisions are supplemented by Directive 2003/122/Euratom on the control of high-activity sealed radioactive sources and orphan sources¹³⁷, which sets up a satisfactory system for source traceability, in which:

- prior authorisation is required for any practice involving a high-activity sealed source, including taking possession of a source; this widens the authorisation obligation under the BSS Directive to all sources considered a cause for concern;
- authorisation will not be granted unless adequate arrangements have been made for the safe management of the source, including when it becomes disused. These arrangements

¹³⁵ OJ C 41, 19.02.2009, p. 2, replacing previous Commission Communication 2002/C40/04 (OJ C 40, 14.02.2002, p. 4).

¹³⁶ The definition given is: "*competent authorities*" means any authority responsible in the Member State for the application or administration of this Regulation or of any other authority designated by the Member State".

¹³⁷ OJ L 346, 31.12.2003, p. 57.

may provide for the transfer of the source to the supplier or placement of the source in a recognised installation or an obligation for the manufacturer or the supplier to receive the source;

- each holder must keep records of all sources under his responsibility, their location and their transfer to another holder. These records must be transmitted to the authorities at precise moments (e.g. whenever the situation changes, but also at regular intervals) and be available for inspection;
- the national authorities must keep up-to-date records of authorised holders, of the sources they hold and of transfers of sources;
- holders are required to verify the location of the source and promptly to notify any loss, theft, etc.;
- holders are required to ascertain that, before a transfer is made, the recipient holds appropriate authorisation;
- sources have to be identified by a unique number and be accompanied by relevant written information.

Two (2) different financial clauses are contained in the Directive in order to:

- *guarantee safe management of the source when it becomes disused*: before authorisation is granted, proof must be produced that a financial security (or any other equivalent means appropriate to the source) has been lodged, including for cases where the holder becomes insolvent or goes out of business;
- *cover costs relating to the recovery of orphan sources*: Member States have to set up a system of financial security (or any equivalent means) on the basis of arrangements to be decided at national level.

In order to facilitate the return of disused sealed sources to suppliers, manufacturers or recognised installations based in another country, Council Directive 2006/117/Euratom¹³⁸ expressly excludes such shipments from the administrative authorisation system.

Council Directive 2011/70/Euratom does not prevent repatriation of disused sources to a supplier or manufacturer. Once the disused sources are considered as radioactive waste according to the Directive, they fall within its scope and should be managed according to its provisions.

¹³⁸ Council Directive 2006/117/Euratom of 12 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel, OJ L 337, 05.12.2006, p. 21.

Section K

OTHER EURATOM ACTIVITIES TO SUPPORT THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT AND THE SAFETY OF SPENT FUEL MANAGEMENT

1. EURATOM LOANS

Financial support in the form of loans is available for all Member States¹³⁹ and certain non-Member States¹⁴⁰. All projects must have obtained approval from the competent national authorities, in particular the safety authorities.

Member States are granted loans to finance investment projects relating to the industrial production of electricity in nuclear power stations and to industrial fuel cycle installations. Although most are related to electricity production, many have included direct or indirect references to the safety of spent fuel and radioactive waste management.

Projects supported in non-Member States in Europe must give priority to improving the level of safety and efficiency of nuclear power stations and fuel cycle installations which are in service or under construction. Support is also given to projects that relate to the decommissioning of installations where upgrading of safety levels is not technically or economically justified and which would pose a hazard if abandoned. Such measures are eligible for financial support only where no provision was made during the operational life of the installation.

With regard to upgrading the safety of nuclear installations, Euratom loans have in the last few years been granted to projects such as the safety upgrade of the Kozloduy Power Plant Units 5 and 6 in Bulgaria and the safety upgrade of Khmel'nitsky Power Plant Unit 2 and Rovno Power Plant Unit 4 in Ukraine.¹⁴¹

2. SITUATION REPORTS

One aspect of the former Community Plans of Action was the requirement for continuous analysis by the Commission of the situation regarding radioactive waste management in the EU. The results of this analysis had to be presented periodically to the Council.

There have now been seven so-called Situation reports, describing the status of radioactive waste management in the EU. The first four reported on actions carried out under the Community Plans of Action. Although the Plans of Action expired in 2000, it was felt necessary to continue with the concept of a situation report, since it provided the only EU-wide analysis of radioactive waste management activities. The fifth¹⁴² and sixth¹⁴³ reports

¹³⁹ Council Decision 77/270/Euratom empowering the Commission to issue Euratom loans for the purpose of contributing to the financing of nuclear power stations, OJ L 88, 06.04.1977, p. 11, as amended and supplemented (the "Establishing Decision").

¹⁴⁰ Council Decision 94/179/Euratom to authorise the Commission to contract Euratom borrowings in order to contribute to the financing required for improving the degree of safety and efficiency of nuclear power stations in certain non-Member countries, OJ L 84, 29.03.1994, pp. 41-43, as amended and supplemented (the "Scope Extension Decision").

¹⁴¹ http://ec.europa.eu/economy_finance/financial_operation/instruments/financing_investment75_en.htm.

¹⁴² Fifth Situation Report - Radioactive Waste Management in the Enlarged EU, EUR20653EN, 2003.

concentrated on the aspect of waste inventories and disposal sites, together with waste management policies and practices. In these last two reports waste quantities were included from Member States which acceded during the enlargements in 2004 and 2007, giving in total twenty seven (27) Member States, of which sixteen (16) operate or have operated nuclear power plants¹⁴⁴. In addition, the recent seventh report¹⁴⁵ includes the likely evolution of waste quantities over the coming years (to 2040), as well as the disposal capacities up to 2070.

The reports have shown the continual increase in inventories of high-level waste and spent fuel in line with nuclear power generation. For high level waste/spent fuel it is likely that by 2025-2030 only Finland, France and Sweden will have operational disposal facilities. Germany and Belgium will possibly follow before 2050. The remaining Member States have set target dates which must in some cases be seen as speculative, in view of the low level of activity concerning repository development activities, combined with the fact that a number of states have yet to define a definitive spent fuel management policy.

There are also significant stocks of long-lived low and intermediate level wastes, which in most circumstances also require deep disposal.

Finally, in the case of the least hazardous waste categories, short-lived low- and intermediate-level waste and very low-level waste, in general terms the estimated disposal capacities will be sufficient to cover the disposal needs. By 2020, if current plans are followed up, all these States having nuclear power plants, with the exception of the Netherlands, could have operational disposal facilities for short-lived low and intermediate level waste.

3. EURATOM RESEARCH FRAMEWORK PROGRAMMES¹⁴⁶

Euratom makes a major contribution to the safety of radioactive waste management through its research activities under the Treaty. In the Treaty, the legal basis for research activities in the field of nuclear science and technology is to be found in Title I, Article 2(a), which provides that "*In order to perform its task, the Community shall, as provided in this Treaty: (a) promote research and ensure the dissemination of technical information*", as well as in the provisions of Title II, Chapter 1, entitled "*Promotion of research*" and especially Article 7 which foresees the adoption of Community research and training programmes. These so-called "Framework Programmes" (FP) and accompanying Specific Programmes (SP) are established by Council Decision, on a proposal from the Commission, as laid down in the Treaty. The Commission is responsible for the implementation of these programmes.

At the time of writing, the current programme is the seventh Euratom FP (FP7, 2007–2011)¹⁴⁷. Priority areas of research related to indirect actions are described at greater length in the accompanying SP¹⁴⁸. Annual work programmes are drawn up by the Commission, with the opinion of the programme committee -which is composed of appointed representatives

¹⁴³ COM (2008) 542 final, available at:

http://ec.europa.eu/energy/nuclear/waste_management/waste_management_en.htm.

¹⁴⁴ Currently, fourteen (14) Member States have nuclear power plants in operation, while two (2) Member States have only nuclear power plants under decommissioning; see section B.1.1 above.

¹⁴⁵ Report from the Commission - Seventh Situation Report on Radioactive Waste and Spent Fuel Management in the EU, SEC (2011) 1007 final.

¹⁴⁶ For additional information on Euratom research Framework Programmes, see Annex I.

¹⁴⁷ Council Decision 2006/970/Euratom of 18 December 2006.

¹⁴⁸ Council Decision 2006/976/Euratom of 19 December 2006. There is a separate SP for the nuclear research activities of JRC (not considered in this Report).

from the EU Member States- and are implemented via calls for proposals announced in the Official Journal of the EU and published on the Cordis website¹⁴⁹. The submitted proposals are evaluated by independent experts from the various fields covered by the call. Successful proposals are funded mainly by a shared-cost mechanism, whereby an EU grant is awarded covering part of the overall project budget, with the project consortium partners contributing the balance of the funding.

The Euratom FP7 covers research in both fusion and fission (including radiation protection). The budget for activities in indirect actions related to fission and radiation protection research is €287 million over the period 2007–2011. Five (5) main areas of activities have been identified: management of radioactive waste (geological disposal, partitioning and transmutation), reactor systems (including installation safety and innovative concepts), radiation protection, research infrastructures, human resources and training.

Activities under the FP7 JRC direct actions are also described in Annex I.

Recently, the Commission adopted a legislative package including proposals for the Euratom nuclear research and training activities for the years 2012-2013. This legislative package consists in particular of the following drafts:

(a) a Council Decision concerning the Framework Programme of Euratom for nuclear research and training activities (COM (2011) 72),

(b) a Council Decision concerning the specific programme, to be carried out by means of indirect actions, implementing the Framework Programme of Euratom for nuclear research and training activities (COM (2011) 73),

(c) a Council Regulation (Euratom) laying down the rules for the participation of undertakings, research centres and universities in indirect actions under the Framework Programme of Euratom and for the dissemination of research results (COM (2011) 71), and

(d) a Council Decision on the specific programme, to be carried out by means of direct actions by the Joint Research Centre (JRC), implementing the Framework Programme of Euratom for nuclear research and training activities (COM (2011) 74).

The aim of these proposals is to continue supporting research and development actions in the nuclear field carried out under the Euratom FP7 (2007-2011), in accordance with the current financial perspectives and in line with the time-frame of the 7th EU framework programme (2007-2013). The proposed legislative package would cover only two (2) years (2012-2013), but the activities remain fully consistent with the policy of giving priority to research on safety-related aspects of nuclear science and technology.

The general objectives of the proposed Euratom FP for the years 2012-2013 are:

- in the area of fusion energy research: to develop the technology for a safe, sustainable, environmentally responsible and economically viable energy source;***

¹⁴⁹ Details of all calls to date under FP7 can be found at:
<http://cordis.europa.eu/fp7/dc/index.cfm?fuseaction=UserSite.FP7CallsPage>.

- *nuclear fission, safety and radiation protection, with the objective of enhancing the safety of nuclear fission and other uses of radiation in industry, in medicine and in improving the management of radioactive waste.*

At the time of writing the proposed Euratom FP is being discussed with the Council, with the aim to be adopted within 2011.

4. INSTRUMENT FOR NUCLEAR SAFETY COOPERATION

The EU contributes significantly to the safety of radioactive waste management also through actions undertaken under the Instrument for Nuclear Safety Cooperation, established by Council Regulation (Euratom) No 300/2007 of 19 February 2007¹⁵⁰. Within the framework provided by this Instrument, the EU engages in cooperation with non-EU countries, amongst others in the field of safety of nuclear material and radioactive waste management. Concrete actions are aimed to address problems posed by the decommissioning of nuclear installations beyond EU borders, not covered by commercial obligations, and problems related to the safe management of radioactive waste of all types and of nuclear material, including environmental remediation of former uranium mines.

The Commission is responsible for the implementation of these actions with the non-EU countries concerned. The Annual Action Programmes, also containing projects in the field of radioactive waste management, are elaborated by the Commission, with the opinion of a committee of appointed representatives from the EU Member States and the active participation of technical experts from the EU Member States.

5. REVISION OF COUNCIL DIRECTIVE 96/29/EURATOM

As mentioned above¹⁵¹, the current framework for radiation protection is established in Directive 96/29/Euratom¹⁵². The first basic safety standards were in fact issued in 1959 and were subsequently amended in 1962, 1966, 1976, 1980, 1984 and lastly in 1996. These changes were the result of advances in scientific knowledge and to a large extent have been based on the scientific recommendations of the International Commission on Radiological Protection (ICRP).

In 2007, after eight (8) years of discussions, ICRP issued their new Recommendations for a System of Radiological Protection¹⁵³. These recommendations offer a new set-up for radiation protection, which is now based on exposure situations rather than on activities. They put an emphasis on the optimisation of exposures and the protection of the environment. Following this development, IAEA launched a process for the revision of the international basic safety standards. Euratom was also invited to participate in the said review.

At the same time, the Group of Experts established under Article 31 of the Euratom Treaty, which is responsible to advise the Commission on the basic safety standards, started a review of Euratom's basic safety standards, in light of the new ICRP Recommendations, and work has continued to date in various ways (working groups, studies, stakeholders'

¹⁵⁰ OJ L 81, 22.03.2007, p. 1.

¹⁵¹ See section E.1.2.

¹⁵² Council Directive 96/29/Euratom, OJ L 159, 29.06.1996.

¹⁵³ ICRP Publication, Recommendation No 103.

consultation, etc.). The overall goal of this initiative is to update the relevant legal requirements, to take into account the experience gained by Member States and the Commission, and to simplify and consolidate secondary Euratom legislation on radiation protection (namely Directive 96/29, the Medical Exposures Directive¹⁵⁴, the Public Information Directive¹⁵⁵, the Outside Workers Directive¹⁵⁶ and the Directive on the Control of High-Activity Sealed Radioactive Sources and Orphan Sources¹⁵⁷).

At the time of writing, it is expected that a Commission proposal for a new Euratom directive on basic safety standards will be finalised before the fifth Review Meeting under the Joint Convention.

¹⁵⁴ Directive 97/43/Euratom, OJ L 180, 09.07.1997, p. 22.

¹⁵⁵ Directive 89/618/Euratom, OJ L 357, 07.12.1989, p. 31.

¹⁵⁶ Directive 90/641/Euratom, OJ L 349, 13.12.1990, p. 21.

¹⁵⁷ Directive 2003/122/Euratom, OJ L 346, 31.12.2003, p. 57.

ANNEX I

Research

Overall Framework Programme objectives

The aims of each Framework Programme ("FP") have been different, though there has been a large degree of continuity in most fields (including in the area of radioactive waste management - "RWM"), because of the long-term nature of the required research effort. Whereas the initial FPs concentrated on safety aspects and technical development of the second generation of nuclear power reactors, the coming to industrial maturity of this technology has naturally resulted in a shift in priority towards other aspects, such as RWM, especially the management of high-level and long-lived waste. This remains the only aspect of the fuel cycle that has yet to reach the level of industrial maturity. Safety considerations mean that RWM is a topic of concern for a number of Member States and an area where research efforts are being concentrated.

FP6 – Sixth Euratom Framework Programme (2002-2006)

RWM was one of the thematic priority areas for research in FP6, covering both geological disposal of long-lived radioactive waste as well as partitioning and transmutation. All of the RWM research projects launched under FP6 have now ended (see previous Euratom Report, submitted in 2008, for a full list of funded projects).

In synergy and subsidiary to the research projects launched by DG RTD under FP6, the JRC has carried out specific direct actions addressing spent fuel management and safety of radioactive waste management, which covered three main axes of research: Spent Fuel Characterisation, Partitioning and Transmutation and Safe Casks for high level nuclear waste, geological disposal, transport, handling and storage. JRC's direct actions were carried out in close collaboration with European partners, including active participation to consortia funded under the FP6 Euratom projects mentioned above.

FP7 – Seventh Euratom Framework Programme (2007-2011)

As in previous programmes, Euratom FP7 covers research in both fusion and fission (including radiation protection) and specific research actions carried out by the JRC. The total budget in the field of fission and radiation protection is €287M and €517M for the JRC programme over the five years 2007-2011.

There is a high degree of continuity with FP6 activities and RWM research therefore remains a key area for support. In the area of geological disposal, the clear emphasis in FP7 is on implementation-oriented research and technological development, such as investigation and demonstration of technologies and safety of disposal of spent fuel and long-lived radioactive wastes in geological formations. Other objectives are to underpin the development of a common European view on the main issues related to the management and disposal of waste and to investigate ways to reduce the amount and/or hazard of the waste by partitioning and transmutation and/or other techniques, in particular as part of advanced nuclear fuel cycles and systems (Generation-IV).

Table 1, below, summarises the current -at the time of writing- status of FP7 implementation, in the field of RWM in general and geological disposal in particular. Only the major projects, involving collaborative research activities, are listed; several smaller coordination and support actions, including in the area of education and training, are not listed. Euratom FP7 is implemented via one call for research proposals per year. To date, 4 of the 5 calls have been completed and all the selected projects launched.

Table 1: Euratom FP7 – Summary of major RWM projects to date¹

Project acronym and title ²	Coordinator	EU contribution / total cost	Start date & duration
ACSEPT Actinide recycling by separation and transmutation	CEA (FR)	€6M / €23.8M	1/1/08 4 years

Project acronym and title²	Coordinator	EU contribution / total cost	Start date & duration
RECOZY Redox phenomena controlling systems	FZK-INE (DE)	€3.50M / €6.05M	1/3/08 4 years
CARBOWASTE Treatment and Disposal of Irradiated Graphite and other Carbonaceous Waste	FZJ (DE)	€6M / €12M	1/3/08 4 years
FORGE Fate of Repository Gases	BGS (UK)	€6M / €12M	1/2/09 4 years
MODERN Monitoring Developments for safe Repository operation and staged closure	Andre (FR)	€2.8M / €5.1M	1/5/09 4 years
CATCLAY Processes of Cation Migration in Clayrocks	CEA (FR)	€0.82M / €1.6M	1/6/10 4 years
PEBS Long-term performance of Engineered Barrier Systems (EBS)	BGR (DE)	€2.8M / €6.5M	1/3/10 4 years
CROCK Crystalline rock retention processes	KIT (DE)	€1.1M / €1.8M	1/1/11 2.5 years
CROCK Slow processes in close-to-equilibrium conditions for radionuclides in water/solid systems of relevance to nuclear waste management	ARMINES (FR)	€1.2M / €2M	1/1/11 3 years
REDUPP Reducing Uncertainty in Performance Prediction	SKB (SE)	€0.9M / €1.6M	1/4/11 3 years
LUCOEX Large Underground Concept Experiments	SKB (SE)	€4.4M / €9.4M	1/1/11 4 years
IPPA Implementing Public Participation Approaches in Radioactive Waste Disposal	Karita Konsult (SE)	€1.6M / €2.4M	1/1/11 3 years
INSOTEC International Socio-Technical Challenges for implementing geological disposal	Univ. of Antwerp (BE)	€2.0M / €2.7M	1/3/11 3 years

¹ All projects are shared-cost (Euratom contributing on average 50%) and involve large multi-partner consortia, with partners from several EU Member States. Projects are also open to organisations from third countries, though normally such partners do not receive funding from the Euratom programme.

² For further information on FP7 projects, refer to http://cordis.europa.eu/fp7/euratom-fission/home_en.html.

In continuity to the FP6, the JRC aligned its Euratom FP7's Multi Annual Work Programme along three main agendas of which "Nuclear waste management and Environmental impact" is relevant to the present report. Under this thematic priority, the JRC activities cover waste management in geological disposal conditions, partitioning and transmutation, conditional and environmental issues. Scientific aspects related to the back-end of the fuel cycle, including nuclear reference materials, nuclear data, actinide science and non-nuclear applications (e.g. medical applications of radioisotopes), and knowledge management, training and education issues are addressed. Within its actions on Waste Management Disposal and Alternative Nuclear Fuel Cycle, the JRC provides repository relevant data relative to the behaviour of nuclear waste which can be used for long-term modelling and assessment of repositories in view of their implementation. Another important contribution is in safety concerns linked to the development of advanced GEN IV type fuel cycles, where specially adapted partitioning schemes are being set-up to cope with the goal of the full recycling of all actinides in view of a minimisation of the waste radio-toxicity. Basic data are being measured and a special focus is given to the understanding of the mechanisms involved in the processes applied. Demonstration of a full recycling of all actinides is achieved using aqueous and so-called dry processes based on molten salt pyrometallurgical techniques. Special focus is paid to corrosion behaviour of high burn-up UO₂ fuels. The JRC is also a key partner in large Euratom projects mentioned in Table 1 and supports the implementation of the European research Area in nuclear field by participating to Networks of Excellence, user access and pooling facilities programmes.

Commission proposals for the extension of FP7 for two years (2012-2013)

The Commission has recently adopted a legislative package including proposals for the Euratom nuclear research and training activities for the years 2012-2013 (COM (2011) 71-74). The aim of these proposals is to continue supporting research and development actions in the nuclear field carried out under the Euratom FP7 (2007-2011), in accordance with the current financial perspectives and in line with the time-frame of the 7th EU framework programme (2007-2013). The proposed legislative package covers research activity both in the area of fusion energy and in the area of nuclear fission and radiation protection. This initiative refers only to two years (2012-2013) and its activities remain consistent with previous research strategy, but with any necessary reorientation regarding additional focus on safety aspects in the aftermath of the Fukushima accident.

Within this context, and with reference to spent fuel and nuclear waste management and environmental impact, the JRC will focus on reducing uncertainties and solving open issues in waste disposal, in order to develop effective solutions for the management of high level nuclear waste following the two major options (direct disposal or partitioning and transmutation). Activities will also be developed to enhance the understanding and modelling of the physics, chemistry and fundamental properties of actinide materials, and the database of high accuracy nuclear reference data, for nuclear energy and non-nuclear applications (e.g. medical). To extend the radiological protection effort, further development of environmental models of radioisotope dispersion coupled with monitoring tests in environmental radioactivity in support to the harmonisation of the national monitoring process and systems will be carried out.