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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
Third Review Meeting of the Contracting Parties
(submitted by the European Commission)**

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1. EXECUTIVE SUMMARY

The European Atomic Energy Community (“Euratom”) is a regional organisation, as referred to in Article 39(4) of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. It became a party to the Convention on 2 January 2006.

This report is submitted in compliance with Articles 30 and 32 of the Convention for the Third Review Meeting of the Contracting Parties, to be held in Vienna starting 11 May 2009.

The report follows the structure suggested in the *Guidelines regarding the Form and Structure of National Reports* established by the Contracting Parties to the Convention (INFCIRC/604/Rev.1).

This report covers both Euratom's general regulatory obligations under the Convention and its specific obligations arising from its own nuclear installations.

2. EURATOM COMPETENCES IN THE FRAMEWORK OF THE JOINT CONVENTION ON THE SAFETY OF SPENT FUEL AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT (*SECTION A*)

2.1. Legal background for the accession of the European Atomic Energy Community to the Joint Convention

The European Atomic Energy Community was established by the Treaty signed in Rome on 25 March 1957. Together with the European Community, it constitutes the first pillar of the European Union (EU). The Euratom Treaty (“the Treaty”) is the legal basis for the competences and activities of Euratom.

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

- Resolved to create the conditions necessary for the development of a powerful nuclear industry;
- Anxious to create the conditions of safety 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 Treaty¹ stipulates that Euratom may, within the limits of its powers and jurisdiction, enter into obligations by concluding agreements with an international organisation.

Euratom meets the requirements laid down in Article 39(4) of the Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (“the Joint Convention”) for becoming a Party to it. It acceded to the Convention by a European

¹ Article 101.

Commission Decision of 14 June 2005² following a Council Decision of 24 January 2005³. The instruments of accession were deposited with the Director General of the International Atomic Energy Agency on 4 October 2005. Euratom's accession came into effect on 2 January 2006, in accordance with Article 40(2) of the Convention.

The instruments of accession included the declaration required by Article 39(4)(iii) of the Convention.

2.2. Declaration by the European Atomic Energy Community 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 European Court of Justice⁴ ruled on the competences of Euratom with regard to the Convention on Nuclear Safety concerning the accession of Euratom to the Convention.

In its judgment, 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.

The declaration of competences 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”.

2.3. Member States of the European Atomic Energy Community

The following States are presently members of the European Atomic Energy Community: 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, Republic of Romania, the Republic of Slovenia, the Slovak Republic, Finland, the Kingdom of Sweden, the United Kingdom of Great Britain and Northern Ireland.

² C(2005) 1729.

³ 2005/84/Euratom, OJ L 30, 3.2.2005, p. 10.

⁴ Judgment of the Court of 10 December 2002, case C-29/99, Commission v Council, ECR 2002, p. I-11221.

3. EURATOM POLICIES AND PRACTICES WITH REGARD TO RADIOACTIVE WASTE AND SPENT FUEL MANAGEMENT (*SECTION B. POLICIES AND PRACTICES*)

3.1. General Euratom policies

Together with 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.

Some 3 600 te of spent fuel (of which at least 1 500 te is currently considered as being placed in long-term storage for possible direct disposal) and 67 000 m³ of radioactive waste (0,4 % of which is high-level waste) are currently produced every year in the European Union (2004 figures). The principal activities giving rise to this waste are: nuclear electricity generation, including back-end nuclear fuel-cycle activities and decommissioning of nuclear facilities; operation of research reactors; use of radiation and radioactive materials in medicine, agriculture, industry and research; and processing of material containing naturally-occurring radioactivity.

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 R&D Framework Programmes and Community Plans of Action in the field of radioactive waste.

Based on the Council Resolutions of 18 February 1980⁵ and 15 June 1992⁶, Plans of Action in the field of radioactive waste were drawn up and remained in force up to 1999. These 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, others 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.

Safe management of radioactive waste is of high importance for all EU countries – not only those producing electricity from nuclear energy. The debate started in 2001 with the Green Paper on security of energy supply⁷ which 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.

Although some progress has been observed on the less hazardous categories of radioactive waste (80 % of the annual short-lived, low- and intermediate level waste is routinely disposed of), 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.

⁵ Council Resolution of 18 February 1980 on the implementation of a Community plan of action in the field of radioactive waste, Official Journal C 51, 29.2.1980, p. 1.

⁶ Council Resolution of 15 June 1992 on the renewal of the Community Plan of Action in the field of radioactive waste, Official Journal C 158, 25.6.1992, pp. 3–5.

⁷ Green Paper "Towards a European strategy for the security of energy supply", COM (2000) 769 final.

The Community considers deep geological disposal to be the most appropriate solution to manage high level waste/spent fuel (if declared as waste) in the long term, even though (i) there may be a need to ensure reversibility, and (ii) implementation-oriented R&D needs to continue in those subject areas identified by the principal research stakeholder organisations and coordinated through the 7th Euratom Framework Programme (see 12.3).

A few countries have established precise programmes for the development of geological disposal with fixed milestones and deadlines and have made large progress towards the implementation of this solution. Indeed, it is likely that by 2025-2030 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, but are less advanced in the implementation of repository development or even the definition of a definitive spent fuel management policy.

Some Member States are reassessing their options, as well as the associated decision-making processes. Radioactive waste and spent fuel management policy remains largely a national competence and varies between Member States. Some regard spent fuel as waste, others as a resource from which valuable quantities of fissile and fertile material can be extracted, while others may have not yet defined a policy. There is consensus, however, that irrespective of the policy adopted, this material must be subjected to an equivalent level of control and supervision.

Complementary solutions to disposal are also under investigation in some countries, in particular partitioning and transmutation (P&T) and long-term storage. In the case of P&T, research is still on-going. 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.

A poll⁸ conducted in 2005 in all Euratom Member States showed that the vast majority of European citizens agree to the need for no further delay in establishing national strategies for the management of high-level radioactive waste. Furthermore, they recognise the political difficulty of taking decisions on the treatment of dangerous waste. Furthermore, citizens acknowledge the European dimension of this subject. There is international consensus that nuclear power generation should continue to be used only if it is safe and waste is safely managed.

A follow-up of the Eurobarometer series on radioactive waste has been published in July 2008⁹. The main objectives of this new poll were to include the new Member States (Bulgaria

⁸ Special Eurobarometer 227 - Radioactive Waste, European Commission, Brussels, 2005:
http://europa.eu.int/comm/energy/nuclear/waste/doc/2005_06_nuclear_waste_en.pdf

⁹ Special Eurobarometer 297 – attitude towards radioactive waste, European Commission, 2008:

and Romania) as well as to analyse the evolution of public opinion about radioactive waste and their management. One of the main messages brought forward by an overwhelming majority of European citizens is that European Member States should take up their responsibilities and implement now demonstrated solutions for high-level radioactive waste instead of leaving it for the future. Radioactive waste remains a major stumbling block to the acceptance of nuclear energy. Four out of ten of those opposed to nuclear energy would change their mind if there was a safe and permanent solution for the management of radioactive waste. Finally, when comparing this last Eurobarometer with the previous one established in 2005, one can note that the support for nuclear energy has increased by almost 20 percent in the European Union, the number of supporters being now nearly identical to its opponents (44 versus 45 percent).

In 2004, the Council published Conclusions¹⁰, reaffirming Member States commitment to the safe management of spent fuel and radioactive waste. These Conclusions recognised the importance of a Community framework, while giving also greater weight to national and international efforts. Following these Conclusions the Council proposed an Action Plan¹¹, as part of which the various international contexts in radioactive waste management were to be considered in terms of the contribution made to safety in Member States. The results of this exercise were to be used in consideration of what instruments should be adopted in the framework of the Euratom Treaty.

Following June 2004 Council conclusion, a wide ranging consultation process was initiated aimed to identify new instrument(s) that can contribute more effectively to further improving nuclear safety and the safety of the management of the spent fuel and radioactive waste, without excluding any instrument in the framework of the Euratom Treaty and in line with the principles of better law making. The Ad Hoc Working Party on Nuclear Safety (WPNS) has been activated by the Council as a consequence of the Council conclusions on Nuclear Safety and Safe management of spent fuel and radioactive waste reached in June 2004, after long negotiations on Commission proposals for Council (Euratom) Directives setting out basic obligations and general principles on the safety of nuclear installations and on the management of spent fuel and radioactive waste.

On 3 December 2004 the Council agreed an Action Plan for following up on the Council conclusions, which called for an “extensive consultation” with stakeholders before any instrument(s) in these fields were developed in the framework of the Euratom Treaty. This Plan is divided into three main action areas with a few elements are proposed for further study:

- Actions concerning the safety of nuclear installations
- Actions concerning safety of the management of spent fuel and radioactive waste
- Actions concerning the financing of the decommissioning of nuclear installations and safe management of spent fuel and radioactive waste During the following years the Member States together with the Commission reviewed the outcome of the work conducted by national nuclear regulatory authorities in multinational fora, such as the OECD/NEA and the IAEA, including in the WENRA framework, and in the past review meetings under the

http://ec.europa.eu/public_opinion/index_en.htm

¹⁰ Council of the European Union 10823/04

¹¹ Council of the European Union 15293/04

Convention on Nuclear Safety and the Joint Convention. In December 2006 produced a final report serving as a basis for the consultation process, in particular taking into account the work conducted by national nuclear regulatory authorities to reach harmonised safety approaches.

In its Communication of 10 January 2007 on "An Energy Policy for Europe"¹², the Commission proposed to establish a High Level Group on Nuclear Safety and Waste Management with the mandate of progressively developing a common understanding and, eventually, additional European rules on nuclear security and safety to support the efforts of those Member States that choose to continue to rely on nuclear power.

At its summit of 8/9 March 2007, the European Council supported the creation of the High Level Group on nuclear safety and waste management which was initially proposed in the Illustrative Nuclear Programme 2007 (PINIC).

In its conclusions of May 2007 on nuclear safety and the safe management of spent fuel and radioactive waste¹³, the Council sets out a list of possible actions for the High Level Group, one being that each EU Member State should be urged "to establish and keep updated a national programme for the safe management of radioactive waste and spent fuel that includes all radioactive waste under its jurisdiction and covers all stages of management".

The High Level Group, essentially composed of the heads of regulatory and safety authorities, has elaborated a work programme covering the improvement to the safety of nuclear installations, management of nuclear waste and transparency measures. The High Level Group also follows closely developments in the area of decommissioning and its funding. Three working groups have been established respectively on Nuclear safety, Openness and transparency and Radioactive waste management and decommissioning.

The working group on radioactive waste and decommissioning met several times and has established a working programme focusing on the following topics:

- How to better use the joint convention process in the EU?
- Establish guidelines for national radioactive waste programmes
- What are the drivers and obstacles for the implementation of geological disposal?

In parallel in the communication "An energy Policy For Europe", the Commission called for an expanded use of renewable energies and for the enhancement of energy efficiency within the EU, while underlining the substantial contribution of low-CO₂ emitting nuclear energy to the EU energy mix.

The conclusions of the European summit of March 2007 endorsed the Commission proposal to organise a broad discussion among all relevant stakeholders on the opportunities and risks of nuclear energy, and established the "European Nuclear Energy Forum".

The European Nuclear Energy Forum brings together high level representatives from public authorities, Members of the European Parliament, Economic and Social Committee,

¹² COM(2007)1

¹³ Council of the European Union 8784/07 ATO 63 + REV 1 (it)

electricity producers, nuclear industry, consumers, finance, and civil society, for a broad and open discussion on opportunities and risks of nuclear energy.

During the first meeting in Bratislava in November 2007, three working groups were established, a working group on opportunities of nuclear energy, a working on risks of nuclear energy and a working group on information and transparency.

As part of the radioactive waste management work, the main priorities of the group on "risks of nuclear energy" aim at encouraging Member States and industry to implement adequate nuclear waste disposal facilities, in particular deep geological repositories for high level waste, to call for sufficient funding for decommissioning and waste management through adequate methods, and to develop innovative approaches and exchange best practices to ensure adequate training for nuclear engineers and technicians and to strengthen safety culture.

The "Information and transparency group" main priorities are to analyse the most effective approaches to build up trust and confidence in the available information, by increasing transparency and giving access to all non-sensitive information, to provide information in clear language on the existing solutions for waste management and also to exchange and develop best practices at the European level between all actors.

The second plenary meeting of the European Nuclear Energy Forum has taken place in Prague on 22 and 23 May 2008. As far as waste management is concerned, the group on risk of nuclear energy will continue to focus on:

- Establishing EU legislation on nuclear safety and waste management, based on common fundamental safety principles for nuclear installations
- Establishing a Roadmap for disposal of nuclear waste in Deep Geological Repositories
- Ensuring sufficient qualified human resources in the nuclear field

Concerning the transparency group the main objectives are to establish a roadmap on better information and transparency in the nuclear field, to develop an appropriate consultative process and to initiate concrete structured stakeholder dialogue beyond the European energy Forum meetings to broaden the discussion basis.

3.2. Euratom policies in the framework of the Joint Research Centre (JRC)

3.2.1. 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 (I), Geel (B), Karlsruhe (D), Petten (NL), Brussels (B) and, later, Seville (E). Originally it was dedicated entirely to nuclear research, but since then it has diversified its activities. The sites in Brussels and Seville have never carried out nuclear 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 European Commission, the JRC functions as a reference centre of science and technology for the Union. 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.

Nuclear activities make up 30% of the JRC's work today and focus on safety and security. The Euratom Treaty makes the JRC responsible for management of its obsolete nuclear installations, in particular for decommissioning installations that have been shut down.

In 1999 the European Commission decided to launch the "D&WM Programme"¹⁴ for decommissioning its obsolete nuclear installations. The programme followed the approach adopted by most of the EU Member States, preferring to start decommissioning immediately after shutdown of facilities rather than "deferred" decommissioning.

3.2.2. *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 remaining JRC nuclear installations, located at Petten, Geel and Karlsruhe, are still in operation. Decommissioning will probably 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 the IAEA's recommendations, the European Commission has drawn up decommissioning plans using these dates as reference scenario for the installations still in operation.

The JRC has been carrying out decommissioning and the associated waste management activities on the four sites, in particular at Ispra, since 1999, in line with the programme laid down in its communication to the Council and the European Parliament¹⁵. The Council and Parliament agreed to the proposed approach. A new communication on the progress on the D&WM Programme and the necessary changes to it was presented to the Council and Parliament in 2004¹⁶.

3.2.3. *JRC policies and practices*

3.2.3.1. Spent fuel management policy

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

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

¹⁴ D&WM: Decommissioning and Waste Management.

¹⁵ COM(1999) 114.

¹⁶ SEC(2004) 621.

3.2.3.2. Spent fuel management practices

- In Petten spent fuel from the HFR¹⁷ is either shipped to an intermediate storage facility managed by COVRA¹⁸, the central organisation for nuclear waste management, or back to the USA in the case of fuel originating from that country, under the take-back programme. In Karlsruhe the route currently followed for irradiated material no longer relevant to research activities is the disposal as waste. At Ispra the matter was investigated in details and the current option is dry storage in dual-purpose casks, pending shipment to the national repository.

3.2.3.3. 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.

3.2.3.4. Radioactive waste management practices

Radioactive waste generated at the HFR at Petten is managed by the NRG¹⁹, the operator and licence holder of the HFR, and then transferred to COVRA. From Geel waste is transferred to ONDRAF/NIRAS²⁰ and shipped to the Belgoprocess facilities. The Karlsruhe institute is located adjacent to the Central Decontamination Operations Department (HDB) of the national research centre (Forschungszentrum Karlsruhe, FZK). This department manages radioactive wastes originating from the FZK, ITU²¹ and various other sites in Germany. No such national service providers exist in Italy. 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 is planned.

3.2.3.5. Waste categorisation criteria

At each site the JRC follows the relevant national waste categorisation criteria, defined by law or by national norms. Refer to the national reports from Belgium, Germany and the Netherlands for the corresponding legislation and categorisation criteria. In Italy radioactive materials can be unconditionally released from regulatory control, after obtaining the pertinent authorisation.

Waste classification in Italy is covered by Technical Guide No 26 issued by APAT. It classifies radioactive wastes into three categories, depending on their radiological characteristics:

¹⁷ High Flux Reactor.

¹⁸ Centrale Organisatie Voor Radioactief Afval.

¹⁹ Nuclear Research and Consultancy Group.

²⁰ Organisme national des déchets radioactifs et des matières fissiles enrichies/Nationale instelling voor radioactief afval en verrijkte splijtstoffen.

²¹ Institute for Transuranium Elements.

- Category 1 are wastes that, within a few months or a few years at most, decay to a radioactivity concentration lower than the values set for disposal into the environment in accordance with Italian legislation. Wastes of this category are mainly generated in biomedical and research activities.
- Category 2 wastes are those that, in a period varying from a few decades to a few centuries, decay to a radioactivity concentration in the order of some hundreds of Bq/g. Category 2 wastes are typically produced during operation of nuclear facilities and in a few biomedical, industrial and research activities; this category also includes part of the wastes arising from plant decommissioning.
- Category 3 wastes are identified as not belonging to the other two categories. Category 3 wastes take a thousand years or more to decay to a radioactivity level of some hundreds of Bq/g. Category 3 includes high-level waste arising from industrial spent fuel reprocessing and waste arising from plutonium-handling facilities (e.g. MOX fuel fabrication). Spent fuel for direct disposal also falls into Category 3.

The Guide provides detailed criteria for the safe management of Category 2 wastes and generic indications for Category 3 wastes.

4. SCOPE OF APPLICATION (SECTION C)

The scope of application of the requirements of the Joint Convention is defined in the declaration submitted by Euratom at the time of accession (see section 2.3).

5. INVENTORIES AND PRACTICES IN EURATOM FACILITIES (SECTION D)

5.1. JRC Geel (Belgium)

Geel has completed the first phase of its programme for the removal of all "historical liabilities". The radiochemical building has been decommissioned and is now being used for non-nuclear activities. The non-irradiated nuclear materials have been transferred to SCK-CEN²² in Mol (BE). This has cleared the way for downgrading the site to Category III, which imposes fewer monitoring constraints than Category I. The small Van de Graaff accelerator has been decommissioned and other clean-up measures have been performed. A map has been drawn of all the buildings still in operation, providing a reference for regular updating of the decommissioning plan, the latest version of which was delivered to the Belgian authorities in 2005.

The original decommissioning programme for JRC-Geel was restricted to decommissioning a radiochemistry laboratory and reducing the site's nuclear material inventory. The programme has expanded, however, to include work on the Van de Graaff accelerators and decommissioning of smaller installations and equipment generating a substantial amount of waste. The D&WM Historical Liabilities Programme was therefore extended, but was completed in 2002.

²² Studiecentrum voor Kernenergie - Centre d'étude de l'Energie Nucléaire.

In particular, the radiochemistry building has been decommissioned and is now used as a non-nuclear analytical laboratory. This included dismantling the process plant containment and services, clearing and/or packaging the waste and transferring it with any radioactive material to ONDRAF/NIRAS, plus the radiological survey of the building, the final clearance and licence termination and reclassification of the laboratory for conventional, non-nuclear use.

Fresh nuclear material was transferred to the Belgian nuclear research centre (SCK-CEN) for temporary storage, so that the Geel site could be classified as a Category III laboratory (no longer Category I), thus reducing the licensing requirements.

In addition, various clean-up activities have taken place, such as the LINAC (LINEar ACcelerator) flight path area, reduction of the number of glove boxes in the mass spectrometry building and solidification of historical liquid waste.

Under the supervision of ONDRAF/NIRAS, 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 financial evaluation of future liabilities mainly concerns the GELINA linear accelerator and also includes provisional decommissioning plans. It was formally approved in 2001 by ONDRAF/NIRAS, the body designated by the Belgian Government to monitor the decommissioning and waste management activities and to verify the decommissioning plans.

5.2. JRC Karlsruhe (Germany)

Under the Euratom Treaty, the mission of the ITU²³ 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 transuranium elements. Its continuously evolving scientific and technological studies have led to a variety of nuclear equipment, which is no longer required by current activities and is progressively being removed to allow optimum utilisation of its nuclear infrastructure. Consequently, the focus of the Karlsruhe site's D&WM Programme is on management of historical waste and the dismantling of obsolete nuclear equipment, such as glove boxes.

A distinction must be drawn between these decommissioning activities and the day-to-day management of the installations and of the waste generated by ongoing R&D activities, which is financed by the research programme. These activities are linked to earlier programmes, which it was decided to terminate as the JRC's activities developed in accordance with its mission. No final shutdown of the installations at Karlsruhe (nor at Geel) is envisaged for the time being, although, for the purposes of establishing a decommissioning plan, 2025 has been assumed as the hypothetical date.

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.

²³ Institute for Transuranium Elements.

Unused vacuum facilities connected to the hot cells and contaminated with irradiated fuel were dismantled and disposed of in order to reduce dose rates and make space for new equipment. An unused welding machine and its glove box without the normally required double containment, as well as contaminated water tanks, were dismantled and disposed of. A number of small unused items of equipment and waste from the controlled area were collected and, where necessary, dismantled and disposed of.

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 final geological repository exists. 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 plan approval for the final repository site KONRAD has been issued recently.

The ITU pays an annual fee towards setting up a final repository in Germany.

The quantity of “historical” nuclear materials requires that the ITU stores/facilities be ranked as Class 1 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 the ITU.

General contractor support

Various tasks have been contracted out, following the principle of using experienced external contractors, with the JRC supervising the activities. The Central Decontamination Operations Department (HDB) of the national research centre (Forschungszentrum Karlsruhe, FZK) 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, the ITU had about 400 glove boxes, of which about 200 are still in use. 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 the Central Decontamination Operations Department at the FZK 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 had to be removed, and the interior of the hot cells had 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, have been decontaminated, if necessary using remote handling techniques to avoid undue risk to personnel. The resulting waste has been sorted and characterised (isotopes and their activities, chemical composition, combustible or non-combustible, etc.) before being packaged and transferred to the FZK 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.

Caisson equipment

One former objective of the 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 started in 2005.

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.

5.3. 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.

Since 1996 provisions are being set aside for the decommissioning of the Petten High Flux Reactor (HFR). The final amount of these provisions will depend on the date of final

shutdown of the HFR. However, assuming shutdown between 2015 and 2020, it will probably cover less than a third of the estimated decommissioning costs (€9 million).

Decommissioning of the Petten HFR is not envisaged before 2015. Following replacement of the reactor vessel in 1984-1985 the reactor could operate well beyond that date. 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.

The HFR is a 45 MW research reactor of the tank-in-pool type, and is in operation since 1961. Its exceptional number of full-power days in operation (more than 280 days per year) and its high utilisation rate makes it one of the best performing European installations of its kind. In this multi-purpose research reactor, a variety of neutron field conditions is available. 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, medical therapy).

The plant itself is in excellent condition, as demonstrated by the regular achievement of its planned operating schedule. The reactor's pressure vessel was replaced in 1984. This reactor vessel is expected to be operational beyond 2015. Therefore, the liabilities associated with the decommissioning of the HFR have to be seen as "future liabilities". In 2004 a reassessment of the future liabilities of the HFR confirmed the initial cost estimates for the dismantling of the HFR.

5.4. 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 European Commission and the Government of the Republic of Italy dated July 22, 1959, transposed in the Italian legislation with the law August 1, 1960 n° 906.

The action programme at the Ispra site is the most pressing since almost all the nuclear installations there 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 medium-long term storage facility for final disposal of the waste. 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 United States 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” activities²⁴ have started. They include dismantling the shut-down VLLW²⁵ incinerator and dismantling the cooling tower of the Ispra-1 reactor²⁶, 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.

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 the Area 40 (site area dedicated to waste characterization, treatment and storage activities) has been recently renewed, while projects for the temporary storage of embedded spent fuel and for liquid wastes are under approval.

The total number of outside contractors working on a day-to-day basis at Ispra is about 70 persons; 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

²⁴ 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.

²⁵ Very Low Level Waste.

²⁶ The first small research reactor in Italy.

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 authority. As mentioned above, the 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.

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. The system will be able to check about 3 000 m³ of suspect material annually. This programme was completed, with the subsequent commissioning of the plant.

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 (continuous measuring chain).

Decontamination plant

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

Compaction and cementation

The need for construction of an in-situ compaction and cementation plant is under assessment. No decision has been yet made as off-site treatment could be more cost-effective, subject to an agreement with an external provider.

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 from the site and segregated in safe conditions with a view to future disposal or transfer to a third party. Contracts are now under execution for their title transfer and final disposal. 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 started and will be completed in the second half of 2009. 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 declassified and can now eventually be utilized for other purposes. 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 the 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.

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 drafted and will be addressed to the Italian authorities together with the request of new technical 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, with the agreement of the authority part of the

treatment circuit has been replaced and work has started on a temporary store for post-treatment sludge (secondary waste). The project for the construction of a new system for the storage of liquid wastes is under regulatory approval.

FARO²⁷ 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 (FR) 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.

The radiochemistry laboratory has been in operation since 1962. In 2001 the laboratory was downsized and a large part declassified. For the remaining part, major action has been taken for safe storage and further licence downgrading.

Physical and radiological characterisation of all Ispra's nuclear facilities undergoing decommissioning will commence soon.

5.5. European Commission premises in Luxembourg

Under a licence issued by the Health Ministry of Luxembourg, the Commission's Directorate-General for Energy and Transport (DG TREN) holds 37 low-activity sealed radioactive sources. The 27 gamma sources, 10 neutron sources and 43 sources containing fissile material are used for calibrating and testing measurement equipment in the context of nuclear safeguards or for operating equipment used for radiological protection of staff. The above mentioned sources are stored in specific locations on the premises of the European Commission in Luxembourg.

Additionally, there are 41 neutron sources stored in JRC Ispra locations: 23 sources with very low activity are out of use, the others are used for nuclear safeguards inspectors training.

A limited number of sources are incorporated in measurement equipment or used intermittently as calibration standards 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 Commission buildings and for any necessary transport to nuclear facilities. In addition, the authorisation for the operation of the locations includes specific requirements for monitoring, recording and reporting radioactivity in waste water and air generated inside the supervised areas. Permanent radioactivity control and regular radio-chemical analysis are performed in order to monitor radioactivity in the waste air systems and waste water treatment channels, which are separated from those of the office buildings.

Furthermore, the authorisation requires annual density checks radioactivity assessment of all radioactive sources held by DG TREN. Since DG TREN is in possession of fissile materials, the rules of the European and IAEA nuclear safeguards legislation and regulations are applied and an annual physical inventory verification is performed.

²⁷ Fuel Assemblies (melting) Release Oven.

The radioactivity measurements are regularly reported to Luxembourg's competent authorities and the annual fissile materials inventory report is submitted to the Euratom Safeguards Office.

6. EURATOM LEGISLATIVE AND REGULATORY FRAMEWORK (SECTION E. LEGISLATIVE AND REGULATORY SYSTEM - ARTICLE 19 OF THE JOINT CONVENTION)

Article 2(b) of the 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.

Chapter 3 of the Treaty ("Health and Safety") sets out a number of detailed provisions intended to establish, bring into force and apply the basic standards mentioned in Article 2(b). Article 30 of the Treaty stipulates 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 ionising radiations".

Under Article 161 of the Treaty, the relationship between the legislation adopted by Euratom and the national regulatory systems of the Member States is as follows:

"In order to carry out their task the Council and the Commission shall, in accordance with the provisions of this Treaty, make regulations, issue directives, take decisions, make recommendations or deliver 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 upon those to whom it is addressed.

Recommendations and opinions shall have no binding force."

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

The central element of this legislation is Council Directive 96/29/Euratom²⁸ 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 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",

²⁸ Council Directive 96/29/Euratom of 13 May 1996, OJ L 159, 29.6.1996, p. 1.

in accordance with Articles 3 and 4 of the BSS Directive which define the relevant practices giving rise to these substances, particularly “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.

7. 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, 32 and 33 of the Treaty and the related secondary legislation.

Elaboration of basic safety standards relevant for radiation protection is a legislative task conferred to Euratom by Articles 2(b), 30 and 31 of the Treaty. In accordance with Article 33 of the Treaty, the Member States are then under an obligation to lay down the appropriate provisions to ensure compliance with the basic standards, taking into account the BSS Directive. The European Commission is therefore involved in any relevant legislative and regulatory measures taken by the Member States to put the Treaty and the resultant basic standards fully and completely into effect.

Under the institutional provisions of the Treaty, Euratom possesses its own mechanisms to check that the relevant legislation is complied with by all its Member States, including the possibility to seek a judgment from the Court of Justice of the European Communities to this end.

Following Euratom's accession to the Joint Convention, this Convention became part of the corpus of binding Euratom legislation.

As far as the existing Euratom legislation provides a binding framework for authorisation, inspection and enforcement, responsibility for implementing and enforcing such European legislation is entrusted to the Member States under the supervision of the European Commission.

8. OTHER GENERAL SAFETY PROVISIONS (SECTION F)

8.1. Responsibility of the licence holder (Article 21 of the Joint Convention)

Euratom is involved in the licensing process for radioactive waste management under Article 37 of the Treaty which states that: “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” on the issue and the licence cannot be granted at national level, before the opinion is delivered²⁹.

²⁹ Article 37 of the Euratom Treaty. 2005 Report (not yet published).

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”³⁰. In the framework of this authorisation system, the responsibility of the licence holder - as required in Article 2 of the BSS Directive - is invoked with regard to the responsibilities of undertakings in Article 47 of the same Directive.

8.2. Operational radiation protection (Article 24 of the Joint Convention)³¹

Article 2(b) of the Treaty requires the European Atomic Energy Community to establish uniform safety standards to protect the health of workers and of the general public and ensure that they are applied.

Euratom shares competences with the Member States to take the appropriate steps to ensure that, in all stages of operations, exposure of workers and the public to radiation caused by a nuclear installation is kept as low as reasonably achievable and that no individual is exposed to radiation doses which exceed the prescribed national dose limits. 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 justification, optimisation and dose limitation. 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). Justification is a matter of judgment by Member States and the Directive does not prescribe how to make this judgment. 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.

8.3. Emergency preparedness (Article 25 of the Joint Convention)

Articles 30 and 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.

Therefore 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 shall ensure that appropriate intervention plans are drawn up at national or local level.

In addition, Decision 87/600/Euratom³² makes arrangements for the early exchange of information in the event of a radiological emergency (ECURIE). These arrangements cover EU member States, Switzerland and Croatia.

³⁰ Judgment of the Court of 10 December 2002, case C-29/99, Commission v Council, ECR 2002, p. I-11221.

³¹ For further information see Annex I.

³² 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.

At international level this competence is reflected in the accession of Euratom to the Convention on Early Notification of a Nuclear Accident³³ and the Convention on Assistance in the Case of a Nuclear Accident³⁴.

8.4. Decommissioning (Article 26 of the Joint Convention)

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 decommissioning of nuclear installations has to be notified to the European Commission under Article 37 of the Treaty. European Commission Recommendation 1999/829/Euratom³⁵ on the application of Article 37 of the Treaty outlines the content of such general data. Information is also requested on “criteria for contaminated materials to be released, for disposal, recycling or reuse” and on “envisaged types and amounts of released materials”. This information allows the European Commission to issue an opinion on whether the dismantling operations could have a significant health impact on other Member States and, if appropriate, on the adequacy of national clearance levels.

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

Dungeness-A NPP (UK), Sizewell-A NPP (UK), Winfrith NPP (UK), Triga-Mark I research reactor (DE), AVR Jülich research reactor (DE), Obrigheim NPP (DE), Creys-Malville NPP (FR), Trino NPP (IT), Garigliano NPP (IT), Eurochemic reprocessing plant (BE), the Dounreay Site Restoration Plan (UK), BR3 pressurised water reactor (BE), Oldbury NPP (UK), FJR-2 Jülich research reactor (DE)

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 ...”.

³³ OJ L 314, 30.11.2005, p. 22.

³⁴ OJ L 314, 30.11.2005, p. 28.

³⁵ OJ L 324, 16.12.1999, p. 23.

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 145 reactors currently operating in the enlarged EU-25 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.

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 electricity³⁶. 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 interinstitutional statement made in July 2003³⁷ 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 report³⁸ on the use of financial resources earmarked for the decommissioning of nuclear power plants published in 2004 and covering the 14 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.

Pending adoption of legally binding instruments, the European Commission has adopted in 2006 a Recommendation³⁹ on the management of financial resources for the decommissioning of nuclear installations, spent fuel and radioactive waste.

In 2007, the second report⁴⁰ has been adopted comparing EU nuclear operators and Member States funding practice with that detailed in the Commission Recommendation. Whereas the first report from 2004 was limited to power reactors, this 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.

³⁶ 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, Official Journal of the European Union L 176, 15.6.2003.

³⁷ OJ L 176, 15. 7.2003.

³⁸ 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, European Commission, COM(2004) 719 final, Brussels, 26 October 2004.

³⁹ OJ L 330 (28.11.2006), p.31

⁴⁰ COM(2007) 794 final and SEC(2007) 1654.

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 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. The Commission will address these issues as follow-up action to the publication of the Recommendation with the assistance of the advisory group representing all Member States.

9. REQUIREMENTS WITH REGARD TO SAFETY OF SPENT FUEL MANAGEMENT AND SAFETY OF RADIOACTIVE WASTE MANAGEMENT (SECTIONS G AND H)

9.1. General safety requirements (Articles 4 and 11 of the Joint Convention)

The particular Euratom legal framework which must be mentioned in this field is the BSS Directive based on Article 2(b) and Chapter III of the Treaty. Article 2 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”⁴¹.

9.2. 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, however, 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 European 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 European Commission does not give an opinion on the proposed siting as such.

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

- modifications of existing installations on which an opinion had already been given: TU5 facility (FR), Centraco facility (FR), Socatri facility (FR), Comurhex facility (FR), Golfech

⁴¹ See section 6 “Euratom’s legislative and regulatory framework”.

NPP (FR), Tricastin NPP (FR), Dampierre NPP (FR), Penly NPP (FR), Belgoprocess Pamela facility (BE), Flamanville 1+2 NPP (FR);

- modifications of existing installations on which no opinion had already been given: Temelin nuclear site (CZ), Ignalina nuclear site (LT) and
- new projects: Georges Besse II enrichment plant (FR), NCS Hanau storage facilities (DE), Studsvik metallic recycling facility (UK), Urenco Capenhurst enrichment plant (UK), Flamanville 3 EPR NPP (FR)

according to Art. 41 and 43 of the Treaty, and considering the fact that for any new investment project within the EU, nuclear safety and waste management should be addressed, over the past 3 years the European Commission has given opinions on the investment projects of construction of a NPP: Flamanville (France), Belene (Bulgaria) and Mohovce (Slovakia).

9.3. 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 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 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 called for, in particular, by Articles 43 and 44 of the BSS Directive.

9.4. 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 European 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 the Member States to communicate those provisions to the European 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 states 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 ... Such protection shall include ... examination and approval of plans for installations involving an exposure risk ...”; they 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 ...”

9.5. 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 European Commission the right of access to such facilities for verification purposes. Article 36 of the Treaty requires periodic communication to the European Commission of the monitoring data referred to in Article 35.

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

“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 ...”

10. TRANSBOUNDARY MOVEMENT (SECTION I - ARTICLE 27 OF THE JOINT CONVENTION)

10.1. Council Directive on the supervision and control of shipments of radioactive waste between Member States and into and out of the Community⁴²

Council Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and nuclear spent fuel is intended to replace existing legislation⁴³ which contains the rules applicable for authorising the movement of radioactive waste from one country to another, as well as it extends 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 European Atomic Energy 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 require 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 its 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

⁴² Council Directive 2006/117/Euratom of 12 November 2006 in the supervision and control of shipments of radioactive waste and spent fuel (OJ L 337, 5.12.2006, p. 21)

⁴³ Council Directive 92/3/Euratom of 3 February 1992 (OJ L 35, 12.2.1992, p. 24)

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, the new Directive is fully consistent with the existing legislation for the health protection of workers and population against the dangers arising from ionising radiation. It also ensures consistency with international Conventions, in particular with the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, to which the Community acceded on 2 January 2006.

10.2. Euratom Regulation on shipments of radioactive substances between Member States⁴⁴

Regulation 1493/93/Euratom on shipments of radioactive substances between Member States 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 European Union. 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.

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

11. DISUSED SEALED SOURCES (SECTION J – 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 European Atomic Energy Community and disposal of radioactive substances is subject to notification.

Furthermore, authorisation is required, in particular, for the use of (X-ray sets)⁴⁵ or radioactive sources for:

- industrial radiography or
- processing of products or

⁴⁴ Council Regulation (Euratom) No 1493/93, OJ L 148, 19.6.1993, p. 1.

⁴⁵ Between brackets because not suitable for terrorist acts.

- 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. These provisions are supplemented by the Directive on the control of high-activity sealed radioactive sources and orphan sources⁴⁶, which set 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 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 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.

⁴⁶ Directive 2003/122/Euratom, OJ L 346, 31.12.2003, p. 57.

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

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

12.1. Euratom loans

Financial support in the form of loans is available for all Member States⁴⁷ and certain non-member States⁴⁸. 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.

12.2. 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 European Union. The results of this analysis had to be presented periodically to the Council.

There have now been six so-called Situation reports, describing the status of radioactive waste management in the European Union. The first four reported on actions carried out under the Community Plans of Action. Although the Plan 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 fifth⁴⁹ and sixth⁵⁰ reports concentrated on the aspect of waste inventories and disposal sites, together with waste management policies and practices. Additionally, in these last two reports waste quantities

⁴⁷ Council Decision 77/270/Euratom empowering the Commission to issue Euratom loans for the purpose of contributing to the financing of nuclear power stations, Official Journal L 88, 6.4.1977, p. 11, as amended and supplemented.

⁴⁸ 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, Official Journal L 84, 29.3.1994, pp. 41-43, as amended and supplemented.

⁴⁹ Fifth Situation Report - Radioactive Waste Management in the Enlarged European Union, EUR20653EN, European Commission (2003)

⁵⁰ COM(2008)542 final.

were included from member states which acceded during the enlargements in 2004 and 2007, giving in total 27 member states, of which 16 operate or have operated nuclear power plants.

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 (LILW-LL), 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 (LILW-SL) and very low-level waste (VLLW), only 7 of the 16 NPP states currently operate disposal facilities to deal with the wastes from these facilities. However by 2020, if current plans are followed up, all these states, with the exception of the Netherlands, could have operational disposal facilities for this last type of waste.

12.3. Euratom Research Framework Programmes⁵¹

The European Union makes a major contribution to the safety of radioactive waste management (RWM) through its research activities under the Euratom Treaty. In the Treaty, the legal basis for all EU research activities in the field of nuclear science and technology in Article 2(a) and in the provisions covering promotion of research in its Title II, Chapter 1, especially Article 7 which foresees the establishing 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 European Commission, as laid down in the Treaty. The current programme is the seventh Euratom Framework Programme⁵² (FP7, 2007 – 2011). Priority areas of research are described at greater length in the accompanying SP⁵³. The European Commission is responsible for implementation of these programmes. Annual work programmes are drawn up by the European Commission, with the opinion of the programme committee of appointed representatives from the EU Member States, and implemented via calls for proposals announced in the Official Journal of the EU and published on the Cordis Website⁵⁴. 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 a EU grant is awarded covering part of the overall project budget, with the project consortium partners contributing the balance of the funding.

The Euratom programme covers research in both fusion and fission (including radiation protection). The budget for fission and radiation protection research activities is €287 million over the period 2007–2011. Five main areas of activities have been identified: management of

⁵¹ For more information see Annex II.

⁵² Council Decision No.2006/970/Euratom of 18 December 2006.

⁵³ Council Decision No;2006/976/Euratom of 19 December 2006. There is a separate SP for the nuclear research activities of the Commission's Joint Research Centre (not considered in this report).

⁵⁴ Details of all calls to date in FP7 can be found on <http://cordis.europa.eu/fp7/dc/index.cfm?fuseaction=UserSite.FP7CallsPage>

radioactive waste (geological disposal, partitioning and transmutation, P&T), reactor systems (including installation safety and innovative concepts), radiation protection, research infrastructures, human resources and training.

ANNEX I Operational Radiation Protection

Article 2(b) of the Treaty requires the European Atomic Energy Community to establish uniform safety standards to protect the health of workers and of the general public and to ensure that they are applied.

Euratom shares competences with the Member States to take the appropriate steps to ensure that in all operational situations radiation exposure to workers and the public caused by nuclear installations is kept as low as reasonably achievable and that no individual is exposed to radiation doses which exceed prescribed national dose limits.

Article 218 of the Treaty underlines the importance attached by Euratom to the basic standards, as these had to be determined within one year of the entry into force of the Treaty. They were first established in 1959. The current safety standards are set out in the BSS Directive. The BSS Directive is based on the 1990 Recommendation of the International Commission on Radiological Protection (ICRP) and is consistent with the International Basic Safety Standards for Protection against Ionising Radiation and for the Safety of Radiation Sources sponsored and issued by the International Atomic Energy Agency and co-sponsored by other five international organisations with competence in radiation protection.

The BSS Directive is divided into ten sections:

- Title I Definitions,
- Title II Scope,
- Title III Reporting and authorisation of practices,
- Title IV Justification, optimisation and dose limitation for practices,
- Title V Estimation of effective dose,
- Title VI Fundamental principles governing operational protection of exposed workers, apprentices and students for practices,
- Title VII Significant increase in exposure due to natural radiation sources,
- Title VIII Implementation of radiation protection for the population in normal circumstances,
- Title IX Intervention,
- Title X Final provisions.

Optimisation (ALARA) principle

The general principles of radiation protection - justification, optimisation and dose limitation - are mandatory under Article 6 of the BSS Directive. In particular, as regards optimisation, Article 6(3)(a) reads:

“... each Member State shall ensure that:

(a) in the context of optimisation, all exposures shall be kept as low as reasonably achievable, economic and social factors being taken into account.”

Dose limits

As regards dose limitation, the BSS Directive sets dose limits for exposed workers, apprentices, students and members of the public. The relevant Articles are:

“Article 9 – Dose limits for exposed workers

1. The limit on effective dose for exposed workers shall be 100 millisieverts (‘mSv’) in a consecutive five-year period, subject to a maximum effective dose of 50 mSv in any single year. Member States may decide an annual amount.

2. Without prejudice to paragraph 1:

(a) the limit on equivalent dose for the lens of the eye shall be 150 mSv in a year;

(b) the limit on equivalent dose for the skin shall be 500 mSv in a year. This limit shall apply to the dose averaged over any area of 1 cm², regardless of the area exposed;

(c) the limit on equivalent dose for the hands, forearms, feet and ankles shall be 500 mSv in a year.”

“Article 11 – Dose limits for apprentices and students

1. The dose limits for apprentices aged 18 years or over and students aged 18 years or over who, in the course of their studies, are obliged to use sources shall be the same as the dose limits for exposed workers laid down in Article 9.

2. The limit for effective dose for apprentices aged between 16 and 18 years and for students aged between 16 and 18 years who, in the course of their studies, are obliged to use sources shall be 6 mSv per year.

Without prejudice to this dose limit:

(a) the limit on equivalent dose for the lens of the eye shall be 50 mSv in a year;

(b) the limit on equivalent dose for the skin shall be 150 mSv in a year. This limit shall apply to the dose averaged over any area of 1 cm², regardless of the area exposed;

(c) the limit on equivalent dose for the hands, forearms, feet and ankles shall be 150 mSv in a year.

3. The dose limits for apprentices and students who are not subject to the provisions of paragraphs 1 and 2 shall be the same as the dose limits for members of the public specified in Article 13.”

“Article 13 – Dose limits for members of the public

1. Without prejudice to Article 14, the dose limits for members of the public shall be as laid down in paragraphs 2 and 3.

2. *The limit for effective dose shall be 1 mSv in a year. However, in special circumstances, a higher effective dose may be authorised in a single year, provided that the average over five consecutive years does not exceed 1 mSv per year.*

3. *Without prejudice to paragraph 2:*

(a) the limit on equivalent dose for the lens of the eye shall be 15 mSv in a year;

(b) the limit on equivalent dose for the skin shall be 50 mSv in a year averaged over any 1 cm² area of skin, regardless of the area exposed.”

Operational protection of the population

As regards practices posing a risk from ionising radiation for the population, Articles 43 and 44 of the BSS Directive require Member States to apply the fundamental principles governing operational protection of the population. In particular, Article 44 states 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 which cannot be disregarded from the radiation protection point of view.

Such protection shall include the following tasks:

(a) examination and approval of plans for installations involving an exposure risk, and of the proposed siting of such installations within the territory concerned, from the point of view of radiation protection;

(b) 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;

(c) examination and approval of plans for the discharge of radioactive effluents.

These tasks shall be carried out in accordance with rules laid down by the competent authorities on the basis of the extent of the exposure risk involved.”

Article 49 of the BSS Directive requires Member States to consider the possibility of radiological emergencies resulting from practices subject to the Directive and to assess the corresponding potential exposures.

Estimates and records of population doses from nuclear installations defined by the Convention are required by Article 45 of the BSS Directive:

“The competent authorities shall:

(a) ensure that dose estimates from practices subject to prior authorisation are made as realistic as possible for the population as a whole and for reference groups of the population in all places where such groups may occur;

(b) decide on the frequency of assessments and take all necessary steps to identify the reference groups of the population, taking into account the effective pathways of transmission of the radioactive substances;

(c) ensure, taking into account the radiological risks, that the estimates of the population doses include:

– assessment of the doses due to external radiation, indicating, where appropriate, the quality of the radiation in question,

– assessment of the intake of radionuclides, indicating the nature of the radionuclides and, where necessary, their physical and chemical states, and determination of the activity and concentrations of these radionuclides,

– assessment of the doses that the reference groups of the population are liable to receive and specification of the characteristics of these groups;

(d) require records to be kept relating to measurements of external exposure, estimates of intakes of radionuclides and radioactive contamination as well as the results of the assessment of the doses received by reference groups and by the population.”

ANNEX II 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 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, and the associated environmental. 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

RWM has been 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 (P&T). Several of the RWM research projects launched under FP6 (2002-2006) have now ended, and the rest will do so in the next two or three years (refer to Table 1).

In the area of geological disposal, major progress has been achieved in the development and testing of repository technologies, the investigation of near-field and far-field phenomena and the promotion of basic scientific understanding relating to safety and performance assessment methodologies. In addition to this more technical research, projects have also been launched in the area of social sciences that are looking at RWM governance issues such as decision-making processes and stakeholder involvement. Research has also been conducted in more strategic fields such as technology transfer and the possibility for countries to share RWM facilities.

Research is also carried out to investigate P&T processes and techniques and their application on an industrial scale to reduce the long-term hazards associated with nuclear waste. The research involves as well investigation of the potential of new concepts of nuclear energy generation to make a more efficient use of fissile material and to produce less waste.

In FP6, the emphasis has also been on enhanced coordination of research activities and cooperation amongst the R&D stakeholder organisations, essentially via the launching of larger projects involving a great number of partners. The desired outcomes are the reinforcing of cooperation between the key players, thereby contributing to the general EU policy aims of strengthening the European Research Area, reducing fragmentation in their search effort and increasing the 'added value' of the EU-funded research activities in general. This strategy has been made possible through the introduction of new funding instruments such as the Integrated Project and Network of Excellence (see Table 1). In addition, education, training, dissemination and knowledge management in general are other essential ingredients of all projects.

Table 1 summarises the current status of FP6 implementation in the field of RWM. Only the major projects are listed; several smaller coordination actions, specific support actions and actions facilitating transnational access to infrastructure facilities are not explicitly mentioned.

In addition, in the field of human resources and training, a number of Euratom fellowships and grants have been awarded in the general area of RWM.

FP7 – Seventh Euratom Framework Programme

As in previous programmes, Euratom FP7 covers research in both fusion and fission (including radiation protection). The total budget in the field of fission and radiation protection is €287M over the five years 2007-2011 (see also section 12.3).

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 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 P&T and/or other techniques.

Finally, the strategic ambition is to establish a 'Technology Platform' in the field of geological disposal bringing together all the key R&D stakeholders such as national waste management agencies, research organisations, and institutes. This forum will then be responsible for agreeing a joint strategic research agenda and associated development strategies. This will provide important input to the defining of future FP annual work programmes in the field.

Following the first FP7 work programme and call for proposals in 2007, three major proposals were retained for funding and the projects have since started (see Table 1). Calls for proposals will be held annually throughout the duration of FP7, but unlike in FP6 there is no ring-fenced funding for RWM research, or indeed for any of the other thematic areas of the programme. This allows maximum flexibility in programme implementation to cater for shifts in strategic and political priorities as well as to respond to the results from on-going research.

Table 1: FP6 – Summary of major RWM projects to date

Project acronym and title¹	Instrument²	Coordinator	Number of consortium partners³	EU contribution / total cost	Start date & duration
NF-PRO Understanding and physical and numerical modelling of the key processes in the near-field and their coupling for different host rocks and repository strategies http://www.nf-pro.org/	IP	SCK.CEN (B)	40 (10)	€8M / €16.8M	1/1/04 4 years

Project acronym and title ¹	Instrument ²	Coordinator	Number of consortium partners ³	EU contribution / total cost	Start date & duration
ESDRED Engineering studies and demonstrations of repository designs See http://www.esdred.info/	IP	ANDRA (FR)	13 (9)	€7.32M / €18.1M	1/2/04 5 years
FUNMIG Fundamental processes of radionuclide migration. See http://www.funmig.com/	IP	FZK-INE (DE)	51 (15)	€8M / €15M	1/1/05 4 years
PAMINA Performance Assessment methodologies in Application to guide the development of the Safety Case	IP	GRS (DE)	25 (11)	€4M / €7.62M	1/10/06 26 months
ACTINET-6 Network for Actinide Sciences See www.actinet-network.org	NoE	CEA (FR)	27 (13)	€6.35M / €10.5M	1/3/04 4 years
RED-IMPACT Impact of Partitioning, Transmutation and Waste Reduction Technologies on the Final Nuclear Waste Disposal http://www.red-impact.proj.kth.se/	STREP	Kungliga Tekniska Högskolan (SE)	23 (10)	€2M / €3.51M	1/3/04 3 years
EUROPART European research program for the Partitioning of minor actinides and some long-lived fission products from high active wastes issuing the reprocessing of spent nuclear fuels http://www.europart-project.org/	IP	CEA (FR)	27 (11)	€6M / €10.3M	1/1/04 3 years
EUROTRANS European Research Programme for the Transmutation of High-Level Waste in an Accelerator Driven System http://nuklear-server.fzk.de/eurotrans/Start.html	IP	FZK-NUKLEAR (DE)	32 (15)	€23M / €43M	1/4/05 4 years

Project acronym and title¹	Instrument²	Coordinator	Number of consortium partners³	EU contribution / total cost	Start date & duration
LWR Deputy LWR fuels for deep burning of Pu in thermal reactors.	STREP	SCK.CEN (B)	8 (6)	€1.25M / €2.43M	1/10/06 4 years
PUMA Plutonium and Minor Actinides Management by Gas-Cooled Reactors	STREP	NRG (NL)	17 (9)	€1.85M / €3.7M	1/9/06 3 years
TIMODAZ Thermal Impact on the Damaged Zone around a Radioactive Waste Disposal in Clay Host Rock	STREP	EURIDICE	14 (8)	€2.65M / €3.95M	1/9/06 4 years
THERESA Coupled thermal-hydrological-mechanical-chemical processes for application in repository safety assessment	STREP	KTH	26 (9)	€1.2M / €1.98M	1/11/06 3 years
MICADO Model uncertainty for the mechanism of dissolution of spent fuel in a nuclear waste repository	CA	ARMINES	19 (7)	€1.3M / €1.75M	1/10/06 3 years
CARD Co-ordination of research development and demonstration priorities and strategies for geological disposal.	CA	NDA (UK)	9 (8)	€0.35M / €0.54M	1/11/06 15 months
SAPIERR-2 Strategy Action Plan for Implementation of European Regional Repositories. http://www.sapierr.net/	CA	COVRA (NL)	8 (8)	€0.70M / €0.94M	1/11/06 2 years

Project acronym and title¹	Instrument²	Coordinator	Number of consortium partners³	EU contribution / total cost	Start date & duration
CATT Co-operation and technology transfer on long term radioactive waste management for member states with small nuclear programmes.	SSA	NDA (UK)	7 (7)	€0.21M / €0.25M	01/01/06 18 months
COWAM-2 Community Waste Management 2: Improving the governance of nuclear waste management and disposal in Europe. See http://www.cowam.org/	STREP	Mutadis (FR)	19 (9)	€1.2M / €2.33M	1/1/04 3 years
CIP New governance approaches to radioactive waste management Europe: COWAM in practice http://www.radwastegovernance.eu/	STREP	Mutadis (FR)	10 (6)	€0.8M / €1.54M	1/2/07 3 years
ARGONA Arenas for risk governance http://www.radwastegovernance.eu/	STREP	Karita Research AB Sweden	14 (8)	€1.2M / €1.86M	1/11/06 3 years
OBRA European Observatory for Long-term Governance on Radioactive Waste Management http://www.radwastegovernance.eu/	CA	ENVIROS Spain	10 (7)	€0.3M / €0.32M	1/11/06 2 years
ACSEPT (FP7 ⁴) Actinide reCycling by SEParation and Transmutation	collaborative project ⁵	CEA (FR)	34 (14)	€6M / €23.8M	1/1/08 4 years
RECOZY (FP7 ⁴) Redox phenomena controlling systems	collaborative project ⁵	FZK-INE (DE)	30 (12)	€3.50M / €6.05M	1/3/08 4 years
CARBOWASTE (FP7 ⁴) Treatment and Disposal of Irradiated Graphite and other Carbonaceous Waste	collaborative project ⁵	FZJ (DE)	28 (10)	€6M / €12M	1/3/08 4 years

- ¹ For information on all FP6 projects refer to <http://www.cordis.lu/fp6-euratom/projects.htm>.
- ² FP6 funding schemes: NoE = Network of Excellence; IP = Integrated Project; STREP = Specific Targeted Research Project; CA = Coordination Action; SSA = Specific Support Action (details on <http://www.cordis.lu/fp6/instruments.htm>)
- ³ The figures in brackets indicate number of European countries represented
- ⁴ For information on FP7 projects refer to http://cordis.europa.eu/fp7/euratom-fission/home_en.html
- ⁵ FP7 funding scheme – details on http://cordis.europa.eu/fp7/what_en.html#funding